

## **ADOPTION OF E-LEARNING SYSTEM BASED ON CLOUD TECHNOLOGY FOR HIGHER EDUCATION ORGANIZATIONS: A REVIEW**

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### **Abstract**

E-learning based on cloud computing is one of the most popular system discovered to promote traditional instruction by software applications and a virtual learning environment. cloud computing systems, whether stand-alone, depending on networked learning on either local networks or the Internet, underlie many e-learning systems. Based on the distinct virtual concentrations, cloud computing is typically split into three kinds depending on computer assets packaging in separate abstraction layers, i.e. infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). However, it offers a practical roadmap that will guide the government organization step-by-step in adopting cloud computing for e-learning. On the other hand, access to the Iraqi education organizations was given to this study in order to collect the information needed for this research. Additionally, it will make a significant contribution to the development of a framework for evaluating the readiness-to-use e-learning system based on cloud computing. Meanwhile, Iraq's use of e-learning services is expected to improve quality, effectiveness, communication, motivation and other aspects. Many researches used e-learning acceptance models to examine e-learning and user recognition systems. We reviewed the studies about Iraq higher education, e-learning background, e-learning advantages, studies on e-learning system

acceptance, cloud computing, cloud computing services models, cloud deployment models, and cloud e-learning.

**Keywords:** *Cloud Computing, cloud services, cloud deployment, E-learning, Cloud System Acceptance*

## 1 Introduction

This section offers a cross-examination of appropriate literature to explain the rationality for using the factors connected with the research model. In addition, comparative studies on adoption cloud computing in e-learning and frameworks, obstacles to e-learning, e-learning in emerging nations in particular, and Middle Eastern nations in particular the important causes of e-learning adoption cloud computing system. Cloud computing is an Internet-based formula mode that allows on-demand sharing of software and hardware resources and data on demand for computers and other terminal devices on demand (Weixiang and Lin, 2016). However, owing to technical disagreements between major service suppliers, there is a compatibility issue with suitable format depending on the virtual machine manager of multiple cloud systems. Consequently, to some level it impedes the versatile implementation of cloud workloads. While these issues can be fixed differently with the excellent development of open source standards (Weixiang and Lin, 2016). Cloud computing is meant to function as a service provider. Therefore, clients rent cloud software resources to finish their work. Efficient resource management schemes should be regarded to guarantee customer-defined service quality (QoS) demands and resource use in cloud data centers (Xu and Li, 2016). However, one of the main issues in offering cloud service is the safety problem. Success in the cloud services company is crucial. Existing research focuses on offering safety systems rather than company characteristics such as service stabilization, continuity and accessibility (Gao et al., 2013). Finally, information from these earlier studies provides a basis for this study's research framework.

## 2 Related work

A total of 29 studies were identified that have investigated the cloud adoption using different theoretical adoption models and theories. Table 2.1 in show below a summary of the reviewed study.

E-learning is one of the most popular techniques discovered to promote traditional instruction by software applications and a virtual learning environment. According to (Ercan, 2010), e-learning involves various kinds of media that supply text, audio, images, animation, video streaming. It involves technology apps and processes such as sound, video, satellite TV, and computer-based learning, as well as local intranet or extranet, and web-based learning. Furthermore, cloud computing systems, whether stand-alone, depending on networked learning on either local networks or the Internet, underlie many e-learning systems. Cloud computing systems is one of the most common buzzwords used in the IT globe. The word CC is obtained from the manner network diagrams often imply the Internet. Based on the distinct virtual concentrations, cloud computing is typically split into three kinds depending on computer assets packaging in separate abstraction layers, i.e. infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). E-learning is learning to use electronic technologies to access instructional curriculum in and out of a traditional school, which promotes education through communications networks, has rendered it feasible to use the Internet from anywhere at any time. The developed countries have produced important advances towards the inclusion of higher education for e-learning platforms (Tarus, Gichoya and Muumbo, 2015). In most education system in the Middle East, there is a definite gap in e-learning implementation. Iraq is the last nation in the Middle East to introduce developments in e-learning (Matar et al., 2011). In fact, the United Nations Educational, Scientific and Cultural Organization (UNESCO) noted that the education system in Iraq suffers severe shortcomings in many fields of learning and teaching. The reason is that inadequate technical support is considered a main obstacle for the application of e-learning in Iraqi universities (Al-Shboul, 2013). The Iraqi higher education organizations could not explore e-learning system willingness due to the absence of ICT, network

infrastructure and communications (Elameer, Idrus and Jasim, 2011). More valuable, as a consequence of such shortcomings, several problems can be summarized as follows:

1. Old exercise between learners and lecturers is the primary problem that has hindered the effective implementation of e-learning owing to traditional leadership techniques, especially in Iraqi universities (Al-Azawei, Parslow and Lundqvist, 2016).
2. Due to the complexity of such a scheme, the students ' learning and qualifying problems in getting to know the e-learning system are critical issues.
3. From the very start of the concept of sustainable development, education has been a vital component of strategies and policies (Alameen, 2017).

Some main variables influence the implementation of cloud system. The first job is to create a sound knowledge of the obstacles, difficulties and variables connected with cloud computing implementation of e-learning. Second, to better comprehend the issue, a conceptual model is required through which the ministry can readily embrace e-learning through cloud computing across the republic if higher education is required. In addition, the ministry of higher education would be more probable to embrace cloud-based e-learning using appropriate conceptual framework suggested in research.

Through this framework, the probable technological, organizational and environmental problems influencing its implementation will be explained and refined.

From the outcomes of this study, further study on e-learning based on cloud computing and its latest methods can be created. In short, this research is important for many purposes: First, it enables Iraqi universities to comprehend the variables that affect e-learning based on cloud computing.

Second, it discusses the divide that remains in practical research in the Iraqi education organizations.

Third, it offers a practical roadmap that will guide the government organization step-by-step in adopting cloud computing for e-learning. Fourthly, access to the Iraqi education organizations was given to this study in order to collect the information needed for this research.

It is well recognized as the most difficult research problems; access to such public organizations, particularly military entities, is not simple. Fifthly, this research is also crucial because it will contribute to current expertise in this sector, particularly in emerging nations such as Iraq, which has a very unique culture.

**Table 2.1** Summary of articles

Author(s)\Year	Theory	Method	Apply	Summary of Result
(Alkhatir, Wills and Walters, 2014; Oliveira, Thomas and Espadanal, 2014; Lian, 2015; Yang and Cheng, 2015)	Technology-Organization Environment (TOE)	Questionnaire	IT Staff	TOE variable significant effect on the adoption of cloud computing. The most important factors are technology readiness, security, privacy, trust, relative
(Burda and Teuteberg, 2014; Tarhini, Hone and Liu, 2014; Aharony, 2015; Alkharusi and Al-Badi, 2016; Choudhary and	Technology acceptance model (TAM)	Questionnaire	Students and IT staff	Ease of use, usefulness and other factors such as security, trust and IT related knowledge are key factors for the adoption cloud computing among

(Alharbi, 2012; Li <i>et al.</i> , 2013; Cao, Bi and Wang, 2014; Nguyen <i>et al.</i> , 2014; Bellaaj, Zekri and Albugami, 2015)	Unified theory of acceptance and use of technology (UTAUT)	Questionnaire is the instrument for all the studies	Students are the respondents of these studies	Effort expectancy, performance expectancy, social influence, facilitating condition, moderators of UTAT; age, gender, experience and a voluntarily are
(Kang <i>et al.</i> , 2013; Park and Ryoo, 2013; Park and Kim, 2014; Yadegaridehkordi, Iahad and Ahmad, 2014; Lim, Grönlund and Andersson, 2015)	No adoption theories were in these studies	Questionnaire was the instruments of data collection	Students are the target respondents	These studies investigate the benefits and challenges of using the cloud computing in education setting. In addition, the factors of adoption were investigated.
(Namisiko, Munialo and Nyongesa, 2014; Sasmita and Mohd Suki, 2015)	(TOE) And (TAM)	Questionnaire	IT Professional	Variable of TAM and TOE are able explain the variable in cloud computing, E-Learning Curriculum Performance Expectancy Perceived Usefulness, Perceived

(Hew and Kadir, 2016; Hew and Syed	Self-determination theory, channel expansion theory	Questionnaire of 1046	Students	Virtual learning environment (VLE) content design, attitude, trust, school support and
(Sawang, Sun and Salim, 2014; Al-Gahtani, 2016)	TAM and TPB	Questionnaire	Students	The perceived usefulness and ease of use affect the
(Hew and Kadir, 2016)	Channel expansion theory, media richness	Questionnaire of 624	Students	All attributes content design affect school support, attitude affect knowledge sharing which affect

## 2.1 Iraq higher education

Iraq, a nation with 8,000 years of recorded history that was once a leader in the performance of its social programs among Arab states, has experienced a sequence of conflicts in latest years that have contributed to the fast decay of infrastructure and fundamental social services. The emergence of higher education in Iraq started in the 1950s with a main goal of modernizing education, concentrating on science, technology, and research programs to satisfy the country's political, financial, and cultural requirements; as well as developing people to create understanding about the country's past and traditions that are similarly well-trained in modern science and technology. A series of conflicts and

sanctions after 2003 significantly harmed Iraq's higher education organizations. The nation went through three conflicts from 1980 to 2003: the Iran-Iraq War (1980-1988), the Gulf War (1990-1991), and the Iraq War of 2003.

It also moved through a sequence of embargoes and international sanctions 13 years after the Gulf War. An increase in demand for bachelor's degree, master's degree, and PhD was witnessed after April 2003 as a consequence of the method of social growth, higher household earnings, and financial reconstruction. With respect to elevated academic performance, the need to restore the instructional systems of Iraq needed more than the traditional strategy to handling higher education. Instead, e-learning was adopted as a pedagogical strategy that allowed a strong ICT infrastructure to create a unique learning environment for both education and teaching. The structure of Iraq's higher education organizations is shown in the Figure 2.:

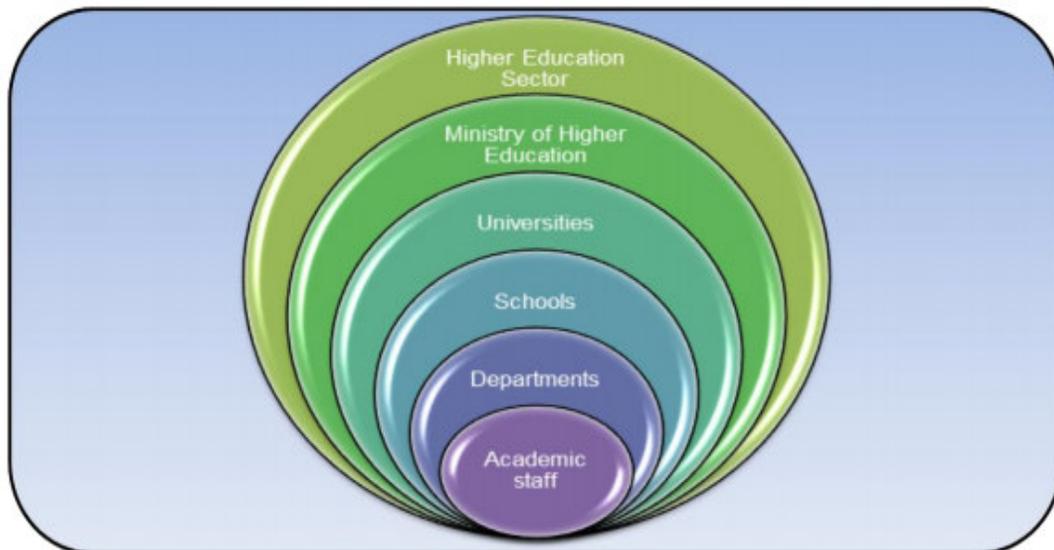
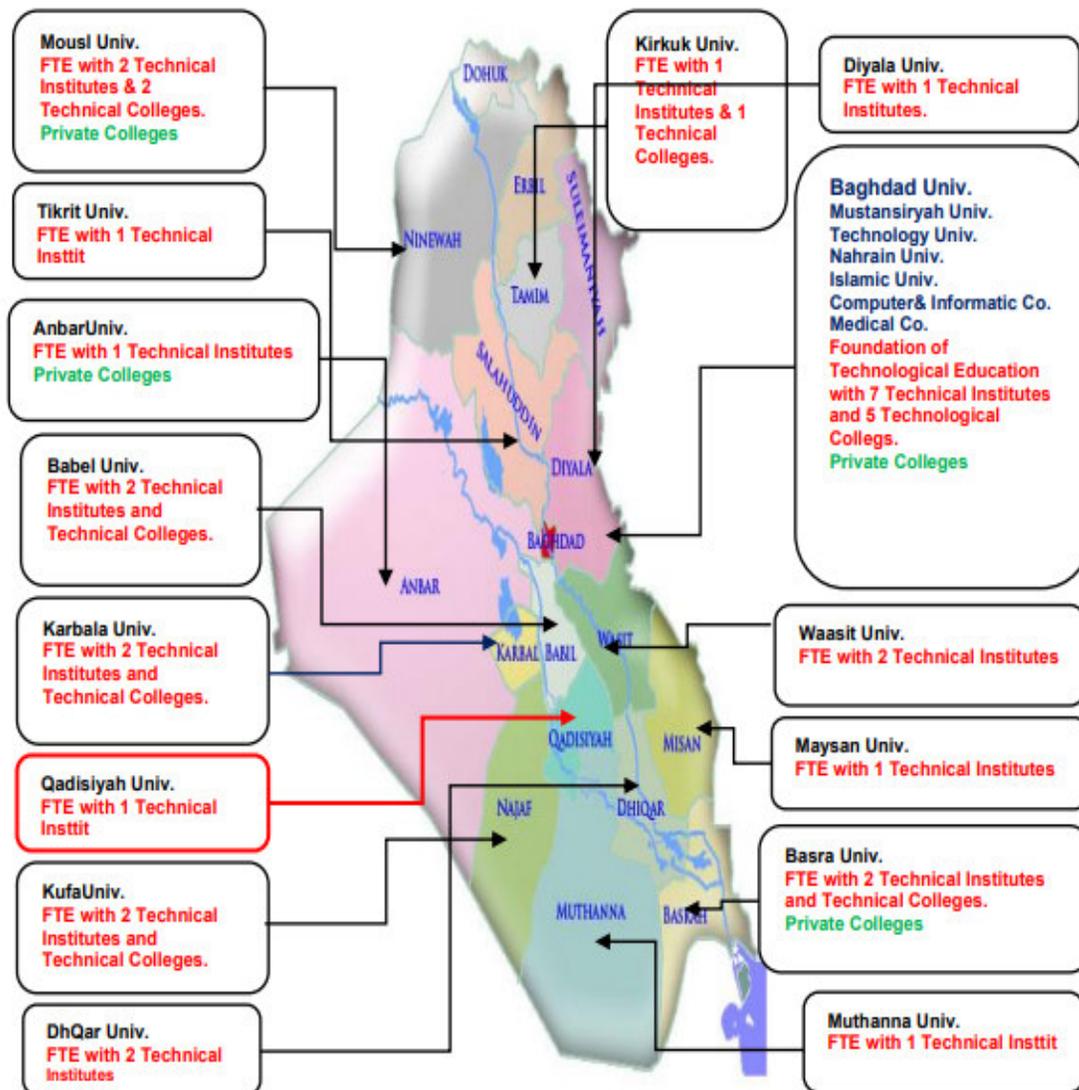


Figure 2.1 Higher education sector in Iraq (Researcher's own construction)

As the vision of student connectedness is fostered in Iraqi higher education teaching and learning system, the country's mixture of learning and technology has driven the development of e-learning. This advancement has led in a resounding commitment to the capacity of technology to provide high-quality education for all. The present Iraqi higher education organizations is made up of 20 universities and 47 MOHESR-managed technical institutes. The commission for computers and informatics also provides specific classes for graduates. In fact, ten private universities give business administration, computer science, and leadership and economics programs. Universities give some significant areas of research, including education, arts, administration, economics, engineering and technology, medicine, and agriculture (Elameer, Idrus and Jasim, 2011). Iraq's higher education organizations could play a significant part in overcoming Iraq's increasing sectarian divide and fostering long-term peace and stabilization. It could provide an organizational location as a major player in Iraqi civil society to address political, social and financial issues while supporting on-campus adherence with human rights and democratic values in a wider culture (Harb, 2008). Higher education is a significant component of generating newsocial knowledge. In six nations, such as Saudi Arabia and Jordan, the median percentage of employees to learners is 1:13, more favorable than the remainder. However, Iraqi universities are highly variable, i.e. 1:4 and 1:43. Below is Iraq's greater teaching map:

Figure 2 Higher education map of Iraq (Elameer, Idrus and Jasim, 2011)



## 2.2 E-Learning Background

E-learning is an IT-based education that involves various formats and hybrid techniques such as the Internet, software, digital media, CD-ROMs, and other E-online training tools( Maxwell, 2012). Major historical software developments in technological and educational methods to teaching started to emerge in the 1970s (Sun, Finger and Liu, 2014). Initially, e-learning started as a computer-based (CBT) training technique by using CD-ROMs across a local area network (LAN), then progressed to a more internet-based e-learning technique by enhancing Internet use (Shim et al., 2011). By the 1980s, computer-based training was used in their academic framework by only a few universities (Kasraie and Kasraie, 2010). The idea of e-learning as a school paradigm, however, expanded beyond traditional boundaries and helped to revolutionize learning (Cheawjindakarn, Suwannatthachote and Theeraroungchaisri, 2012). The use of universal resource locators (URLs) in the 1990s allowed access to resources worldwide through the implementation of the World Wide Web (WWW) (Yusuf and Al-Banawi, 2013). With the introduction of the Internet and worldwide access via URLs, a web-based training age has appeared that enables universities to use the Internet as a feasible e-learning instrument for their education (Yusuf and Al-Banawi, 2013).

During this moment, e-learning has been created to promote blended modality approaches, including a mixture of internet and face-to-face training, access to an educator or mentor, organizational coaching and e-learning (Shim et al., 2011). Through the use of web-based interaction, instruction and information transfer, e-learning advanced through web-based interaction, coaching and information transfer to include modalities for computer network technology that provided teaching equipment via the Internet, intranets and extranet and promoted effective user learning without space and time limitations (Cheng, 2011). During this era, computers and modems, animation and user interactivity were still unpleasantly seen owing to the Internet's slower nature (Yusuf and Al-Banawi, 2013). In fact, many of the

e-learning relationships between e-learners and educators have been conducted on the keyboard and mouse, leading e-learners to experience an environmental adverse impact owing to the absence of visual and audio relationships (Qin, Zheng and Li, 2014). However, e-learning was primarily taught through the Internet, adding new difficulties to the campaign against learner boredom and finding methods to enhance e-learning communication, engagement and social excitement (Qin, Zheng and Li, 2014).

### **2.2.1 E-learning Advantages**

E-learning provides some of the primary benefits that organizations can eliminate significant costs such as training pay, travel expenses, loss of staff hours, catering and training equipment and the price of training equipment ( Park and Kim, 2014). The other benefits include removing geographical barriers, enabling staff to schedule their time, making it more adaptable to their teaching, customizing teaching training and establishing a platform for self-learning (Ali, Shamsuddin and Eassa, 2014). They asserted that the technical abilities of trainers and staff, the accessibility of IT assets, job plans for staff, and the advantages of moment and expense savings could have an effect on organizational practice. Matt and Jones stressed that while businesses could save time and expenses by adopting new techniques, many did not know whether open source applications, new techniques or data sharing were accessible. Matt and Jones' research addressed how distinct Web 2.0 e-learning techniques could promote instructional projects, improve efficiency, and enhance the competitive benefit of a company. Professional training is learning for an organization that encourages organizational objectives, operations and projects. Organizational goals should include methods to boost workplace abilities, promote education, staff abilities and enhance productivity in order to achieve a competitive edge.

### **2.3 E-learning offers the following key advantages**

1. Easy to access: Students can readily access instructional services or register for instruction without being prepared to physically access the training center and without exchanging local time with their educators.

2. Group-based cooperation: Students can therefore communicate and transmit thoughts and enhance communication between educators and learners (Venkataraman and Sivakumar, 2015).
3. Flexibility: At any moment in the newsletter panel, learners may engage voluntarily in conversations with fellow learners or meet teachers in chat areas.
4. Self-ridden learning modules allow learners to know their own abilities at their own speed and to discover their own learning curve (Benta, Bologna and Dzitac, 2014).
5. Universal dimensions of knowledge: Enable learners to search and discover endless information and data needed by ICT-enabled instruments (Venkataraman and Sivakumar, 2015).
6. Improved reaction to deadlines for homework applications compared with traditional teaching strategy (Benta, Bologna and Dzitac, 2014).

Safety and security are the most significant variable of influence. As stated previously, the particular condition and climate of the European Union can justify this. The second significant factor that affects scalability is one of the most significant characteristics of cloud technology. Therefore, scalability in the public cloud is also of excellent concern in the use of CRM (Schmidt, Möhring and Keller, 2017). Internet broadband connectivity content has developed a worldwide phenomenon where information and communication technology (ICTs) are used to transfer education. Because of its vibrant scalability and resource efficiency, cloud computing becomes an appealing technology that can be used in conditions where funds are not accessible. E-learning systems have strong infrastructure demands to provide a competitive service for that number of learners who achieve the capacities of a standard internet server. Cloud computing provides an e-learning platform that provides the software and hardware as an Internet service (Bibi and Sumra, 2017). An ICT system requires an appropriate ICT infrastructure and the scheme must usually be owned, run and retained by the state. It can be very costly. Furthermore, investment in the scheme and infrastructure must be chosen wisely. However, traditional ICT infrastructure is not a

simple job. If the scheme is too big, disposal funds will be used. However, scaling up is not simple if the scheme is too tiny (Almunawar, 2015).

#### **2.4 Studies on E-learning System Acceptance**

Many researches used e-learning acceptance models to examine e-learning and user recognition systems. A significant amount of studies have been located within the framework of present research-based education; the following is an overview of these significant e-learning relating to user acceptance of cloud e-learning (Chatzoglou, Chatzoudes and Symeonidis, 2015).

##### **Study1: Exploring Gender Differences in SMS-Based Mobile Library Search System Adoption.**

The aim of this research is to examine the distinctions between male and female of learners and to adopt a library catalog search service for brief texts (SMS). The study disclosed gender differences in intent to use and perceived usefulness, but when it arrived in self-efficacy, the variations were important for men relative to their peers. Overall, however, the research strengthened present views that perceived usefulness remained the main power behind intention to use, irrespective of user gender (Goh, 2011).

##### **Study2: An Individualized e-Reading System Developed Based on Multi- Representations Approach**

The aim of the second research was to create a system for students with teaching problems in Taiwan; an integrated reading aid system was suggested to assist learners. The system was intended to provide sensory, behavioral and physical assistance to all senses. A system usability evaluation with expected customers indicates that the scheme was both user-friendly and effective. A total of 30 learners with learning disabilities evaluated the system and recorded enhanced knowledge of reading and achievement (Ko et al., 2011).

##### **Study3: An Analysis of the Technology Acceptance Model in Understanding University**

###### **Students' Behavioral Intention to Use e-Learning**

The objective of the study is to tackle a long-term study divide that has arisen in Korea as a consequence of wide e-learning system execution. A sample of 628 learners from Korean universities

was examined while Structural Equation Modeling (SEM) was used to clarify the adoption process. This general model included self-efficacy of the e-learning system, subjective norms, and system access, perceived usefulness, social perception, behavior, and cognitive purpose to use the TAM scheme. The outcomes validate the use of TAM to explore the implementation of e-learning technologies, whereas the most significant building was e-learning system effectiveness (Sung Park, 2009).

**Study4: Attitude of Students Towards E-learning in South- West Nigerian Universities: An Application of Technology Acceptance Model**

This study seeks at learners at Nigerian universities to explore attitudes toward e-learning systems. The researchers examined the connection between user conduct and e-learning systems and specifically implemented the TAM. The research discovered that ease of use and perceived usability are essential for influencing habits and intentions towards e-learning technologies (Adewole-Odeshi, 2014).

**Study5: Looking under the Bonnet: Factors Affecting Student Adoption of E-Learning Systems in Jordan**

The research examined main variables influencing the acceptance and connection of e-learning system among learners. The research was therefore performed by 486 undergraduate learners at universities centered in Jordan. The system involved was Moodle, an e-learning platform for internet studies and TAM. The results verified that previous knowledge has played a significant part in influencing user adoption of such e-learning system (Abbad, Morris and de Nahlik, 2009).

**Study6: Learners' acceptance of e-learning in South Korea: Theories and results**

Although the Technology Acceptance Model was implemented, researchers attempted to explore the critical variables affecting e-learning in South Korea. The research examined a sample of 250 learners in South Korea and showed that perceived usefulness continues a significant driver of acceptance. Dependent variables such as teacher characteristics, advancement of learning equipment and teaching equipment were examined and discovered to be favorably linked to perceived usefulness. It has been shown that usefulness is the biggest predictor of using e-learning system. Therefore, the study shows that

the easier and cheaper a scheme is, the more probable it will be used by learners (Lee, Yoon and Lee, 2009).

### **3 Cloud Computing**

Cloud computing technology is currently introducing the concept of data storage and management on virtualized servers so that applications, individuals and organizations around the world can connect to databases and resources anywhere and at any time (Alemu and Omer, 2014). Sometimes a broad range of internal / external rivals experience cloud service that can maliciously delete or manipulate user information; and sometimes cloud service suppliers can behave dishonestly, conceal data loss or corruption, and argue that documents are still saved properly for success in the cloud (Navya and Ramanjaiah, 2017). It is a new model that is regarded to be an evolution in the technology globe, referring to the allocation over the Internet of software facilities such as data storage assets, utilities, etc., each of which could be accessed by everyone anywhere. The cloud computing system consisted of three models of service and four designs of deployment.

#### **3.1 Cloud Computing Services Models**

Cloud technology is used to rent resources in three kinds: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS).

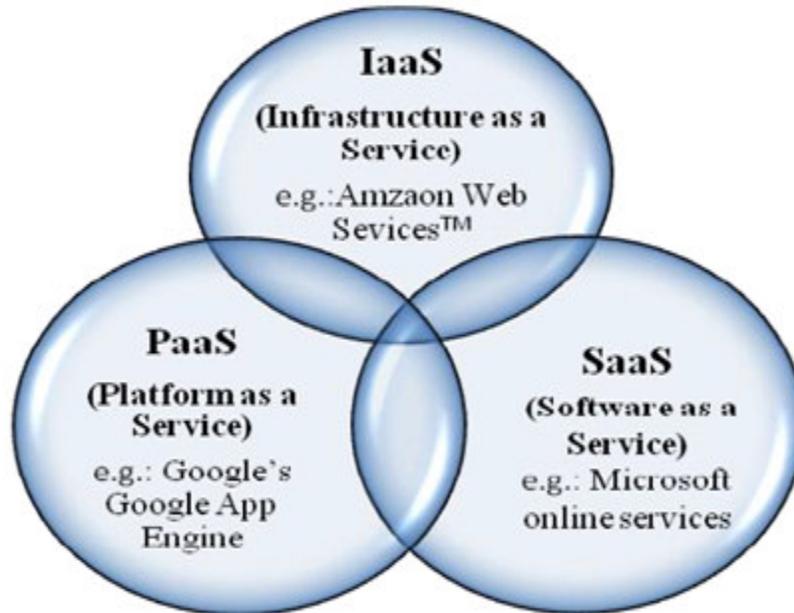


Figure 3 Cloud Computing Service Models

### 3.1.1 Software as a Service (SaaS)

cloud software is accessible on request. In this service model, applications that are available via a web browser are designed for end users (Mahalakshmi, 2017). Users can use a range of SaaS devices through client access to service suppliers operating on cloud computing infrastructure apps. The distinctive Internet nature of SaaS software makes data security - especially acute (Wang, 2016).

### 3.1.2 Platform as a Service (PaaS)

Cloud Platform technology requires an operating system, programming environments, and applications and frameworks that are also supported. Cloud products can support various operating systems, some of which are: Windows, Linux, Solaris, and so on. The other major issue in this section is

programming environments and frameworks, where programming languages and runtime environments are compulsory. In addition, important items are APIs, special domain, script and wizard considering supported application software.

### **3.1.3 Infrastructure as a Service (IaaS)**

IaaS benefit is low cost, clients only need to lease the suitable services, you can use virtual cloud processor technology, memory and other hardware opposed to traditional price methods considerably reduced (Hao, 2016). It incorporates hardware and software for system assistance, storage, networking and other computer resources to build an infrastructure (Mahalakshmi, 2017). Infrastructure as a Service — As the name suggests, an IaaS arrangement deals mainly with computing infrastructure. In an IaaS agreement, the subscribers outsource the storage and resources they need, such as hardware and software (Huth and Cebula, 2011). However, IaaS (infrastructure as a service) totally blocked the hardware behind it and allowed users to use infrastructure as a service without needing to care about the fundamental complexities (Soofi and Khan, 2014). SaaS (Software as a Service) allows users to access internet applications and software provided by service suppliers (Soofi and Khan, 2014).

Table 2 Relationship between Cloud Service Models and Resource Assignment

Cloud Service Provider (CSP)		Service model		
		SaaS	PaaS	IaaS
Virtual Resources	Hardware	CSP	CSP	CSP
Operating System		CSP	CSP	Customer
Application Software		CSP	Customer	Customer

Each of the above-mentioned model of cloud services has a distinct level of risk for organizations. It needs to build up their own governance models to guarantee that cloud computing facilities are well-defined and run in a secure setting within their current IT operations.

### 3.2 Cloud Deployment Models

The four cloud computing deployment models are crucial when looking at the prospective cloud-related products and services that stakeholders can now deliver. These products and services differ based on the delivery model used or deemed to be integrated by an organization. The four deployment designs offer each organization a distinct amount of command and control over their information and data (Pross, 2016). In addition, as can be seen in Figure 2.4, the cloud deployment models involve public cloud, private cloud, community cloud and hybrid cloud.

#### 3.2.1 Public Cloud

Public clouds provide access to computing assets over the Internet to the general government; however, the cloud service possesses supplier and operates the cloud resources. Public cloud suppliers

generally enable clients to regulate resources using an Internet service interface. Customers lease access to assets as required on a pay-as-you-go basis. Public clouds provide temporary access to big spaces of scalable assets without the need for investment in data center infrastructure (Farah, 2015). Public Cloud: An organization offers cloud services in this form from the cloud provider's on-demand grounds. User services using the computing utility system (Sakharkar, Dande and Mate, 2017).

### **3.2.2 Private Cloud**

Private Clouds provide users with instant access to computing resources in an organization's infrastructure, and the cloud resources are for that organization's use only. Users monitor and scale private cloud resources and a web service interface comparable to a public cloud (Farah, 2015). With the organization's own firewall, the private cloud is implemented within the organization's current data center. This implies that the private cloud is subject to the organization's physical, digital and safety policies, which implies that there is a higher standard of safety over delicate information. This model allows the company to implement its norms of cloud data storage and safety. Private clouds tend to be the most complicated and costly among the various designs (Farah, 2015).

### **3.2.3 Community Cloud**

Two or more organizations are shared with cloud needs and have same of cloud requirements (Huth and Cebula, 2011). Several organizations monitor, control, share community clouds and assist a particular society with mutual concerns such as task, strategy, safety standards, and compliance considerations. It can be controlled by organizations or by a third party and can occur on-site or off-site, and group participants can share access to community cloud information and applications (Carroll, Merwe and Kotzé, 2011).

### **3.2.4 Hybrid cloud**

Hybrid cloud can assist companies increase their IT infrastructure capacity, making the hybrid cloud more common on the market (Xie et al., 2016). A hybrid cloud involves various suppliers with a

range of government and the private sector choices. By distributing stuff across a hybrid cloud, each element of the company can be held in the most effective setting feasible. The downside is that IT executives need to maintain track of various distinct safety systems and guarantee they can interact with all elements of the company. Hybrid clouds are often excellent options when healthcare organizations set up a virtual personal network (VPN) behind their firewall. Or perhaps a medical organization intends to use a public cloud to communicate with clients, but maintain information safe in a private cloud (ClearDATA, 2014). Hybrid Cloud: This cloud form is made up of multiple internal or external components. This is the situation when an organization shifts from its private cloud to the public cloud domain (Sakharkar, Dande and Mate, 2017).

### **3.3 Cloud e- learning**

E-learning system alters teaching and learning methods. There are various application packages that function as a tool for the planned organization and management of different study courses in a planned manner (Salam, 2015). With the help of modern educational technologies, this platform teaches students. Invention and application of cloud computing system in the computer and networking field has really increased speed, ease, accuracy and changed the way social communications, activities and interactions are conducted (Salam, 2015). The implementation of cloud computing in China is presently facing several barriers, namely: Absence of standards; inadequate educational data; and disregard for economic and environmental effects (Duan, 2016). With the growth of the E-Government in latest years in order to limit government authority and discourage occupational conduct from corruption, many national and global regions are investigating the institution. Cloud computing, an evolving trend in the e-learning organization, has drawn many service suppliers to the sector in a very short time, offering users with several applications at their disposal (Upadhyaya and Ahuja, 2017). Cloud interoperability needs cloud suppliers to embrace and enforce normal collaborative interfaces, protocols, formats, and architectural elements. Without these provider-centered modifications, cloud interoperability is hard to

accomplish. The most prominent scenarios among various provider-centered approaches are Hybrid Cloud, Cloud Federation, and Inter-cloud. Additionally, Cloud technology offers a big information technology environment for small to medium-sized businesses (Sakharkar, Dande and Mate, 2017). Therefore, the application of a cloud-based smart grid solves the issue of the electrical system computing platforms and cloud storage ability, which also enhanced information collection effectiveness and environmental perception in the current system (Yang, Wu and Yang, 2012).

### **3.3.1 Adoption cloud for e-learning in word wide**

Educational organizations in the United States have acknowledged the anticipated position of cloud computing in enhancing spending, expertise and comfort for the education organizations. Examples of instances concerning cloud computing in schooling are given below.

### **3.3.2 Eastern Michigan University**

In 1999, Eastern Michigan University (EMU) embraced the web-based online course material and class interface. Although the venture was on the fringe of cloud computing, there was consecutive development and learners were accessible for cloud-based course equipment and aid apps. In order for the scheme to operate effectively in tune with the vast requirements of the research body and enhance features, as the scheme depended completely on cloud computing, the initial edition had to be modified continuously. EMU-Online was introduced as a cloud-based instructional implementation in 2010. It allows learners to access threaded conversations, class email features, access to grade books, and shared records through a web portal. By 2014, all learners depended on the implementation as their primary source of course data. In the same year, new innovations enabled students' access to Google's cloud phone in both the EMU-Online box and the university documents database. The university moves from EMU-Online to Canvas, which is also a cloud-based software with the same characteristics as EMU-Online, but the interface is a lot user-friendly (Ashtari and Eydgahi, 2015).

### **3.4.2 University of California**

The University of California (UC) regarded cloud computing as appealing for use in one of its classes targeted exclusively at deploying and creating SaaS applications. A donation from Amazon Web Services helped the contents of the UC course move from being owned locally to the clouds as many servers (needed for the course) could be easily obtained as soon as possible. (Armbrust et al., 2009).

### **3.4.3 University of Westminster**

The University of Westminster (UOW) also adopted cloud computing, with a student capability in the UK reaching 22,000 learners. An obsolete student email system and a study whose study indicated that 96 percent of the student population chose to set up private email accounts that would provide third-party accounts where all messages obtained could be automatically sent from their university account triggered interest in university cloud computing. They discovered Google Apps (Educational Edition), which offered a free email of 7.3 GB of computer room, shared calendars and SMS to each student or personnel member in search of an appropriate solution to the issues. Another benefit of the bundle is that it enables customers to maintain their domain name, for instance, a customer can use this email address with justin@wmin.ac.ke. In fact, the platform provides a number of productivity apps such as spreadsheet, word processing, with a cooperative function that enables customers to exchange files remotely, a function that assists learners in group tasks. After pilot testing and consultation, the application, which has an email storage ability of 7.3 GB, was introduced for use during the academic year 2008/9. Some of the problems encountered by the learners were that, first, university emails were handled as fake, spam or bogus messages or even deleted once they were sent to their private email accounts; therefore, learners did not obtain immediate and key university emails. Second, there were storage-based hurdles encountered by network servers and email that caused learners to resort to either lost or misplaced USB memory drives. Google Apps is the ultimate answer for spam emails and storage problems. It also provided an alternative for the University to use a student's friendly names instead of

an ID code for the email domain. Third, learners could use their mobile devices to access messages and store records. Finally, as the price of Google mail was too much, the University was willing to save a ton of cash. However, the university continues using the university's ancient email system that is Exchange / Microsoft Outlook. This is the choice of the university because they were worried about how the transition of their information from their secure storage to a third party would have legal implications.(Sultan, 2010).

#### **3.4.4 Kentuckys Pike County Schools**

Pike County county of Kentucky launched its cloud computing colleges to assist rationalize operating expenses. The platform is controlled by an IBM subcontractor, ICC Technology Partner. Cloud computing has allowed colleges to upgrade 1400 ancient, completely operational pcs that were idle waiting to turn into scrap. The accessibility of on-site ancient machines to conduct computer-based formative evaluation was a benefit for the county as a prospective issue was the absence of adequate equipment. The availability of desktops was a bonus because cloud computing was possible because a local computer hard drive is not needed with a cloud computing system. Processing requires place at the server stage and not at the desktop stage. The desktop feature functions as a dumb or performed workstation that recognizes the capacity of the cloud-sent software and processing. According to the county, expenditure on the host virtual desktop alternative will be lowered for half a century to half the price of maintaining the desktops on the floor. Hosting the screens in the IBM data center also helped to prevent extra infrastructure and staff expenses (Rania Almajalid, 2018).

#### **3.4.5 Florida Atlantic University Florida**

Atlantic University, a public university, has an upward ability of 29,000 learners and 170-degree programs. The university utilizes HyperV as a server-based virtualization platform that merges workloads on one server. By virtualizing its data center and delivering fresh IT facilities without extra employees, University has been prepared to decrease IT costs by US\$ 600,000. The university was also prepared to

operate Blackboard on Linux in the HyperV environment, produce more efficiency and simplify administrative job (Chandra and Borah, 2012).

### 3.4 Conclusions

E-learning is one of the most popular system discovered to promote traditional instruction by software applications and a virtual learning environment. cloud computing systems, whether stand-alone, depending on networked learning on either local networks or the Internet, underlie many e-learning systems. Based on the distinct virtual concentrations, cloud computing is typically split into three kinds depending on computer assets packaging in separate abstraction layers, i.e. infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). However, it offers a practical roadmap that will guide the government organization step-by-step in adopting cloud computing for e-learning. On the other hand, access to the Iraqi education organizations was given to this study in order to collect the information needed for this research. Many researches used e-learning acceptance models to examine e-learning and user recognition systems. Additionally, it will make a significant contribution to the development of a framework for evaluating the readiness-to-use e-learning system based on cloud computing. Meanwhile, Iraq's use of e-learning services is expected to improve quality, effectiveness, communication, motivation and other aspects. We reviewed studies about Iraq higher education, e-learning background, e-learning advantages, studies on e-learning system acceptance, cloud computing, cloud computing services models, cloud deployment models, and cloud e-learning. In the future work, we will identify critical factors that affecting adoption of cloud learning for Iraqi higher education organizations.

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