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**FACTORS AFFECTING THE INTENTION TO ADOPT CLOUD
COMPUTING AMONG COLLEGE STUDENTS IN IRAQI HIGHER
EDUCATION INSTITUTIONS**

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ABSTRACT

FACTORS AFFECTING THE INTENTION TO ADOPT CLOUD COMPUTING AMONG COLLEGE STUDENTS IN IRAQI HIGHER EDUCATION INSTITUTIONS

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Cloud computing is a revolutionary technology that has remodeled many fields, including education, health, government organizations and business. This technology offers numerous on-demand options for organizations to boost their performance and to reduce the cost of production, infrastructure and applications. However, many academics have investigated the topic of cloud computing with regard to factors that influence the adoption decision, especially in developed countries. But, the study still at an immature stage in emerging countries, especially in Iraq. Furthermore, many of the current problems have not been fully researched, particularly in the higher education institutions. As it is known cloud computing is based on services managed by third-party providers. For that reason, trust in cloud services and the perception of possible threats, such as privacy and security concerns, are critical to ensuring the efficient adoption of the appropriate cloud. On the other hand, most studies have researched the technological dimensions of cloud-based systems, such as cloud virtualization and scalability. Even though, it is claimed that the biggest challenge to cloud computing is not technical, but instead cognitive or attitudinal. Accordingly, and in an attempt to close this gap, this study investigates the influences that impact the acceptance of cloud technologies by Iraqi universities. This study is focused on the modified Technology Acceptance Model (TAM) as a framework for the creation of the study model. Based on the factors of the proposed modified TAM,

research questions are investigated. The factors are: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitudes toward the cloud (ATT), Behavioral Intention (BI), Perceived Risks (PR), Trust (TR), Anxiety (ANX), Actual Use (AU), Perceived Benefit (PB), Perceived Overall Concern (POC), Perceived Cost of Usage (PCU), Perceived Speed of Access (PSA), Social Influence (SI), Culture Context Issues (CCI) and External Storage (ES). These variables are determined through the use of verified items from previous studies. This study employed a quantitative process methodology including data collection and analysis. The suggested model is reviewed and validated using a questionnaire survey conducted online in Iraqi universities groups. Amidst 601 responses received, 576 are valid for data analysis. The questionnaire is divided into two parts: the first set for participants who use cloud computing, and the second directed for the one who do not use cloud computing. The IBM SPSS Statistical Package and the Analysis of Moment Structures (AMOS ver. 24) software are used for data analysis. The suggested model was empirically examined using hierarchical multiple linear regression alongside the Structural Equation Model (SEM). The findings of this study indicate that factors such as Perceived cost, Perceived speed, Social Influence to use cloud computing, a general positive feeling about clouds, variables, that play a significant role in motivating students to adopt cloud computing as part of their core curriculum. On the contrary, factors such as a general negative feeling about clouds, Availability of information and Using External storage It has proven to have a negative impact on the student's intention to adopt cloud computing. Such factors proved to play a significant role in preventing students from embracing cloud computing as part of their education. In conclusion, this study has led to a greater comprehension of the students' intention to use cloud computing at Iraqi universities. This offered deeper insight into the key factors that affect students' decision to accept and use cloud computing services. As well as, the proposed model, including such factors, has been demonstrated to be a true predictor of user intentions, within the context of Iraq.

Keywords: Cloud Computing, (TAM), Structural Model, Higher education, Iraq.

ÖZ

IRAK YÜKSEKÖĞRETİM KURUMLARINDA ÜNİVERSİTE ÖĞRENCİLERİ ARASINDA BULUT BİLİŞİMİN KULLANILMASINI ETKİLEYEN FAKTÖRLER

Estabraq Abbas Fadhil

Yüksek Lisans, Bilişim Sistemleri Mühendisliği

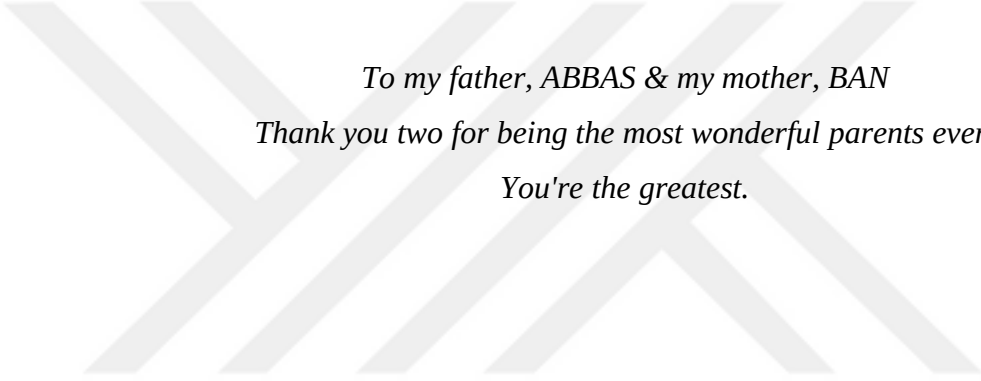
Tez Yöneticisi: Dr. öğr. üyesi. Sacip Tokar

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Bulut bilişim, iş, eğitim, sağlık ve devlet kurumları gibi birçok alanı yeniden şekillendiren devrim niteliğinde bir teknolojidir. Bu teknoloji, kuruluşların performanslarını artırmak ve üretim, servis, ekipman ve uygulama maliyetlerini azaltmak için çok sayıda isteğe bağlı seçenek sunar. Bu nedenle, birçok akademisyen, özellikle gelişmiş ülkelerde, bu teknolojiyi etkileyen faktörler hakkında bulut bilişim konusunu araştırmaya başlamıştır. Ancak, araştırmalar, Irak gibi gelişmekte olan ülkelerde, henüz olgunlaşmamış bir aşamadadır. Ayrıca, mevcut sorunların birçoğu, özellikle yükseköğretim kurumlarında da tam olarak ortaya çıkarılmamıştır. Bilindiği gibi bulut bilişim sistemleri, üçüncü taraf sağlayıcıların hizmetlerine dayanmaktadır, bu nedenle, bulut hizmetlerine güven ve gizlilik endişeleri gibi olası tehditlerin algılanması, uygun bulutun verimli bir şekilde benimsenmesini sağlamak için kritik öneme sahiptir. Öte yandan, çoğu çalışma bulut sistemlerini sanallaştırma, ölçeklenebilirlik ve kararlılık gibi bulut tabanlı sistemlerin teknolojik boyutlarına bakmıştır. Yine de bulut bilişim için en büyük zorluk teknik engellerden daha çok bilişsel veya tutumsal olduğu iddia edilmektedir. Bahsedilen araştırma açığını kapatmak için, bu çalışma, Irak özelinde üniversite öğrencileri tarafından bulut teknolojilerinin kabulü üzerinde etkisi olan faktörleri araştırmıştır. Çalışma modelinin oluşturulması için bir kuramsal çerçeve olarak genişletilmiş Teknoloji Kabul Modeli kullanılmıştır. Önerilen genişletilmiş TKM'in bileşenlerine dayanarak araştırma soruları sorulmuştur. Bileşenler: Algılanan kullanışlılık,

Algılanan kullanım kolaylığı, Buluta yönelik tutumlar, Davranışsal niyet, Algılanan riskler, Güven, Kaygı, Gerçek kullanım, Algılanan fayda, Algılanan genel endişe, Kullanım maliyeti, Erişim hızı, Sosyal etki, Kültür bağlamı ve Harici depolama aracı kullanımı olarak belirlenmiş ve araştırmanın değişkenleri olarak kullanılmıştır. Bu değişkenler, önceki çalışmalarda geliştirilmiş olan anketler ya da bunların maddeleri kullanılarak belirlenmiştir. Bu çalışmada tarama yöntemi anket ile uygulanmış ve alınan verilerin toplanması ve analizini içeren nicel analizler kullanılmıştır. Araştırma verisi Irak üniversiteleri sosyal medya gruplarında birkaç defa yayınlanmıştır. Alınan 601 yanıtın içerisinde 576 verinin analiz için uygun olduğu görülmüştür. Anket iki bölümden oluşmaktadır: ilk bölüm bulut bilişim kullanan katılımcılara detaylı sorular yöneltilmiş, ikinci bölüm ise bulut bilişim kullanmayan katılımcılar için verilmiştir. Katılımcılar anketin başında bulut bilim kullanıp kullanmadıkları üzerine bir soru iletilmiştir. Bu soruya verdikleri cevap evet ise anketin ilk bölümüne hayır ise ikinci bölüme yönlendirilmişlerdir. Önerilen model, hiyerarşik çoklu doğrusal regresyon ve Yapısal Eşitlik Modeli (YEM) birlikte kullanılarak incelenmiştir. Bu çalışmanın bulguları, tüm bu dokuz değişkenin, Algılanan kullanışlılık, Algılanan kullanım kolaylığı, Güven, Tutum, Davranışsal niyet, Algılanan erişim hızı, Algılanan kullanım maliyeti, Sosyal etki ve Algılanan faydaların önemli rol oynayan etmenler olduğunu göstermektedir. Öğrenciler temel müfredatlarının bir parçası olarak bulut bilişim dersini bulut bilişim benimsemeye motive edici etken olarak belirtmişlerdir. Bunun aksine, Kaygı, Algılanan risk, Algılanan genel endişe, Kültürel Bağlam ve Harici depolama birimi kullanımı gibi etmenler öğrencilerin bulut bilişimi benimseme niyeti üzerinde olumsuz bir etkisi olduğunu göstermiştir. Bu etmenlerin, öğrencilerin eğitimlerinin bir parçası olarak bulut bilişimi benimsemelerini önlemede önemli bir rol oynadığı kanıtlanmıştır. Sonuç olarak, bu çalışma öğrencilerin Irak üniversitelerinde bulut bilişim kullanma niyetinin daha iyi anlaşılmasını sağlamıştır. Bu, öğrencilerin bulut bilişim hizmetlerini kabul etme ve kullanma kararını etkileyen temel etmenler hakkında daha derin bir fikir vermiştir. Bunun yanı sıra, bu etmenleri içeren önerilen modelin, Irak bağlamında kullanıcı niyetlerinin gerçek bir yordayıcısı olduğu gösterilmiştir.

Anahtar Kelimeler: Bulut bilişim, (TAM), Yüksek eğitim, Irak, Yapısal Eşitlik Modeli.



*To my father, ABBAS & my mother, BAN
Thank you two for being the most wonderful parents ever.
You're the greatest.*

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CHAPTER 1

INTRODUCTION TO CLOUD COMPUTING

1.1 Introduction

Internet is progressing rapidly from a conventional portal of supplying users with information only, to an essential necessity for users who want to store data, conduct computing, as well as operate software applications from anywhere in the world at any time. This can be accomplished with the advent of new innovations such as cloud computing, which is recognized as the fifth generation of computing next: client-server computing, mainframe computing, personal computing and the web computing [1, 2]. cloud computing has influenced and motivated Many users at individual and institutional levels due to the transparently of managed systems and applications, which enable users to access cloud resources via the Internet without the need for expertise or skills [3]. Consequently, cloud computing can be defined as the consequence of the progression of computer technologies besides their combination with the Internet to deliver a “Model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., Networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” [4, p.2].

Cloud computing was also defined as a large group of computers connected to each other. They can either be personal computers or network servers. Through this formulation, a very wide range of authorized end-users can access applications and information stored in the clouds from anywhere at any time utilizing any smart device over the Internet. It is known that cloud providers keep the technologies and architecture behind the cloud hidden from the end-users, so what Procedure the cloud providers use is meaningless [5]. For example, to clarify the definition of the cloud computing, we could

compare it to a source of energy or gas. All these services are delivered to consumers in a seamless and simple way without the need to consider how to deliver them. Similarly, Cloud Computing offers computer resources to customers in a simplistic way and avoids a lot of complex operations and internal processes, because customers don't need to learn what's going on within the cloud; they're just interested in the performance of the output services [6].

Cloud computing has become universally common as a means of providing technologies to educational institutions and other organizations. Industry leaders predict that incomes from cloud computing firms would exceed \$160 billion, they have described cloud computing is an innovative IT development, implementation, and distribution model that facilitates the delivery of products, services and solutions over the Internet in real-time with its focus on providing low-cost or free services anywhere on the Web. Cloud computing is an exciting future for educational systems struggling with financial restraints and dispersed student populations. Commercial service providers are keen to promote the educational use of cloud computing; for example, Google has developed a special educational version of their cloud-based applications in order to meet students requirements [7, 8]. However, effective cloud computing implementation in educational environments demands a strong analysis of different perspectives by both students and academics. In order to facilitate the transition, educational institutions have to consider whether to create their own cloud infrastructure systems or using services offered by similar service providers through a public cloud. This decision must be taken after setting their own standards. Therefore, it is strongly advised that educational institutions classify which services they want to turn into before committing to this movement, they should create a service catalog, by defining and deciding which criteria they would need to use in order to exchange this data with their service providers [9]. In consideration of shortcomings in previous researches about the factors impacting students' acceptance of cloud computing technologies, this study intends to find out and examine the factors affecting the intention of adopting cloud computing among college students for Iraqi higher education institutions with the goal of understanding the variables that contribute to effective implementation [8]. The level of implementation of cloud computing in

developed countries' universities is extremely high and studies have been undertaken in many developed countries such as Australia, United States and Turkey [8, 10-12].

However, in comparison, the level of adopting cloud computing in universities in developing countries is extremely low and there is a shortage of studies in emerging countries such as Iraq and Saudi Arabia [13-15]. Accordingly, this study conducted in Iraq in order to address that shortcoming. This study applied the Technology Acceptance Model (TAM) to set up the factors that influence the intention to adopt cloud computing services by students in the Iraqi higher education sector. This model will help decision-makers and cloud providers better perceive the current state of Iraqi universities, also will facilitate understanding of such factors that influence students' intention to adopt cloud computing services in the higher education environment.

1.2 Why switch to cloud computing?

Nowadays, several institutions are struggling with the requirements of technology like the physical location of servers and technical issues. thus, in order to produce higher and improved performance, costs of the implementation and maintenance of this technology are required to be paid off over time. Cloud computing offers creative solutions for the biggest challenges confronting different branches of industry, chief among them include cost-effectiveness, usefulness, increased scalability, efficiency, ease of use, global level connectivity, and greener computing [16-19]. In practice, students need their documents for various instructional purposes in classes setting, such as submitting the assignment, presenting the task, reviewing material, and academic discussion. Students often depend on flash drives to accomplish academic objectives, but flash drives can malfunction or be lost [20]. One of the researchers said that 66 percent of USB drives are missed; therefore, cloud storage is safer than the hard drive or USB flash drive storage. At the same time, students can depend on cloud storage to solve specific problems. Students could use cloud computing in the educational environment to complete tasks, online courses, group projects, reports and presentations [21]. The core principle of cloud computing is to deliver computing resources at any moment, anywhere on the Internet. As a consequence, the educational sector could be developed in order to allow students have access to

educational resources wherever and whenever they want [22]. So switching to technology that have endless capabilities such as cloud computing will save effort, cost, time and technical problems, which will drive institutions to a better position [23]. In contrast, shifting to cloud computing needs a well-processed strategy to be executed effectively, and this strategy should provide a detailed roadmap for stages of migration from old to modern system for the purpose of saving institutions from management and human resources problems and conflicts during the transition to a new strategy [24].

1.3 Problem statement

In spite of cloud computing considered as one of the top relevant innovations in the present IT sector, but there is still a limited focus on the use and acceptance of cloud services in educational environments [25]. Specifically, students' behavioral attitudes regarding cloud computing are still unclear [26]. Even though cloud computing could be really helpful for developing countries since they do not have the capital to provide their own IT infrastructure and services. Several studies concentrate on the decision to adopt cloud computing but without going into specifics such as which factors are more relevant and successful, how such factors impact users' choices, how users react to such factors and how institutions are attempting to deal with these issues [27]. Many academics discussed the subject of cloud computing, especially in developed countries. But, research on it still at an immature stage in the developing countries and many existing issues have not been fully addressed especially in higher education institutions sector which requires advanced technologies for the purpose of advance the standard of education, knowledge and research [28-31]. For that reason, the purpose of the present thesis is to explore the factors influence students' intention to use cloud computing in the context of Iraqi universities.

1.4 Objectives of the study

This research intends to examine the impacts of human factors on the acceptance of the cloud computing adoption. The main objectives of this study are set out below:

- To study the impact of cognitive factors such as perceived usefulness, perceived ease of use and effects of attitudes on the behavioral intention to use cloud computing services in universities.
- To study the impact of factors such as trust, perceived cost, perceived speed, perceived benefits, perceived concern and perceived risks on the behavioral intention to use cloud computing services in universities.
- To Identify factors that clarify attitudes towards cloud computing. Therefore, the researcher trying to integrate all the factors that might impact attitudes.
- To study the factors that impacting the real usage of cloud computing.
- To provide significant guidelines for decision-makers and cloud providers to make the implementation of cloud computing more effective for students at Iraqi universities.

1.5 The motivation for this study

The biggest obstacle to cloud computing is the attitude or perspective of the user, not the technological one. Hence it is important to examine both cognitive impact processes and technical impact processes in order to evaluate the acceptance of cloud computing by users [17]. Decisions regarding technological implementation are taken by IT executives. Technology cannot enhance organizational performance until it is implemented correctly. The main issue is the resistance of the director to the system of the end-user. In order to extend individuals acceptance cloud computing and for the purpose of facilitating managerial decisions to implement cloud computing within the institutions, it is extremely important to explain whether individuals support or reject cloud computing services, there is a need to recognize and analyze variables such as perceived concern, perceived cost of usage, perceived benefits, perceived risks and perceived Speed of Access [27].

Studying the impact of these variables combined with other factors when adopting cloud computing would be very important for effective implementation. This is the explanation of why this research is being proposed. In addition, due to limited studies in growing countries on the utility of cloud computing, this research work is inspired and aims to resolve the research gap from the students' point of view.

1.6 Overview of methodology

This current study developed a questionnaire survey as a means to obtain students' feedback in Iraqi universities regarding their perception of cloud computing. In specific, a survey was structured to measure Factors included in this study. The questionnaire generally consists of two main sections, the first section directed for the participants who know what cloud computing is, in order to collect data about the study factors. While the second section for the collection of data from participants who do not use cloud computing along with the reasons for not using cloud computing. The questionnaire distributed randomly to students at Iraqi universities through the internet. A 5-point Likert scale has been used for several questions, that ranged from strongly disagree to strongly agree. In fact, This study proposes an expanded Technology Acceptance Model (TAM) [32, 33]. which incorporates Perceived Risk (PR), trust (TR) and Anxiety (ANX), along with other factors to examine the perceptions and intentions of students towards cloud computing adoption. The suggested model was empirically tested in order to interpret data obtained by the questionnaire from students' views point.

1.7 The importance of this research

The goal of this research is to help students, academics, researchers and even institutions to recognizing the factors that influence the individual acceptance of cloud computing in universities. It is also one of the few studies that seek to demonstrate these factors among students in higher education contexts in developing countries. particularly, in Iraq. Accordingly, the results of this study can help bridge this gap in the literature, and act as a valuable resource for researchers who want to use the study results as the basis for continuous research. Furthermore, this study will raise the awareness of policymakers at Iraqi universities by illustrating the importance of cloud computing and its advantages to students. on top of that, the findings of this study would also inform cloud service providers and decision-makers at Iraqi universities on how to address the factors that impede students' adoption of cloud computing applications and increase student adoption, as well as promote the successful implementation of cloud computing applications in educational institutions. The main contributions to this analysis are listed below:

- Decision-makers in Iraqi universities and those who are facing challenges related to decision-making on innovations, in general, and cloud computing technologies in particular, will directly benefit from this study findings. The results of this research can be used to develop an innovative strategic plan to encourage the efficient and rapid use of cloud technology by students.
- The comprehensive analysis of this study which examines the different factors would give researchers empirical insight about this topic.
- Future studies may review and leverage the findings of this study in the positive adoption of cloud computing by educational institutions.
- This research helps organizations to consider the variables that affect the decision to utilize cloud computing and its actual use. Therefore, the findings of this research will be beneficial to professionals.
- This research addressed significant empiric questions: What are the factors that influence users' acceptance of cloud computing technology? So, the results of this research may provide opportunities for decision-makers and those who are interested, to understand the need to build a new, cloud-based educational environment.

1.8 Thesis Organization

This thesis is classified into five chapters described as follows. Chapter 1 introduces an overview of cloud computing followed by presenting the problem statement and research objectives. Chapter 2 presents a comprehensive review of cloud computing including the theoretical framework used in this study which is the technology acceptance model (TAM). Chapter 3 discusses the research methodology applied in this study. Chapter 4 presents quantitative data analysis results and the discussion of the study findings. Chapter 5 discusses future research directions and contributions to the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Chapter Overview

This chapter lays out a thorough overview of cloud computing technologies. It covers an overview of cloud computing history as well as the cloud computing concept. The chapter further addresses the components of cloud computing plus the mechanism about how cloud computing works, characteristics of cloud computing, the popular service models of cloud computing in particular as regards with Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), and the four deployment models involving private cloud, community cloud, public cloud, as well as hybrid cloud. The chapter also draws attention to the opportunities and obstacles associated with the use of cloud computing. In addition, the chapter introduces the theoretical framework used in this study. Furthermore, discusses cloud computing in the education setting, besides the state of cloud computing in the higher education of both developed and developing countries. Finally, the chapter presents previous studies based on TAM, besides the factors that have a positive or negative impact on cloud computing adoption.

2.2 An overview of cloud computing history

Cloud computing means various things for different individuals. But overall, it indicates to internet technologists outside resources or describes the delivery of IT services and resources across the internet without the necessity to know the involved operations behind the scenes [34].

Voas and Zhang, describe the past of cloud computing, which shows six developmental stages [35]:

- Central stations computing.
- Desktops computing.
- Network computing.
- Web computing.
- Cluster computing.
- Cloud computing.

Throughout stage 1, The terminals were widely used to communicate with large and powerful mainframe computers, so users did their individual work by connecting to the central computer. During stage 2, stand-alone personal computers developed to become powerful enough to satisfy the majority of people's needs, thus users did their individual work on their own desktops. In stage 3, personal computers and servers became integrated together across local area networks to pool resources, including providing free access to data on each PC. Over stage 4 local area networks got tied to other local area networks. Which led to the creation of a global network known as the Internet. This has supported the ability to access and retrieve distant applications and data. While Stage 5, grid computing enabled storage and resources to be combined in a fragmented computing grid system. Finally, cloud computing appeared within stage 6 as a facilitated and accessible way of sharing resources over the Internet [36]. When observing these six computing development levels, Cloud computing tends to be a pure variant of the centralized computing system in stage 1. Nevertheless, there are several major differences. The number of PCs connecting to the cloud contributes to their strength and capacity, plus efficiency, while centralized computing offers a limited computing power that can be easily calculated and determined. In addition, users reach the mainframe computer through the central stations, while powerful PCs can be used in cloud computing to connect to the cloud including using their local computing power [36]. The same technology is used by cloud computing and traditional networks. The biggest distinction between both is virtualization. Virtualization enables consumers to have tremendous versatility through the availability of limitless services through cloud connectivity to apps, information, and data. In conventional networking, all hardware is set under a reasonable range, usually restricted by the device's capacity or the computer owner's finances. In

order to ramp up digital operations, more extra money has to be spent on updating the equipment or applications, even if it is not used to the fullest possible degree. Furthermore, the client shall pay for equipment, installation, and maintenance. In comparison, a cloud computing system ensures that a database user can tap into massive tools that are able to meet the needs of the user. Moreover, the customers just charge for their usage [37].

2.3 Components of cloud computing

Cloud computing technology includes several components Which are: clients, data centers and distributed servers, that play a major role in the provision of usable cloud computing services.

2.3.1 Clients

Represent computers and portable devices that are used by end-users to access services in the cloud. Clients are also classified into three categories: mobile, thin and thick clients [38, 39]. Mobile clients represent portable devices such as Personal Digital Assistants and smartphones. Thin clients reflect computers used to view information solely since they do not have hard drives so they cannot process any information as a result. Thin clients are preferred today because of their advantages, which include reduced equipment and IT cost, improved security, lower noise and power usage. Thick clients are regular computers such as PCs that link to cloud services utilizing interfaces such as a browser [38].

2.3.2 Datacenter

Datacenter basically refers to a place with a community of servers that hold cloud service applications. Depending on the configuration of these servers are either physical or virtual. Using virtualization tools, several virtual servers can be built on a single physical server [38, 40, 41].

2.3.3 Distributed servers

Represent numerous servers spread around a wide geographic area [38, 42]. despite the servers are not in the same place, they look to users like they were together. The role of

these servers is to increase the Cloud services' reliability, performance, availability and scalability [38].

2.4 How cloud computing works

In general, a personal or local device is filled with only one of the resources accessible to workers to access or profit from, while the cloud computing offers a range of services to perform any function. Typically, the consumer needs only a device capable of operating a web browser and connecting to the cloud. cloud computing gains all the characteristics and data needed by the client [43]. The next three sections outline how cloud computing operates in the context of cloud architecture, cloud storage and cloud services.

2.4.1 Cloud architecture

Cloud computing is an app-based software infrastructure that stores data on remotely accessible servers via the internet. In order to understand how cloud computing works, it can be divided into front-end and back-end, which are connected through a network, similar to the Internet. The front-end allows users to access cloud data through an Internet browser or cloud computing software. While the back-end represents the main component of cloud computing which responsible for storing data and information securely. It comprises all applications linked to the cloud including servers, devices, databases, and central servers. that formulate the cloud. The central server contributes to facilitating operations in compliance with the rules referred to as protocols. It utilizes software, middleware, in order to ensure smooth connectivity between cloud-linked computers. Cloud service providers typically hold several backups of the data to mitigate security risks, data theft and data leaks [43].

2.4.2 Cloud storage

Data storage is the core service of cloud computing. In the past, data are typically kept in a single particular server, whereas now data is processed in the cloud on a third-party site or server. While saving data users will see a stationary location for their data, despite the fact that the location in the cloud is virtual, so the data is saved in a specific location

by a specific name. However, the data can be saved on any device that is used to build the cloud. In this regard, data location can change over time due to the dynamic cloud management of the storage space. Even so, users in this virtual storage space can access and process their data as if they were stored on their own computers, on the condition that they are connected to the Internet [5, 44].

2.4.3 Cloud services

Cloud services refer to any IT services provided and accessed by a cloud provider. This broad term includes all cloud computing service models and related solutions. Cloud services are available over the Internet and are accessible globally at any time. The user can run the applications through the Internet using a web browser. A browser, such as Google Chrome, Opera, Microsoft Edge. This web-based application functions and behaves as a regular application installed on the PC. Despite that, the applications and the working documents reside on the host's cloud servers, not the device of the end-user [5].

2.5 Fundamental characteristics of cloud computing

- **On-demand self-service:** Clients can independently access computing resources, such as processing time and network storage, as required, without needing human contact with each service provider. So, it's a constructive service on the order, usually calculated in a minute, hour, or megabyte [45].
- **A broad network access:** Capabilities are accessible across the network and activated via standardized mechanisms that enhance usage by thin or thick heterogeneous client platforms such as cell phones, tablets, laptops, and workstations. Thus, it's a flexible service, user can have as much as he or she wants, from anywhere at any time using any communication device [45].
- **Resource pooling:** The computing resources of the provider are gathered to provide several users with a multi-locator model that dynamically assigns and transfers specific physical and virtual resources according to user demand. There

is a concept of geographic independence in that the user does not necessarily monitor or recognize the exact location of the services offered but may determine geographic on a higher level of abstraction (for example nation or state or datacenter). Examples of resources include storage, processing, memory, and network bandwidth. The cloud service is completely managed by the service provider, and the consumer only needs a PC and access to the Internet [45].

- **Rapid elasticity:** In some cases, Capabilities can be conditional or flexible to expand the range of inputs and outputs quickly both in proportion to demand. For the user, the supply capability always tends to be limitless and can be obtained in any quantity at any time [45].
- **Measured service:** Cloud services dynamically monitors and optimize the usage of resources by using the metering functionality at some level of abstraction relevant to the form of service (e.g. Storage, processing, bandwidth, and active user accounts). The use of resources can be tracked, managed and recorded, providing both the provider and the user with the accountability of the service used [45].

2.6 Service models of cloud computing

Throughout the context of the NIST interpretation, technology models determine what sort of services can be delivered from the cloud. There are three core services classes to be listed: SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service). The provider provides various services, depending on the model chosen. In general, these facilities are typically classified according to the extent of the IT infrastructure in which they exist, the degree of complexity of the capability offered and the service model of the providers [46].

2.6.1 Software as a Service (SaaS)

First, cloud computing responsible for the service Software management process, which provide tools to the cloud computing application, such as Google Documents,

Google Drive, YouTube and social networks. students can upload their work to the web in any format while trusting that their data and documents are protected and are not going to get misplaced or lost [28]. In software as a Service, the service provider stores the program inside its data center on a server and the user accesses it through a normal web interface. The user wouldn't be able to monitor the operating system, the network, the servers, and the storage system. [4, 47].

2.6.2 Platform as a Service (PaaS)

Second, in platform as a Service, Cloud computing works as a platform for the purchasing of internet products (for example, Amazon). The functionality offered toward the user is a computing platform which is leased or distributed as a consolidated solution built using the provider-programming languages plus resources. The user does not able to monitor or operate the underlying cloud infrastructure, as well as network, servers, operating systems, or storage, but owns the ability to manage the applications being deployed. Examples of platform as a service are Azure Services as well as the Google app engine [4, 47].

2.6.3 Infrastructure as a Service (IaaS)

Third, it acts as an infrastructure which offers a virtual hardware functionality, like data storage and web hosting. In infrastructure as a Service, the potential granted to the user is to supply computer infrastructure handling, storage, networks, and various computing resources of an outsourced foundation to sustain business activities where the user can install and operate software that can include operating systems and applications. The user could not operate or monitor the underlying cloud infrastructure but has oversight over storage, operating systems, installed applications and likely minimal monitor of selected network components. Examples of IaaS are Amazon, IBM and Blue cloud [4, 48].

All these classes of cloud computing and its features offer great value to higher learning students. Students can store their data, share it with colleagues, and collaborate by editing and inserting content [28].

2.7 Deployment models of cloud computing

Regardless of the infrastructure form or service type, the cloud can be categorized as private, community, public or hybrid depending on the deployment model [4].

2.7.1 Private Cloud

A private cloud is a paradigm where IT resources are delivered for the exclusive usage of a particular entity through private IT infrastructure. An individual or a (third-Party) vendor may operate a private cloud that is normally controlled by internal resources [4, 49].

2.7.2 Community Cloud

A community cloud is a cloud service model shared by several organizations and supports a particular community with shared concerns; it can be controlled and secured by all the involved organizations or even a third party [4, 50].

2.7.3 Public Cloud

The public cloud refers to a type of software infrastructure that is open to the general public or a broad business community which is operated by a company that provides cloud services. The public cloud provides access to IT services through the "pay-as-you-go" form of billing. A service provider controls the central infrastructure, software and other back-end construction in a distributed multi-tenant environment in order to liberate the user from these obligations [4, 51].

2.7.4 Hybrid Cloud

Hybrid cloud is a cloud infrastructure service model that mixes two or more types of clouds: private, community or public, integrating their several benefits and drawbacks. For instance, data that needs to be secured can be installed on a private cloud while public data or apps can be deployed in the public cloud [4, 52].

2.8 Cloud computing benefits

Cloud computing offers tremendous benefits to individuals, organizations as well as educational institutions. It provides efficient services and infrastructures without the need to acquire the required IT infrastructure [53]. Although choice of deployment model determines the benefits that can be realized, the technology is becoming increasingly popular because many organizations and education institutions are moving to it due to the realized benefits. Some of the widely reported benefits are presented as follows:

- **Cost-saving:** Cloud computing is a cost-effective technology [54, 55]. This is the biggest benefit of cloud computing technologies. U.S.-based higher education institutions have announced savings of 21 percent since moving their applications to the cloud. [56]. Cloud computing eliminates equipment and software acquisition, installation and maintenance expenses, and technological assistance received by organizations. [57]. It Reduces IT-related expenses by centralizing software, operating systems, infrastructure and applications by sharing resources and solutions [55, 56, 58]. The pay-per-use payment system reduces service costs as consumers pay directly for utilities. [57, 59-61]. Instructional institutions waste resources due to the under-use of technology during the off-peak instructional season, while implementing cloud computing would increase resource management because services can only be used on demand. [56, 62].
- **Efficiency:** Cloud computing offers automatic software updates to stay pace with developing technologies. [57, 58, 63], enhances performance [64], plus increases IT agility [56]. Cloud computing enables the procurement, distribution and implementation of technology, software and applications rapidly. Deployment is rendered simpler because there is no need for equipment sales, program licenses and services deployment. In turn, cloud computing has the potential to launch Web 2.0 apps easily and scale-up apps as required, and improves flexibility by real-time workload balancing. [56, 62]. Moreover, it saves IT management time thereby increasing the productivity of the IT personnel.

- **Sharing:** Skills, practices, applications, infrastructure, and teaching content can be shared to avoid duplication, thereby harmonizing resources and promoting new ways of accessibility to education [57]. Likewise, sharing of cost between the cloud service users improves infrastructure utilization. The cost is further reduced as a result of sharing the infrastructure [46].
- **Reliability:** This is the ability of the cloud to function as expected, involving guaranteeing a high quality of service, high transmission rate, minimum error rate, and faster recovery from error [65]. Cloud infrastructure is more reliable than on-premise infrastructure [55].
- **Portability:** Cloud computing services can be accessed using any computing devices like PC, laptop, tablet, smartphone, and any other internet-enabled mobile devices [54, 57]. It eliminates document format incompatibility because documents are accessed from the cloud. Portability involves moving data from one cloud application to another within different cloud environments with little cost and disruption [66].
- **Flexibility (elasticity):** Cloud computing uses various technologies like virtualization and modularity of component parts that promote flexibility and capability of responding to changes quickly. Cloud computing enhances mobility by permitting access to services and resources from any location. Flexibility of learning and teaching content gives easy access to courses and content at any time, any place, allows students to learn outside school, outside school calendar, and enables ongoing learning [64].
- **Scalability:** Cloud computing enables hardware and software expansion as the needs arise and when user load decreases, the resources shrink [67]. Therefore, when clients, orders, and traffic grow, the cloud system will be ready to sustain the new demand [68]. Administrators can utilize parallel remote application server capability to add new servers and provide applications or services to new users in

a very short period of time [69]. In educational settings, the demand for resources usually increases during peak periods like enrolment, assignment submission deadlines, and publishing of results; therefore, at this period the resources will increase to accommodate a large number of users at that particular time [53].

- **Security:** Cloud computing providers implement appropriate security policies and use the latest threat intelligence to ensure that customers' data is protected [64]. The data and other contents stored in the cloud are usually accessed after authentication, so it is not easily accessible [56].
- **Backup and recovery:** Cloud provides backup and recovery services so that customers can easily backup and recover their data anytime in case of disaster or failure [70]. One of the major benefits of cloud backup and recovery is improving data protection. Since customers' data is managed by cloud service providers and the data is available and reliable especially if proper measures are taken; therefore, data can be easily and quickly recovered. Usually, contents are automatically saved and remain in the cloud, so they can be easily and quickly restored [68].
- **Green technology:** In cloud computing, resources are virtualized which increases energy and resource efficiencies [54, 71, 72]. Virtualizing the infrastructure protects the environment since the number of physical equipment is reduced which in turn means low cooling, space requirement, and energy consumption [54]. Using cloud computing reduces electronic waste and emission of hazardous substances as a result of widespread use of computer systems.
- **Availability and accessibility:** Cloud computing allows infrastructure, services, applications, tools and resources to be accessed anytime from anywhere using any device [57, 73]. Generally, cloud-based resources and services are accessed via the Internet, so they can be accessed on-campus or off-campus which increases their availability [68, 74]. Hence, students can easily access resources such as files, assignments, and lecture notes.

- **Reduce processing and task time:** Since the content is online the teacher does not need to spend time and resources while collecting, processing, sharing, printing, or copying large files or documents. The students can also access their courses, resources, assignments, and other kinds of stuff online [68].
- **Facilitate task and data management:** Cloud computing allows permission and roles to be defined for each user to ensure that each department or employee in an institution performs their duly assigned duty to avoid role conflict. It allows the IT departments to focus on innovation rather than implementation and maintenance [75]. Cloud computing also allows easy scheduling, reservations, and management of computing resources that can be used by students or teachers [53].
- **Enhance distance and mobile learning:** Students can use their mobile devices to access courses and resources online either on their campus or off-campus [53, 54]. This increases the productivity of organizational staff, educators, and students, and improve the quality of education; since users can work or learn anytime from anywhere [69]. Some of the learning services supported by the cloud include receiving context-based e-Learning content in real-time and live video streaming. Mobile learning by using cloud services improves student engagement, resource availability, and simplification of teaching and learning processes [53].
- **Simplification and standardization:** There is no need to carry devices like thumb drives or Compact Discs (CDs) anymore, so there is no need to worry about losing or damaging the device, or content getting corrupted. In cloud computing data centers and facilities are consolidated and at the same time, standardized practices and security compliance are improved, making management easier [59].
- **Innovation:** Cloud computing promotes and speeds up innovation by making resources available and by providing services quickly to innovators so that they can fully focus on the innovation [62, 74]. Using cloud computing enables institutions to explore research opportunities and get the latest technological

innovations by sharing cloud resources with various universities [56, 69]. This can be achieved when educators, students, and administrators are given the required applications and the freedom required to do their work [56].

- **Access to top-end IT capabilities:** Cloud computing enables access to sophisticated hardware, software, and IT personnel that an institution cannot afford [56].
- **Effectiveness:** Cloud computing offers effective computation by centralizing storage, memory processing and bandwidth. Cloud computing leads to productive and effective learning for students, and it also encourages pooling and implementation of good management practices [59].
- **Collaboration:** Cloud computing enhances learning by using cloud-based collaborative technologies such as Google Docs which allow multiple users to work on one document and share ideas [68]. In a collaborative setting, groups can be created to work on projects, assignments, collaborative writing, and peer editing in the cloud [76]. Collaborative learning is regarded as one of the factors that significantly contribute to students' learning since it promotes active learning by allowing a group of students and teachers to socially interact for sharing of information, knowledge, and experience [64]. It is important to recognize that the extent of these advantages, the potential to recover them as well as the expense and profit ratio obtained depends on several specific variables and can differ significantly. This involves where an organization has located within the ICT capital expenditure and technology developmental process, its current hardware, and software architecture, for instance, many current applications may not be "cloud-ready". Its staff and control capabilities. Legal and policy restrictions would be specially relevant in the public sector [77].

2.9 Challenges of Cloud Computing Adoption

There are many challenges associated with cloud computing adoption. According to a survey conducted by International Data Corporation (IDC), the top three most reported challenges of cloud services are security, availability, and performance [78]. Researchers also have highlighted other challenges that may affect an organization's decision-makers to adopt cloud computing. The widely reported challenges are described in the subsections below.

- **Security and Confidentiality:** This is one of the highly reported and fundamental issues that prevent customers from adopting cloud technology [79-81]. Customers' data and applications are vulnerable to various security threats like data loss, and unauthorized access as a result of a lack of control over cloud data and infrastructure[82]. Even though cloud providers typically give an assurance to customers that they use experts to manage their data centers, customers are still worried about who will monitor and manage their data and anxious about the fact that their data is under the control of the cloud providers which may not protect their confidential data [83, 84].
- **Availability:** This factor regarded as the second most significant issue that affects cloud computing adoption [78]. It is determined by factors such as reliability, latency, and performance. Although the availability issue is common with cloud, most cloud infrastructure is built to provide high availability [85]. Ensuring the availability of a cloud service or resource implies that the customer's request is granted instantly, and the requested service is delivered immediately. Steady and good quality Internet connection will eliminate service outage, which increases the availability and accessibility of the services [58]. The provider should guarantee high service availability to customers. The availability of cloud services is guaranteed in SLA documents. Hence, availability is among the most significant issues to be considered when choosing between the cloud service types and delivery models [79].

- **Performance:** This indicator is considered as the third most significant issue that affects cloud computing adoption [78]. It is usually determined by the capabilities of the applications running on the cloud [86]. The performance of the cloud system may be affected by the distance between the cloud and the customer as a result of delay [87]. Internet is the medium through which cloud services are delivered, so the performance of the cloud services depends on the Internet [88]. The cloud data has to pass through different shared routes, hops and packets during the transmission process, where the data may be lost or corrupted. Thus, the procedure could be negatively affected by data transmission challenges like delay and jitter which will consequently result in poor performance [88]. The reliability of the Internet itself may as well affect the performance [88, 89]. A slow Internet connection can significantly affect cloud service performance. Hence, a fast Internet connection is required for efficient service delivery [83]. Organizations experience poor performance when cloud applications become unresponsive which may happen due to communication delay. The performance becomes worse if multiple users are simultaneously using data-intensive services on a low bandwidth network. The consequence of poor performance is loss of customers which may result in a reduction in revenues [84, 86]. Therefore, the provider should guarantee performance especially for a task that requires extensive computing power, and availability for timely delivery of resources and research results [74, 90].
- **Costing Model:** Cloud computing can reduce the infrastructure cost, but when network resources such as data usage and bandwidth are highly used it will increase the data communication cost [91]. The cost of computing resources will be higher if more resources are used for data exchange between providers and organizations. For instance, a customer who is using a hybrid cloud where the organizational data is distributed across different clouds will consume more computing resources than a private based or a public based customer. Therefore, the saved infrastructure cost will now be spent on communication and data transfer [92]. The pricing models include pay-as-you-go and subscription pricing. The

costing model of a provider and the resulted trade-offs should be analyzed prior to deployment [82]. In this case, the benefits should be weighed against the cost in order to maximize the benefits over the cost by considering the desired level of security [92]. For organizations of a limited budget, the pay-as-you-go plan should be used, while subscription pricing is the best when there are long term and well-defined requirements. On the other hand, using a hybrid cloud would result in a better return on investment [82, 92].

- **Service Level Agreement:** SLA is a contract between the cloud service providers and customers, which specifies what services the provider will offer [93]. SLAs are used by providers to guarantee the efficient delivery of cloud services and resources. This involves: ensuring the quality, availability, reliability, and performance of the services [91, 92]. SLA is regarded as one of the crucial considerations when choosing the right deployment model. Customers usually negotiate SLAs with the providers to make sure the service delivery feature meets their expectations [82]. Some of the concerns related to SLA are an interpretation of the conditions, the omission of some customers' requirements, and the criteria for assessing the terms in the agreement [92].
- **Vendor Lock-in:** Cloud service providers have distinct ways of interaction between customers and the cloud [82]. They have no standard format for storing data which hampers customer's migration from one provider to another or in-house data center for resource optimization [64, 67]. Lock-in prevents customers from moving from one cloud provider to another or on-premise data center [53]. When institutions are locked into a particular provider, switching to another is difficult and attracts high cost [85]. Cloud service providers develop different APIs, which complicates the integration of cloud services with organizations' legacy systems. This results in interoperability issues that can be resolved using standardization. Vendor lock-in can lead to risks such as price increase and non-reliability because the customers are locked-in to a certain provider. Therefore, the

customers have to stay with the provider, even though they are displeased with the service provided [94].

- **Compliance and Physical Location:** Compliance is one of the determinants of cloud computing adoption because customers may not know the location of their data or may not have control over the location, creating legal issues with regulatory and privacy laws [85]. For instance, many European Union countries and the USA do not allow a certain type of data to be moved out of their countries. Likewise, customers who have their cloud data stored in the USA have to comply with rules concerning storage and disclosure of data [83]. Legal issues can bind institutions into unsatisfactory conditions which may result in legal disputes due to laws of the location where data is situated. For instance, Lakehead University in Canada is facing legal challenges with the faculty union as a result of adopting Google public cloud. The union complains that Google does not protect their privacy and academic freedom since Google is a United States (US) company and they are required to give their data to US government when required based on their law [70]. In addition, organizations that are required to comply with regulatory compliance measures like Health Insurance Portability and Accountability Act, Payment Card Industry Data Security Standard, or Sarbanes-Oxley Act may be reluctant to adopt cloud computing.
- **IT Department's Stand and Changes:** The change from traditional ways of computing to cloud computing becomes an issue because the IT personnel will be worried about losing their jobs since adopting cloud computing will require them to change the way they operate. But cloud computing will increase the performance of the IT personnel since they will now focus on new innovations rather than managing IT infrastructure [83]. Outsourcing IT operations from a cloud computing provider may result in a reduction or elimination of IT personnel's routine support activities [27].

Despite all the benefits and drawbacks of cloud computing, we can't argue that cloud computing is the fastest-growing aspect of network-based computing. It provides a huge benefit to the community, people, developers, enterprises, and all sorts of organizations. So, this invention has been here for a long time to live. Like for all merging technologies, people have a choice as to how they can embrace the technologies. Many computational models have been used to model the adoption by consumers of different modern or evolving types of technology. Some of the most commonly used models is the Technology Acceptance Model or the TAM model [33].

2.10 Cloud computing in education

A few years earlier the word cloud computing did not exist. Now, it is one of the most significant developments of IT [95]. Cloud computing is the fresh dawn for education, It contributes via different computing models for delivering facilities to students, academics, researchers, and university management personnel [21], Via virtualizing resources. Besides saving time and effort to learners, it can be used to modernize laboratories with hardware and software licenses whilst ensuring the frequent maintenance of equipment consistent with the usage requirement. Thus the movement towards cloud computing in education has become gradually an integral part of organizational strategies that must be followed [96]. Switching to the cloud computing environment has a variety of purposes, primarily economic ones, as well as cloud system provides a reduced ownership expense model. [97, 98]. Furthermore, A virtual computing services system could be designed using computing resources, especially in online education environments [31, 98]. So it's provides HEI links to distance learning services and e-learning platforms [99]. In fact, IT specialists believe that cloud-based institutions will continue to expand and grow over the coming years [100]. HEIs could be provided with cloud computing services including data hosting, databases, and software. This allows HEIs to use a virtual environment that hosts cloud apps and services [101]. Nevertheless, Before the development of the cloud, every organization had to install software packages on its local computers, protect them against viruses, and maintain them up-to-date, which puts a heavy load on the staff and imposes considerable costs on them. Moreover, universities had to provide adequate equipment to fulfill the requirements of their students and staff, as well as to maintain the machines and

physical network that operates across and between buildings, in spite of the fact that all devices and applications were utilized only during some periods through the year, such as test period and have been unused throughout the rest of the year. By adopting cloud computing services, universities can reduce the cost of installing and updating software for each computer. Because updates become the duty of the cloud service provider. Hence, updated cloud applications can be accessed on any Internet browser or computer with Internet connectivity via mobile, tablet, desktop or any smart device. While universities have to pay for the cloud provider's service, the expense is not as high as when universities had to build and operate an internal data network. Cloud computing not only eliminates expenses and other requirements, it also offers students with accessibility to advanced tech services and a shared environment where students can collaborate together [99, 102]. Iraq is one of the developing countries, and large expenditures in this area are required to enhance public IT services such as e-government systems [103]. Adopting cloud technologies in institutions would minimize spending costs on IT facilities, software, infrastructure and maintenance [104]. Consequently, investing in cloud computing is an opportunity for Iraqi higher education institutions to use emerging technology such as cloud computing with limited expertise and investment. In fact, colleges and organizations will not have to pay for the expenses of delivering innovative technology services, maintenance, infrastructure, equipment, and other IT facilities [105]. In general, higher education institutions are in a permanent status of transition and growth, primarily as a consequence of the significant challenges presented by efforts to implement modern technologies [106]. Nevertheless, cloud computing allows HEIs to hold their data on an online server, which can be easily accessed by a cloud computing provider from anywhere in the world. On the other side, this can contribute to a question of data threats relevant to privacy and security [104]. In conclusion, we can say in academic environments cloud computing can be used for the good towards students in order to complete assignments, online courses, group projects, presentations, designing and publishing papers, plus for work or entertainment, etc. Among the many gains from cloud computing models, it is important to figure out how students observe this technology. The objective of this thesis is to investigate factors that promote or prevent students from adopting cloud computing as part of their education [21].

2.11 Cloud computing for higher education in developed countries

Cloud computing is increasingly popular in universities and higher education [107]. For instance, several universities and colleges in Commonwealth countries have adopted a collaboration program called the Virginia Virtual Computing Lab, which allowed these colleges and universities to minimize their IT expenditures by reducing software upgrading and licensing requirements [108]. One research carried out by Mircea & Andreescu has demonstrated that about 70 percent of IT leaders in higher education preferred cloud computing over conventional computer technologies, adding that the most significant aspect in their decision was enhancing IT services [73]. Furthermore, it is concluded the use of cloud computing in any facility can reduce the total operating cost by between 25 to 30% [109]. Cloud computing technology represents a major step forward in the education sector and also a significant opportunity to develop operational efficiency, promote creativity, reduce technology spending and increase agility [110, 111]. Cloud computing also aims to offer virtually limitless processing capacity at low cost [112]. These opportunities of cloud computing will overcome the problem of resource constraints and lack of digital technology availability in growing countries [113]. With the passage of time, the popularity of cloud computing in higher education has increased exponentially and it is clear that its usage and value will continue to expand in the future [21, 73]. This is primarily related to its teaching and learning advantages, among other factors [114].

2.12 Cloud computing for higher education in developing countries

As stated by Stein et al. [115], Cloud computing can maximize educational performance, boost productivity and reduce total IT costs. For instance, many East African educational institutions (such as Nairobi University, Kigali Institute for Education, and Kenyan Methodist University) have partnered with Google to achieve substantial benefits for students and lecturers from Google's cloud services [116]. In addition, Microsoft has assisted educational institutions in Ethiopia by deploying 250,000 laptops for lectures, all operating Windows Azure, which is primarily based on the platform as a service (PaaS) [21]. Windows Azure is a cloud-based operating system that is used by lecturers in Ethiopia for uploading and downloading curriculum as well as for transferring student

records securely into the education system. In this way, Ethiopian educational institutions do not need to spend heavily in data centers, in addition to hardware and software costs to link this large amount of transactions. In a large-scale quantitative analysis, Shirazi, Gholami, & Higón [117], examined the effect of information technology on the economies of eleven countries in the Middle East (United Arab Emirates, Oman, Lebanon, Jordan, Bahrain, Kuwait, Yemen, Saudi Arabia, Qatar, Syria and Iran). The results of this research have shown that there is a positive and clear correlation between economic development and the usage of ICT. Moreover, it has shown that countries which have higher education achievement, like Jordan, Bahrain and Kuwait have been able to gain more benefits from ICT, while other countries, such as Syria and Iran, have gained less advantage from ICT due to government constraints and policies. that hinder the development of ICT infrastructure. In Oman, Sharma, Al-Badi, Govindaluri and Al-Kharusi [118], have been able to demonstrate in their outstanding study the clear positive connection between job opportunities and the adoption of cloud computing at the individual level. The same study showed that the use of Cloud Computing is positively influenced by other variables such as perceived usefulness, self-efficiency and trust. In developing countries, several authors [113], noted that education institutions are concentrate primarily on teaching and learning practices. While certain universities in developing nations are known as research-oriented institutions, they are smaller than teaching-oriented universities. The same researchers concluded that universities are facing several obstacles in developing countries which can be summarized as follows:

- Universities of developing nations are struggling with insufficient resources relative to population rates. Hence, students often face a high degree of rivalry with others to obtain a seat at such universities.
- Due to cost, high-quality services are not available. As a consequence, colleges in developing countries cannot manage complicated and advanced research projects by using these limited technological resources.

- The services at the laboratory are not accessible after class hours. Hence, students are restricted unless university resources are open.
- The lack of interaction and exchange of information among students and the lecturers outside of the learning environment. Theoretically, in emerging countries cloud computing technologies can be used in the same line as in developed countries [15]. nevertheless, the educational, cultural and resources environment are different, for example, the effectiveness of cloud services requires well-processed infrastructure like Internet upload and connection speed, which are still not readily accessible in most growing countries [116].
- The funds are required Even if cloud computing reduces IT costs by reducing physical resources, it is still costly to universities in developing countries. Moreover, providers of cloud computing services typically allow online payment by credit or debit cards. This form of payment is an issue in developing countries, which often prefers conventional payment methods instead of online banking due to shortcomings in online banking services. Hence, the shortage of electronic payment services can impede the adoption of cloud computing in institutions of higher education [113].
- The instability of electricity and the widespread weakness of infrastructure in several developing nations such as Syria, Iraq, Jordan, India and Africa, where electricity can be unexpectedly shut down from the power source. This electrical instability could destroy the loading and downloading process, especially when there is a large number of data depends on the automatic tasks [119].
- The Lack of awareness in most developing nations has led to the disregard of new technologies, as awareness of new technology benefits is the first and most important step in the implementation of technology [120, 121]. According to a study conducted by Sabi et al [15], To identify the factors of cloud computing adoption in the growing countries universities, results showed that awareness of

the gains from cloud computing is strongly and positively linked with the adoption of cloud computing.

- Concerns about security and privacy have led to a loss of desire for the shift into cloud services. A recent study conducted by Alkhater, Wills and Walters [122], which studied Saudi Arabia's intention to adopt cloud computing, commented that security and privacy were the main obstacles to implementing cloud computing. Nevertheless, the negative aspect of this paper is the fact that it failed to answer how these variables prevent cloud technologies from being implemented in Saudi Arabia.
- The Internet can be blocked by the government in some emergencies case for hours and even days. Consequently, it causes real problems for many how have sensitive data or daily tasks since they cannot reach the internet signal until the government returned it back.

However, Iraq is one of the growing countries and strong expenditures in this area are required to improve public IT services such as e-government services [103]. Adopting cloud technology within institutions would reduce technology expenditures on IT infrastructure, applications and services [104]. Therefore, adopting cloud computing offers the HEI in Iraq the opportunity to leverage emerging technology with limited knowledge and expense. In addition, colleges and institutions will not have to take into consideration the costs of offering new technological services, support, maintenance and other IT facilities [123]. Besides, cloud computing enables universities to rely mainly on research and education practices rather than complicated IT architecture, software structures and maintenance [124]. In general, HEIs are continually evolving and growing, primarily as a consequence of major challenges resulting from attempts to implement new technologies [106]. Therefore, this research focuses on the essential aspects of utilizing cloud computing services. Technology acceptance model (TAM) has been applied to review the acceptance level of cloud computing in Iraq's HEI. An online survey used to conduct this empirical research As a consequence, the questionnaire sent to the online

college students groups from various universities in order to reach largest possible number, then data obtained will be analyzed via SPSS software system to demonstrate which factors that have been most influenced by the adoption of cloud computing.

2.13 Cloud computing technology services in the education domain

There is a lot of platforms which is designed to meet educational institutions need. We will discuss some of them.

- **Microsoft Live@edu for education**

It is a set of services cloud-based, easy-to-use based on the popular Microsoft resources many are still using today. The aim of Microsoft Live@edu is to fulfill educational needs. It offers a range of shared collaboration services for educational institutions. This online infrastructure provides shared services, collaboration platforms, smartphone apps, desktops, and web-based software. It has the functionality of storing data. This offers Microsoft Exchange Server, email from Microsoft Outlook and a host of other services, including web apps from Microsoft Office. This ensures academics and students will be able to view their information from anywhere in the world through common web browsers by any internet-connected device at any time. Colleges, universities, and schools can register in the system via the online free registration method. Microsoft Live@edu designed for institutions in particular to allow facilities for their academic activities [125].

- **Google Apps for Education**

Google Apps is a cloud-based platform hold package of services, provided to colleges and educators for free through Google. These communications and collaboration applications involve Gmail, Calendar, Drive, Docs and Sites, and the Google Apps for Education accounts offers links to hundreds of other interactive resources provided by Google. All of these services exist entirely online or in the cloud, which means that all formulations can be accessed from any device with an Internet connection. So, it operates via a web browser without needing users to purchase or download the applications. Users can access easily and modify their

files by signing into the program, these tools are free, or users can pay for a Premium Version which includes additional storage space and other features. Google Apps enables institutions to choose their private domain name and services to represent the institution's branding. This means a college or university can deliver the features of Google Apps in a package. [126].

- **Amazon Web Services for Education (AWS)**

AWS Educate is the global strategy of Amazon, to afford students and academics with the best tools to promote cloud-related learning activities and to strengthen the power of administrators, workers, and academics of the future. AWS in Education offers a collection of initiatives allowing the educational sector to fully access the teaching and research benefits of Amazon Online Services. With AWS for Education, instructors, academics, scholars, and students around the world can register for free usage credits to access Amazon Web Services' on-demand platform to teach specialized courses, tackle research activities and pursue new projects. AWS in Education deals with several Independent Software Vendors as well as System Integrators to provide solutions to specific problems in the education environment such as storage, disaster recovery, archiving and content distribution [127]. There are a number of programs accessible to the educational institution. This will help the educational institution by releasing IT staff from maintenance, updates, and technical assistance. The accessibility provided by cloud computing is adequate for most people, who have access to their data and relevant applications anywhere they have a device and an Internet connection. Additionally, cloud providers can operate with established single-sign-on systems, which makes device failure less of an issue. Institutions such as Microsoft, Google, and Amazon are offering opportunities and free access for educational institutions, universities, researchers, academics, and students to utilize the facilities with less effort. Nevertheless, the most relevant solutions and advantages for cloud-based education services can be outlined as follows.

- It offers opportunities to cut the money spent on IT, it reduces the cost of software, equipment, networking, transportation, power, refrigeration and machine space [128]. furthermore, customers of cloud computing will have unlimited access to services and they will only pay for what they actually accessed [129].
- It helps students to carry out instructional tasks without the restriction of time and location, to reach library material and online services directly [130].
- It ensures students to track their performance and receive their scores electronically with frequent reviews and progress in compliance with the specified standards [130].
- It enables online groups to be set up where academics, students, and administrators can collaborate together [130].
- It inserts the environment for exchanging thoughts and perspectives between instructors and administrators [130].

2.14 Theoretical Framework: Technology acceptance model (TAM)

This study has constructed on the principle of the technology acceptance model (TAM) as the theoretical basis for this study. Cloud computing concept definitions differ greatly according to the resources and implementations it is used for. As cloud computing includes applications from Google services to Dropbox for example, (G-mail, Google Documents, Google Drive), Services rely on the servers that are given to users. Applications are various, differing from business to education [28]. The multiplicity of innovative information systems, their complexity and the difficulty of handling them are all considered to be obstructive for the end user. That usually has a problem in being able to deal with these new complex technologies when they are applied in facilities or when replacing old systems with more modern systems, hence those new technologies and systems fail to reach the goal for which they were designed to achieve the greatest possible competition, user's failure to accept them has created an important model that determines

whether the user will be able to accept besides be able to handle these new technologies. This model, called technology acceptance Model, which has the abbreviation (TAM), it's the most popular, and effective models of adoption. Used to understand the acceptance of technologies, its principal stands on two important factors: The Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of the technology. PEOU is described in such a way that a customer will not need to know about the system or technology or have any preparation to do. So, PEOU is described as the degree to which an individual believes that the use of a specific system will be effort-free. Which can be determined by fundamental inspiration and reaction. Whilst PU has a direct impact on the intention of the user to accept and implement new technology. Technology acceptance model explains the behavior of the usage of a given technology [131, 132].

TAM is known as the most prominent and widely used framework for explaining the acceptance of information systems by an individual's and was also effective in discovering and determining How users can consent to use a new technology. [131]. So, When the user believes that using a new system will enhance and ensure career development, this will be an important factor in increasing the acceptance of any new system and will lead to optimal use of this new technology. Integrated with the other element (ease of use), this will accelerate the understanding of new systems faster and then adds a feel-good to a user who will not find complications that may be beyond the performance of their daily work, that will positively reflect on the performance of the work and achieve a return benefit from the system in use. Therefore, it should be considered that the failure of new systems is often due to users not accepting to deal with them either because they do not see the benefit of using them or because they see a great complexity, which causes them a lot of trouble handling them. Consequently, they are unable to perform their daily tasks as required, then the result is system failure [33, 118, 133]. Since cloud computing tends to use third-party resources, confidence in cloud providers and possible threats such as privacy and security concerns are critical to ensuring the effective implementation of an acceptable cloud [48]. A variety of previous studies have reviewed the technological aspects of cloud-based systems, for example, cloud virtualization, scalability and security [134]. However, the greatest challenge of cloud computing is not technical, rather it is

sensory or attitudinal [17]. Thus, this research aims to analyze the attitudes and expectations of users towards cloud computing systems, with a special emphasis on the perception of risk, trust and anxiety, in order to explore the factors influencing the acceptance of cloud computing services in Iraq's HEI. These factors will be explored using a suggested conceptual model focused on the Technology Acceptance Model (TAM).

Consequently, this research would address attitudes and intentions towards cloud computing, among the perceptions of college students. Most of the study has reported and expected increases in trust, anxiety and perceived risk in cloud environments, but only a few studies have investigated the impact of these variables on behaviors in cloud computing adoption. This research aims at understanding the adoption behavior of cloud computing, specifically the acceptance of users towards cloud technology and its services.

2.15 Previous studies based on TAM

Cloud computing was studied from different viewpoints and through various research strategies. There is a range of studies that recognize and examine factors influencing the adoption of cloud computing services. Several of the research concentrated on the adoption by organizations, while some looked at the adoption by individual users. The growing importance in cloud computing services adoption by companies and individuals is attributed to the advantages that can be achieved. However, there is a shortage of studies aimed at determining factors impacting the acceptance of cloud computing systems by university students. In this part, we will shed more light on some of the important studies that have taken place in various countries around the world [135-137].

As it is known TAM became a serious action in modeling the acceptance of information systems by consumers. It has withstood the test of time as the leading model over almost two decades, TAM is considered as the most popular and widely applied term for explaining the individual's acceptance toward information technology. Fundamentally, there have been three patterns for TAM modifications: integrating new external factors, modifying predictive factors and examining moderating impacts [138]. Under the setting of cloud computing, there was a single stream of research that applied expanded TAM

models to explore consumer perceptions and intentions towards the cloud. For instance, Opitz et al. [139], in their study, the technology acceptance of cloud computing was analyzed using factor analysis through an examination of empirical evidence from 100 CIOs and IT directors of indexed companies. They also used a modified version of the popular TAM to provide a clear conceptual context. The findings demonstrate that user acceptance of cloud computing can be clarified and predicted across many non-monetary factors originated from an extended version of the familiar TAM related to social impact and cognitive contributory processes. Another research [140] has shown that TAM is a reliable model for the investigation of the adoption of cloud computing in Saudi Arabia. Basically, For the purpose of assessing the acceptance of cloud computing, a study and interpretation of the adoption behavior of cloud computing should be conducted [141]. In the setting of TAM, a number of factors have been suggested for the prediction of the acceptance of cloud computing, and these external variables have been hypothesized to be mediated by perceived usefulness (PU) and perceived ease of use (PEOU) [142]. Moreover, recent studies have shown that both trust and attitudes towards cloud technologies are significant antecedents of behavioral intention to use the cloud. As an instance, Udoh's study [143] of factors impacting the implementation of cloud technologies utilizing modified TAM, showed that attitudes and trust were expressed as 27 and 21 percent of the variance in BI. At certain, trust, anxiety, perceived risk and attitude were primary factors capable of impacting cloud acceptance [22, 141, 144]. Hence, trust has shown to have positive relationships with PEOU, ATT and AU in TAM contexts. And as such, it could be said that the PEOU and AU of cloud computing are positively associated with trust. Beyond that, there are two major prior contexts of behavior intention to use technologies in TAM, Perceived usefulness is the first one of those perspectives and perceived ease of use is the second one, however, PU is the most important indicator of behavioral intention. Besides, one of the hypotheses was developed from a recent study of cloud-based TAM, stated that cloud BI is positively correlated with cloud PU [140]. Perceived usefulness is the extent of students' conviction that utilizing cloud technologies will enhance the efficiency of their learning and courses activities. According to a study that examined TAM, Davis et al [33] noticed that perceived usefulness has the greatest effect on intention as opposed to attitude. This indicates that

individuals adopt the system primarily when they feel that their performance will be enhanced. So, perceived usefulness is generally associated with performance as its first conception. Similar to PU, perceived ease of use (PEOU) is an integral factor of TAM. Perceived ease of use is described as the extent to which the potential client anticipates the target system to be effortless. Ease of use can be deemed a significant factor in cloud solutions since adopter experience in human-computer interaction is a key criterion in assessing whether or not an application is successful. The adoption of Cloud Computing would boost the adopter experience as contrasted to conventional systems such as grid computing. Subsequently, Cloud computing adoption makes the ease-of-use easier to accomplish, and even the availability of valuable resources can be accessed seamlessly by cloud users [145]. PEOU this factor takes on a key role in interpreting human reactions toward information technology [33, 143, 146]. Several studies over the past decade offer proof of the substantial impact of perceived ease of use on the intention to use [32, 147, 148]. It could, therefore, be said that perceived ease of use is impact positively with AU, BI and ATT of cloud computing as well as that perceived usefulness is positively associated with BI. In addition to that, the effect of the general perception in computing cannot be neglected, as indicated in the previous study. For instance, Venkatesh & Bala. [142], indicated that PEOU of every emerging technology is negatively influenced by anchoring perceptions, such as computer anxiety. Besides anxiety symptoms were also noted in a recent study by Wu & Chen. [22], in cloud computing settings but were incorporated into the attitudes structure. In a similar manner, Udoh, Emmanuel. [143], indicated that anxiety prevents the acceptance of cloud computing technologies. However, anxiety was described in the context of trust as consumer concerns regarding cloud security, privacy, and reliability. In our line of study, perceived risks and trust were regarded as two separate external variables that can directly influence perceived usefulness. Anxiety was often described as a concept that adversely impacts expectations of belief. Through this point of view, it can be claimed that computer anxiety is negatively correlated with PU in the setting of cloud computing. Furthermore, from the end users' perspective. Chandra et al. [149], carried out their research using a quantitative strategy to collect responses from 338 users who are actively using cloud storage. The framework used in this analysis is the Technology Acceptance Model (TAM). The findings of this

study are first, Social influence (SI) has an effect on perceived ease of use (PEOU) but not on perceived usefulness (PU). Second, perceived ease of use (PEOU) has an effect on perceived usefulness (PU) but not for attitude (ATT). Third, perceived usefulness (PU) has an effect on attitude (ATT) and behavior intention (BI). also, attitude (ATT) has an effect on behavior intention (BI). As well as according to Shana & Abulibdeh. [150], who researched the willingness and foundation to use cloud computing for higher education in the United Arab Emirates using the Theory of Acceptance Model. the analytical results were extracted from an online survey with 239 participants from teachers and undergraduates. The results have shown that perceived ease of use has influenced the intention to use technology in the future. And the intention to use it has been shown in the actual use of teachers. The findings of this analysis provide a better understanding of cloud computing implementation issues for educational institutions and cloud service providers. It also supports the basis for future research that aimed to improve the understanding of technology acceptance and the continuing usage of innovation factors in educational technologies. By the same token but from different region, from Users' in Saudi Arabia view point [151]. This research proposes an expanded TAM, which incorporates Perceived Risk (PR), trust (TR) and Anxiety (ANX), to examine the perceptions and intentions of consumers towards cloud computing adoption. The suggested model was empirically tested in order to interpret data obtained by questionnaire from both IT experts and end-users using the Structural Equation Model (SEM). The results have been shown that Perceived Risk and Anxiety both had major negative effects on perceived ease of use (PEOU) and perceived usefulness (PU). Trust has shown a significant positive effect on Perceived Ease of Use (PEOU), but it has not seen any substantial effects on Perceived Usefulness (PU). Furthermore, Behavioral Intention (BI) to use cloud computing can be predicted by trust, attitudes and Perceived Usefulness, since it has been shown that Perceived Risk (PR) has no major impact on Behavioral Intention (BI). The suggested model, including Perceived Risk, anxiety and trust, has been proven to be a valid indicator of users' intentions for cloud computing usage, Under the Saudi Arabia context. There has also a similar study from the Jordanian students perspective [152]. This research aims to investigate the factors that influence the intention of students for using cloud computing within Jordanian universities. In order to accomplish this goal, a quantitative analysis

methodology based on a survey has been applied. Approximately 400 questionnaires were randomly distributed to students of Information Technology (IT) at four Jordanian universities and only 236 relevant questionnaires were collected. The findings indicate, by utilizing multiple regression strategies that the students' decision to embrace cloud computing and using it was greatly affected by perceived usefulness, perceived ease of use, perceived security, perceived speed of access and perceived cost of usage. Furthermore, the results indicated that the developed model explains 50.4% of the variance in the students' intention to use cloud computing. In practice, the results of this study are considered fruitful for the universities and students to increase the usage of cloud computing in educational contexts. In contrast with [153]. The public and private sectors are looking to improve their cloud-based data storage. nevertheless, some of them still in the early stage with issues related to both technical and human factors which need to be fully addressed to ensure successful implementation. This research reviews studies performed in the area of health, Higher education institutions and the public sector. It was noticed that security, privacy, technology readiness, human readiness, environment and organization support are the most critical factors in cloud computing implementation. From these facts, one may conclude that the actual use of cloud computing can only be predicted by the behavioral intention to use the cloud. [25]. As mentioned, that there were three patterns for TAM modifications: Incorporating new external variables, modifying predictive factors and examining moderating effects [138]. In the context of TAM, several factors were proposed to predict the acceptance of cloud computing, these external variables were theorized to be mediated by PU and PEOU [142]. In the current study, TAM has been modified to suit the cloud computing setting. specifically, the modification of TAM includes the incorporation of new external variables which have been shown to have a likely impact on the adoption of cloud computing. However, there is a shortage of studies aimed at determining factors impacting the acceptance of cloud computing systems by university students. In our study, we will shed more light on that aspect. This study has modified the Technology Acceptance Model to incorporate additional factors besides TAM original components : perceived usefulness (PU), perceived ease of use (PEOU), attitudes (ATT), behavioral intention (BI), perceived risk (PR), trust (TR), anxiety (ANX), actual use (AU), perceived cost of usage (PCU), perceived speed of access

(PSA), social influence (SI), cultural context (CC), perceived benefits (PB), perceived overall concerns (POC), external storage (ES). Several forms of cloud-based research have been studied the factors that are potentially influential to adopt cloud computing in either as a challenge or opportunity and examined these determinants in order to assess their importance and their impact on the adoption intention. So, based on previous studies we developed our research questions.

2.16 Factors that have a positive impact on the adoption of cloud computing

Cloud computing offers enormous opportunities to people, companies and academic institutions. It offers effective facilities and infrastructures without the need to purchase the requisite IT infrastructure. Accordingly, these opportunities will positively impact cloud computing adoption [53, 154]. To explain this, below are some of the widely reported incentives that can be outlined under the name of motivations. Most businesses expend a substantial portion of their balance on IT infrastructure, even though they use less than 10% of their system resources considering the replenishment every three years, as well as maintenance and administration requirements. Cloud Computing capable of reducing these costs extraordinarily. According to Marston et al. [17], "Economies of scale for datacenters cost savings can lead to a five to a seven-time reduction in the total cost of computing". In addition, cloud computing solutions are the best opportunity for small companies and developing countries. It can reduce expenses by utilizing a comparatively low-cost high-level IT infrastructure, whereas such high-performance servers were available for big companies only [155]. In view of this, it can be said that cost is impact positively with PU, PEOU and TR of cloud computing. For example, from an organizational point of view, Opala and Rahman. [156] examined the effects of security, cost-effectiveness and IT compliance on the decision of managers to implement cloud computing services in the United States of America organizations. The survey participants comprised 282 CIOs, Operational Managers, and other IT administrators and executives responsible for technology procurement. The findings revealed that management's awareness of cost-effectiveness is more strongly correlated to their decision to adopt cloud computing compared with security. The reason for this stronger correlation is due to the awareness of the cost savings resulting from the adoption of the cloud. In the same

direction in any institution, additional benefits over other alternatives play a vital role in its adoption. According to Rogers. [157], the comparative benefit implies that the extent to which a technological factor is viewed as offering greater benefits to organizations. Cloud computing has extra benefits over other technologies, as an instance low costs, scalability, flexibility, accessibility and pooled resources. Corporations pay a substantial proportion of their budgets on The IT infrastructure while fewer than 10 percent of their servers are literally used, leading in expenditures that can be averted when adopting cloud computing technology [17]. As well as Cloud computing relieves organizations from managing and maintaining IT infrastructure every year. Hence this dramatically reduces the overall cost of IT operations. moreover, Cloud computing offers leased services on a pay-as-you-go basis, which means that the level of use can be modified to meet the actual requirements of the organization [158]. further, Mobility considers one of the most important benefits it gives consumers the ability to connect and operate on their own data records from everywhere in the world, as long as they have access to a device and an Internet connection. So, Users do not need to have a specific device to utilize cloud computing services. Since cloud computing offers shared resources services that allow its customers to access cloud-based services from any location, and thus it saves money, time and effort. [159]. Mezghani and Ayadi. [160], have studied factors that have led a negative feeling towards the adoption of cloud computing in Saudi companies. The results revealed that the focus on risk factors promoted negativeness, while a positive cloud understanding such as perceived benefits, perceived ease of use and perceived usefulness, lead to a positive stance towards cloud computing. Over and above that Changchit in her study [18]. she examined how college students view cloud computing, and what influences tend to motivate or prevent them from embracing cloud computing as part of their curriculum. In this analysis, the questionnaire adapted the instruments and scales produced from technology Acceptance Model (TAM) to measure Perceived Ease of Use, Perceived Usefulness, Perceived Security, Perceived Speed of Access and Perceived Cost of Usage. The analytical results were extracted from an online survey with 558 participants from students. The findings of this study show that all five factors, (PEOU), (PU), (PS), (PSA) and (PCU), are factors which play a significant role in encouraging students to consider cloud computing as part of their core curriculum. For the "perceived

usefulness" aspect, it is very evident from the finding that if students view cloud computing as a technology that supports them, they would typically be accessible to the using and studying of it as part of their education.

Not only that, Users are affected to adopt innovations because they are considered to be part of their technological experience [161]. The ongoing need for simulation as part of the user interaction with technologies has an effect on how various people adopt technologies [162]. Social influence are essential determinants of human behaviors depending on the context in which behavior is driven [163]. Generally, social factors indicate the extent to which users believe it is necessary to use emerging technologies [164]. Such social factors relate to the manner in which certain users of a particular social community utilize technology resources. When more individuals in the social network of customers recommend adopting technological advancement centered on perceived benefits, more customers will adopt technologies [165]. Cloud computing services are technical innovations that can be observed as valued on the basis of individual user social networks. In other terms, as social trends reflect the advantages of new technology, customers become more inclined to adopt technological innovations

2.17 Factors that have a negative impact on the adoption of cloud computing

The Reasons for not using CC regard to many obstacles. There are several obstacles connected with the acceptance of cloud services that impact users' intention to embrace such technology. According to a survey undertaken by the International Data Corporation (IDC), security, availability and performance are the top three most frequently mentioned issues in cloud services [78]. However, there are several unexpected potential extra costs resulted from the modifications needed by cloud adopters to satisfy their unique needs and specifications. Accordingly, they will be liable for running a personalized cloud that would cost more than what was planned for [166]. In the same direction, and that will imply extra costs. So, Cloud adopters must pick the right cost strategy to fulfill their requirements [87]. In conclusion, costing is seen as an advantage as it decreases the expense of implementing for the Cloud Solution adopters but also has certain possible realistic economic consequences. Users should be mindful that a loss of cloud service

(outage) could exist for a short or long period, and it could occur once or several times, therefore this should be taken into consideration before cloud is adopted as a solution [48]. Previously, Google and other large companies have undergone similar circumstances in the past and may face them in the future. so, full availability of cloud services is impossible. For this situation, sensitive applications or data should not move to the cloud. actually, most of the applications that are hosted on the cloud are non-critical it's either for backup or software testing. Accordingly, users have to back up their data somewhere. presently, Cloud providers trying as possible as they can to avoid outage of services and promise to keep a high level of reliability in the Service-Level Agreement (SLA). This factor poses a challenge and it is one of the most effective factors for the adoption of cloud computing. It can decide the kind of applications that will be used in the cloud coupled with its adoption strategy [87].

Data protection is perceived to be one of the most critical concerns that can present a real danger to company data and may contain sensitive details regarding it, based on the previous 'reliability' factor, the system is reliable, security is achieved at one side. Hence, the full control given to the cloud provider must be secured against violation through the SLA, which addresses this issue through the specifications and contract of the provider [167]. Moreover, data are not available physically at the company location, the cloud provider secures the data against any external threat and providing the company with backup. Security threats are the dominant factor that influences IT managers' overall risk perceptions [27]. About 75 percent of IT managers and CIOs reported security issues as their main concern. On the other side, security concern resides in all devices, not just on cloud servers, hackers can still find a way to penetrate any computer network [87]. Despite that Experts can enhance cloud server security where they can secure the computer system with the best methods and techniques, as well as using the latest software and hardware that provide the highest standards of security for servers and the applications [168]. Similarly in [169]. Users who intend to implement personal cloud computing (PCC) may be worried about the cloud's ease of use, usefulness, or security risks, which leads to distrust in the cloud. Negative feelings towards the use of technology have been shown to have a negative effect on the technology's success. This research based on the technology

acceptance model (TAM) and had the aim of understanding PCC acceptance by users. Within the United States, the demographic survey composed of adult users between the ages of 18 and 80. An online survey was performed to test participants' measurements and comprehension of trends. In spite of the benefits of PCC, the results showed that security and privacy threats prevent many users from switching to PCC. In addition, the performance indicator also tends to rely on security and availability factors and can be assessed by the quality of the connection between the cloud server and the client. Performance is assessed by system steadiness when multiple users linking to the cloud server at the same moment and when there is a massive data sharing among them, the performance will either stays stable as long as the cloud server maintains too many connections at high levels, or it will slow down or interrupt if the connections are too much [170]. In addition, bandwidth and processing requirements must be assessed prior to accepting the adoption decision, taking into consideration current and future expansions [32]. In summary, security concerns can be perceived as both an opportunity and a challenge at the same time, but they are often doubtful as seen by cloud-adopters and non-adopters. as well as this factor plays a significant role in deciding the kind of applications that can be deployed into the cloud and the industry type which can adopt cloud solutions. For example, banks, hospitals and governments are used to avoid cloud solutions due to security problems [27, 87, 171]. Accordingly, it can be noted that security have impact on BI, ATT and PR of cloud computing. In the context of technology and information, Language was perceived as an obstacle to embracing modern technologies [172, 173]. Primarily, language is the main medium of human contact, it is important because it is a portal to the transmission of information in the modern world [174]. The literature has shown that language, represents a significant impediment to Information technology dissemination, particularly in developing countries. As well as, A number of researchers have highlighted the fact that linguistic differences can be categorized as among the most significant obstacles to the diffusion of IT in developing countries [175, 176]. However, English has been the dominant language in the history of IT and in the ongoing growth of modern IT technologies and therefore, it is the primary language used on the internet [177, 178]. Vatanasakdakul et al. [175], recommend that language should be more thoroughly incorporated into the cultural context of Hofstede's due to its importance as an integral

part of all cultures [179]. By the same token, Internet domination by websites in English is a well-known problem for those who do not speak English [180, 181]. It can create some barriers for non-English-speakers, the elderly and less educated individuals who are less inclined to learn a foreign language [182]. So, the language will have a negative impact on the intention to adopt cloud computing. Cloud computing refers to any system operated by a third party that enables users to access their data over the Internet. Some of the main pros are: All that users need is an Internet connection to access their data. There is no need to store the data in a physical form and Free versions are available for storing small amounts of data. In contrast, there are some cons: If users want to store a lot of information, they will probably have to pay for extra storage. Third-party storage is vulnerable to theft and hardware failure. Cloud storage requires an Internet connection for access. By comparison, Local Storage refers to physical hardware such as external hard drives, flash drives, and CDs. Here are several pros of local storage: Inexpensive, Easy to use and the data is under user control. In return, the data isn't accessible unless users have the hardware with them. external hard drives or CDs can fail or break or stolen. Against this background, Sultan has stated that 66 percent of USB drives are missed; therefore, cloud storage is safer than the hard drive or USB flash drive storage. However, students can rely on cloud storage to solve specific problems. Students can utilize cloud computing in an institutional setting to complete assignments, online classes, group projects, reports and presentations [21]. Cloud storage systems have quickly gained traction among Internet / Mobile consumers because of their advantages over conventional storage solutions. For instance, cloud storage services typically have a broad free storage allowance as an e.g., (Baidu Cloud: 2 TB, Dropbox: 2 GB) coupled with great reliability [183]. In addition, data saved in the cloud can be viewed in various formats, including web servers, Desktop device applications, and mobile apps. Sharing files is simple as well, so users can conveniently build collaboration groups in Dropbox or give temporary access codes in Baidu Cloud [184]. Accordingly, the main concept of cloud computing is the availability of computing resources at any moment, anywhere on the internet. As a result, the education system could be improved in order to enable students to gain access to educational services anywhere and wherever they choose [22].

2.18 Chapter Summary

The literature review discussed the context of cloud computing, comprising the concept of cloud computing by prominent academics, and the history of cloud computing, through its stages starting from Central stations computing, Desktops computing, Network computing, Web computing, Cluster computing, ending to Cloud computing.

The chapter also discusses the three components of cloud computing which are clients, data centers, and distributed servers, followed by a mechanism for how cloud computing operates. moreover, this chapter explained the five popular Fundamental characteristics of cloud computing which are: on-demand self-service, rapid elasticity, resource pooling, broad network access, and measured service. as well as the popular service models of cloud computing in particular as respects with Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) they were also thoroughly discussed, followed by the four deployment models involving private cloud, community cloud, public cloud and hybrid cloud.

Then, the chapter further highlights to benefits and barriers connected with the usage of cloud computing to individuals, organizations and educational institutions. In addition, the chapter sets out the theoretical framework utilized in the research. It also addresses cloud computing in educational settings, as well as the status of cloud computing in higher education in both developed and emerging countries.

Finally, the chapter has presented an extensive review about previous TAM-based studies, in addition to factors that have a positive and negative impact on the adoption of cloud computing.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Chapter overview.

This chapter presents a comprehensive review of the most recognized technology adoption theory and methodology used to study human behavior toward the acceptance of emerging technologies known as the Technology Acceptance Model (TAM). The model is examined in order to identify its strengths and limitations, which in turn allows us to recognize the most important variables that will react correctly to our research questions. Finally, the chapter presents the rationale for the selected research model of this study which is TAM.

3.2 Problem statement

Despite the fact that cloud computing is perceived to be one of the most important technologies in the current IT sector, but there is still a restricted concentration on the usage and adoption of cloud technology in educational environments [25]. Specifically, students' behavioral attitudes regarding cloud computing are still unclear [26]. While cloud computing could be a great benefit to developing countries because they do not have the resources to have their own IT infrastructure and services. A few reviews focus on the decision to implement cloud computing but do not contain details such as which considerations are more important and effective, how such considerations affect the decisions of users, how users react to such factors, and how organizations seek to resolve such concerns [27]. numerous academics have investigated the topic of cloud computing, especially in developed countries. But study still at an embryonic stage in emerging countries and many of the current problems have not been fully tackled, especially in the higher education institutions sector, which need advanced technologies to develop the

quality of education, information and research [28-31]. This research is therefore designed to explore the factors that affect the intention of students in Iraqi higher education to embrace and use cloud computing technologies.

3.3 The motivation for this study

The behavior or viewpoint of the consumer towards any technology is the biggest challenge to adoption, not the technological aspect only. It is therefore important to analyze both cognitive and technological effect mechanisms in order to determine the adoption of cloud services by consumers. [17]. Matters regarding technological implementation are taken by IT directors. New technologies cannot improve organizational performance unless it has been effectively applied. The key problem is the aversion of the director to the end-user system. As a result, it is extremely important to explain whether individuals support or reject cloud computing services in order to broaden the acceptance of cloud computing by individuals and to facilitate managerial decisions to implement cloud computing within institutions, it is necessary to recognize and analyze variables such as perceived costs, perceived benefits, perceived risks, perceived attitudes, besides TAM original factors [27]. Investigating the effect of these factors in combination with other factors when adopting cloud computing will be quite necessary for successful implementation. This is the clarification of why this work is being suggested. furthermore, owing to insufficient studies in emerging countries on the usage of cloud services, this research study is motivated and seeks to tackle the research void from a student viewpoint.

3.4 Research questions

In the light of the problem depicted and motivation for this study stated, the following research questions are investigated

1. What are the factors (concerns, motives, cost, speed, social influence, cultural and contextual issues, and using external storage) explaining TAM components?
2. What are the factors (concerns, motives, cost, speed, social influence, cultural and contextual issues, and using external storage) explaining Trust to CC?

3. What are the factors (concerns, motives, cost, speed, social influence, cultural and contextual issues, and using external storage) explaining Anxiety of CC?
4. What are the factors (concerns, motives, cost, speed, social influence, cultural and contextual issues, and using external storage) explaining the Perceived risk of CC?
5. Can a comprehensive model combine the factors indicated as a significant impact on previous research questions, TAM components, Trust, Anxiety, and perceived risk of CC?
6. If the comprehensive model is viable, can any mediation or moderation associations be indicated in the model?
7. What are the underlying reasons for not using CC?

3.5 Research design for this study

The selection of a suitable research design method is vital since it determines how research data will be obtained and analyzed. Each method has its own merits and demerits; however, the researcher chooses an acceptable method based on study challenges, goals and questions. So, the research problem in this thesis directs the determination of the research design. This study adapted the technology acceptance model (TAM) as the theoretical model to examine the adoption of cloud computing services by students at Iraqi higher education institutions. The modified TAM will be analyzed using a quantitative methodology. Nevertheless, the research problem needs further exploration as no analysis has been undertaken in the Iraqi educational setting to examine the factors impacting the acceptance of cloud computing services by university students. So, the exploratory nature of the quantitative study design would allow the researcher to better understand the issue, contributing to better results that can be generalized. On this basis, a quantitative analysis approach is used to determine and classify variables that influence the adoption of cloud computing by students in Iraqi higher education institutions. Besides, a questionnaire survey technique is adopted as a quantitative data collection tool because it is perceived to be the most suitable method approach for achieving the study goals and answering research questions plus inspect the intended questions and the theoretical model [185]. The Data were obtained from cloud-based computing, including data from customers and prospective cloud adopters. The current research developed a questionnaire as a way of

collecting responses from students at Iraqi universities regarding their understanding of cloud computing. The questionnaire contained fifteen items, and a 5-point Likert scale was used for nearly all questions, with anchoring points varying from strongly disagree to strongly agree.

3.6 Data collection

The number of universities in Iraq has reached 35 public universities and 45 private universities and colleges. Throughout the quantitative process, the data were gathered using a questionnaire. for the reason that questionnaire is one of the most effective and cheap data collection method which is simple to handle [186, 187]. It can be controlled directly, via mail or through online means. Questionnaires are employed if the researcher understands specifically what is required, understands how to evaluate relevant factors that need broad samples for more accurate and reliable data [188].

Accordingly, an electronic survey questionnaire was used to collect data from the students in different universities using google forms. The survey was conducted via student Facebook groups, and there were 576 participants who entered the survey. 420 of them completed all the questions. The reasons behind the choice of these Facebook student groups are as follows. First, covering all universities is difficult because of time and resources limitations. Second, these groups are active and contain a large proportion of student population with diverse culture and levels from different cities. Third, the selected groups have students with good knowledge since they discuss only the Latest technologies innovation and relative stuff regard to students and IT.

3.7 Questionnaire design

Questionnaire is a widely employed method for gathering data in quantitative studies. The nature of the questionnaire will affect the answer rate of the sample and can have an impact on the reliability and validity of the data obtained [189]. Consequently, thoughtful design of the questions, a straightforward and simple layout, plain and consistent description of the questionnaire, a reasonable strategy and the administration of the questionnaire in a good manner would increase the answer rate plus the reliability and

quality of the collected data [189]. Nonetheless, Sekaran proposed the main three points that should be discussed by the researcher during the preparation of the questionnaire. The first point is the structure of the form, which involves the method of answering questions. The terminology is influenced by the appropriateness of the information, vocabulary and language used in the questions, the format and nature of the questions, the order of questions and the personal details of the respondent [187]. In this study, the researcher took into consideration the object of each question and used plain language that would be readily understood by the participants. As well as closed-ended questions have been included in the questionnaire as they are less time-consuming and contribute to complete and analyze them faster. The researcher also averted double-barrelled, vague, and lengthy questions as Sekaran recommended. The second point indicates the preparation of adequate assessment. For this context, nominal and ordinal scales have been used to mark factors [187]. The ordinal scales were classified using a 5-point Likert scale beginning from 1 (strongly disagree) to 5 (strongly agree) [190]. A 5-point Likert scale was chosen because it allows the questionnaire to be read and finished more simply for participants, and is one of the most commonly used metrics for cloud adoption studies. A Likert 5point scale was selected because it allows the questionnaire to be read and finished more simply for participants as well it's one of the most highly used scales for the cloud computing adoption studies [8, 72, 191]. Finally, the third point addresses the presentation, which is how the questionnaire appears, including orientation and well-organized directions [187]. In this study, the questions were conveniently and clearly arranged with directions about how to answer the questions. In this study, the questionnaire was formed in English (see Appendix A and B), since English is the official language in IT, as well most universities in Iraq particularly, Graduate Schools of Natural and Applied Sciences they introduce their courses in English So, most high educational students can speak English and. However, the key content of the questionnaire was split into four parts. Part one It began with a short description of cloud computing technologies, as cloud computing is a recent term for most students in Iraq. Another reason for the justification is that cloud computing technologies built for academic purposes have not been recognized or utilized by university students and academics in Iraq. Part tow of the questions refer to the general details of the participant. The questions are linked to

demographic statistics, such as gender, age, degree of education, and some additional questions related to the participant knowledge. Part three includes questions that discuss the factors that have an impact on the adoption of cloud computing technologies. The questions in this part are based on the factors of the proposed modified TAM based model. The factors are perceived usefulness, perceived ease of use, Attitudes toward the cloud, Behavioral intention, Perceived risks, Trust, Anxiety, Actual use, Perceived benefit, Perceived overall concern, Cost, Speed, social influence, culture context and external storage. Such Factors are measured by using verified items from previous studies. The questions are assessed using a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree). The variables are listed in Table 1 with their respective objects as well as sources. Moreover, The questions in each factor are clustered together in accordance with other researchers. It is endorsed by Davis and Venkatesh [192], who indicated that similar items can be clustered together in order to get higher reliability and validity of a model. At the conclusion of the questionnaire, the forth part contains some questions that relate to clarifying the reasons for not using cloud computing and if there is any intention to use it in the future.

3.8 Participants

As we mentioned, the total proportion of responses was (97%). But only (82%) of participants who completed all questions until the end. The following paragraphs present the respondents' background characteristics regarding age, gender, and level of education.

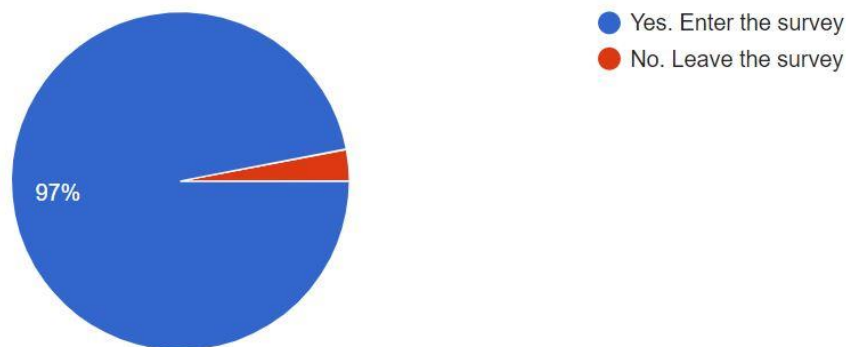


Figure 0.1 Participants proportion

The age. As shown below in fig.2 from 25-34 years of age was the largest proportion which represents (54.3%). Followed by 18-24 years of age which represents (22.6), after that 35-44 years group comes with (20.3%). Finally, only about (2.6%) of respondents were from category 45-54. This could be taken into consideration to the fact that participants over 45 years may not be interested in cloud computing and IT in general, or maybe unmindful of the IT system at the university. It is estimated that the more youthful generation, which represents the majority of participants, has contributed more to the survey as they use the computer system increasingly, almost every day for different tasks.

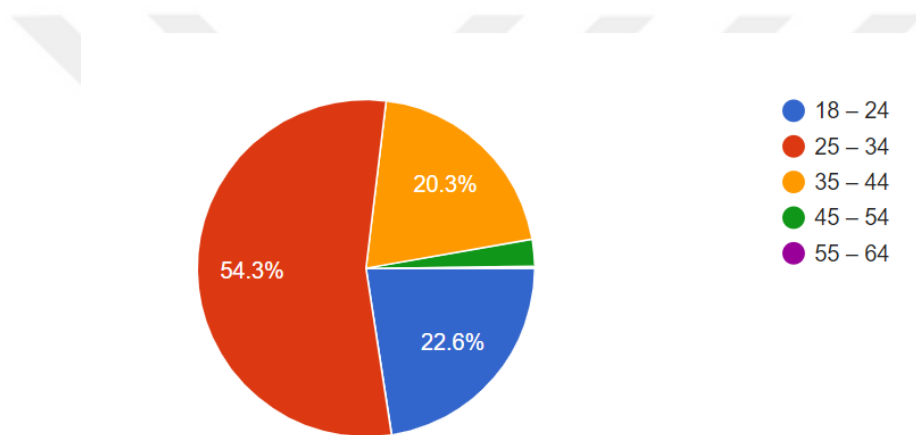


Figure 0.2 Percentage of participants age

Gender. As illustrated in fig.3 the percentage of males participating in the survey was (82.8%) representing 477 from participants, which is higher than the proportion of females at (17.2%) representing 99 of participants. So, it should also be borne in mind that females in Arab environments are less interested in cloud computing.

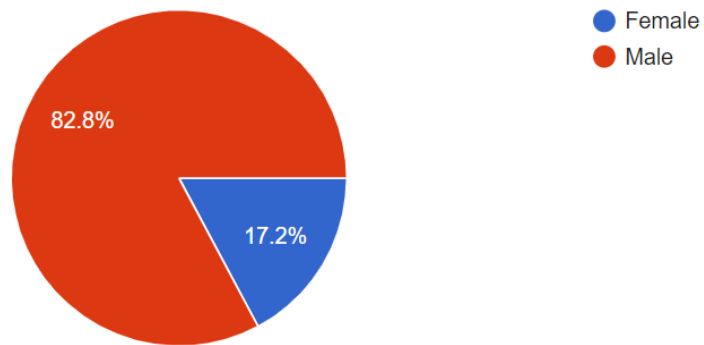


Figure 0.3 Percentage of male and female respondents

Qualifications. According to the survey, there are 350 participants held Bachelor's degrees, which represents a percentage of (60.8) regarding the overall participant's proportion, followed by Master's degrees at (30.9%), then Doctorate degrees comes with (8.3%) as shown below.

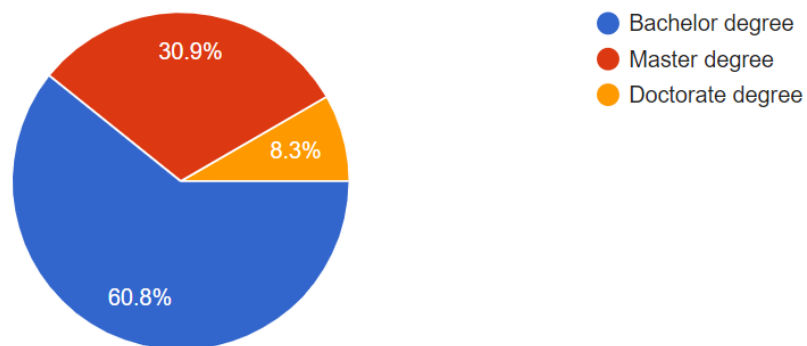


Figure 0.4 Percentage of participants qualification

3.9 Questionnaire main factors

Table 0.1 The model contents with its factors and references

Factors	Fact or code	Questions	Source
PERCEIVED USEFULNESS (PU)	PU1	I would find cloud computing useful.	[32, 33]
	PU2	Using cloud computing would increase my efficiency.	[32, 33, 193]
	PU3	Using cloud computing increases my productivity.	[32, 33, 193]
	PU4	If I use cloud computing, I would accomplish my tasks more quickly.	[32, 33, 193]
	PU5	I would find cloud computing effective for my tasks.	[32, 33]
PERCEIVED EASE OF USE (PEOU)	PEOU1	Learning to operate cloud computing would be easy for me.	[32, 33, 193]
	PEOU2	Using cloud computing would require less mental effort.	[32, 33, 193]
	PEOU3	My interaction with cloud computing would be clear and understandable.	[32, 33, 193]
	PEOU4	I would find cloud computing services flexible to interact with.	[32, 33, 193]
	PEOU5	It would be easy for me to become skillful at using cloud computing services.	[32, 33]
	PEOU6	In general, it is simple to use cloud computing.	[32, 33, 193]
ATTITUDES (ATT)	ATT1	Using cloud computing is a good idea.	[32, 33]
	ATT2	I like the idea of using cloud computing.	[32, 33]
	ATT3	Using cloud computing is pleasant.	[32, 33]
	ATT4	I find using cloud computing enjoyable.	[32, 33]
BEHAVIORAL INTENTION (BI)	BI1	I'll keep using cloud computing in the next 6 months.	[32, 33]
	BI2	I expect to be a regular user of cloud computing.	[32, 33]
	BI3	I'll keep my intention to use cloud computing in the next 6 months.	[32, 33]

PERCEIVED RISK (PR)	PR1	I believe the confidentiality and security of my data are not guaranteed when using cloud computing.	[27]
	PR2	I am concerned about privacy in cloud computing.	[194]
	PR3	I am concerned about cloud computing performance and reliability.	[195]
	PR4	Overall, I consider the adoption of cloud computing to be risky.	[27]
TRUST (TR)	TR1	I trust the cloud because its vendors are competent and professional.	[194]
	TR2	The cloud vendor is one that keeps promises and commitments.	[194]
	TR3	I trust the cloud vendor because they keep my best interests in mind.	[194]
	TR4	Overall, the cloud is trustworthy.	[196]
ANXIETY (ANX)	ANX1	I feel apprehensive about using cloud computing.	[147, 197]
	ANX2	It scares me to think that I could lose a lot of information using cloud computing by doing any mistake.	[147, 197]
	ANX3	I hesitate to use cloud computing for fear of making mistakes I cannot correct.	[147, 197]
	ANX4	Cloud computing is somewhat scary to me.	[147, 197]
ACTUAL USE (AU)	AU1	I have used cloud services.	[32, 33]
	AU2	I am regularly using cloud services.	[32, 33]
PERCEIVED COST OF USAGE (PCU) I believe that the COST of cloud computing is	PCU 1	Inexpensive for the amount of storage provided.	[18]
	PCU2	less expensive than buying software applications for a laptop/PC.	[18]
	PCU3	Is expensive compared to cost of using open source or Internet applications.	[18]
	PCU4	Decreases with volume, the more space you use, the cheaper it costs to buy more.	[18]
	PCU5	Inexpensive considering the cost of maintenance I have to spend if I use my own storage.	[18]
PERCEIVED SPEED OF ACCESS (PSA)	PSA1	Is the same as working on files stored on a traditional laptop or PC	[18]

I believe that the SPEED of cloud computing	PSA2	Is sufficient for backup and storage	[18]
	PSA3	To upload/download files is the same as uploading/downloading to any other Internet website.	[18]
	PSA4	To work on files will mostly depend on the speed of the Internet connection being used	[18]
	PSA5	Is sufficient for my everyday work	[18]
SOCIAL INFLUENCE (SI)	SI1	The people around me think I should use cloud computing services.	[164]
	SI2	I have discussed cloud computing services with my family and friends.	[164]
	SI3	I have used cloud computing services because I am influenced by my family and friends.	[164]
CULTURAL CONTEXT ISSUES (CCI)	CCI1	Language problems in using technology is considered as a barrier in adopting cloud computing.	[176, 198]
	CCI2	Some services in cloud computing don't support Arabic languages.	[176, 198]
	CCI3	Lack of laws to organize and keep Islamic boundaries while using cloud	[176, 198]
PERCEIVED BENEFITS (PB)	PB1	Lower costs (Saving money through lower total costs)	[199]
	PB2	Elasticity (The ability to grow and shrink capacity with demand)	[199]
	PB3	Security (Access to a cloud is secure)	[199]
	PB4	A large set of services (Cloud providers offering additional services such as message busses, mailing and payment systems.	[199]
	PB5	Just like clouds (Generally positive feeling about using computing)	[199]
	PB6	Updates (updates and security settings can be speedily rolled out or modified)	[199]
	PB7	Accessibility (easier to control access from anywhere at any time using any smart device)	[199]
	POC1	Data privacy (Concerns about leaking information when someone else manages it)	[199]

PERCEIVED OVERALL CONCERNS (POC)	POC2	Infrastructure control (Inability to dictate what happens to infrastructure, who can disable it, and who ultimately controls it)	[199]
	POC3	High costs (Higher total cost of recurring utility bills)	[199]
	POC4	Networking costs (Compared to the cost of moving bytes around, everything else is cheap. As clouds are elsewhere, networking costs will be high)	[199]
	POC5	Job security (Concerns that private IT will lose its jobs to public providers)	[199]
	POC6	Availability (information anywhere anytime)	[199]
	POC7	Internet speed (problems in my country affect me not to adopt cloud computing)	[199]
	POC8	Just don't like it (A general feeling of danger about clouds)	[199]
EXTERNAL STORAGE (ES)	ES1	Using external storage (will have an impact on cloud computing adoption)	[18]

Throughout this research, the general concept of cloud computing used and discussed cloud services, specifically google docs, since they were used in studies that investigated the adoption of cloud computing services, particularly in academic environments by students, as well the studies recorded positive attitudes of intended users towards technology adoption [200-202]. Moreover, it's one of the common free online instruments used for collaboration, storing and sharing of data. Users only need a Google account to use it, which is an incredibly easy procedure [202].

Therefore, the researcher designed and tried to cover the most effective factors to familiarize the students with the cloud services and also to enable them to answer the questionnaire more efficiently. The survey contains four sections as follows. In the first section, a brief introduction is represented on the first page of the survey, which includes an explanation about the aim of the research and general concept of cloud computing. The second section contains demographic details on the participant such as age, gender, qualifications and some general questions about cloud computing using. The third section

divided into three subsections directed for participants who used cloud computing, it contains questions about all factors used in the study. Respondents were asked to identify the aspects that were most important in their selection or non-selection to cloud computing. The factors were developed with respect to the theory of TAM.

Finally, The last section is directed for those who do not use cloud computing, so, it designed to explain why cloud computing is not used and whether there is any intention to use it in the future. the Questionnaire designed 81 questions, 68 of them for those who use cloud computing such that will take respondents about 30 minutes to complete. The other 13 questions for those who do not use cloud computing.

The aim of this survey is to enable the participants to have experience with cloud computing and to know what is the real obstacles in Iraq educational setting. The letter of introduction and the information sheet included the approximate anticipated period to complete the questionnaire. Confidentiality guarantee, as well as the contact information of the researcher and supervisor have been given to the participants. So, they can inquire or obtain search results if they wished. Finally, the introduction letter and the information sheet concluded with a thank-you message to the respondents. The consent form contains information that guarantees respondents data privacy and also makes it explicit that their participation is based on voluntariness and they can withdraw at any point they want without any consequences.

3.10 Quantitative data analysis

The quantitative data collected using the survey questionnaire were analyzed using IBM SPSS statistical package for social sciences software, and the Analysis of Moment Structures (AMOS ver. 24) software. The suggested model was empirically examined the relationship between the variables using hierarchical multiple linear regression alongside the Structural Equation Model (SEM).

3.11 An introduction to multiple regression

Multiple regression is a statistical strategy that helps one to predict someone's score on a single variable according to their scores in a variety of other variables. An explanation could be helpful. Suppose the directors were involved to predict how much the employee likes their works. Predictors such as income, degree of academic education, age, gender, number of years of full-time employment and socio-economic status may all lead to work satisfaction. If data on all these factors are collected, obtainable by surveying a few hundred representatives of the population, could be helpful to ascertain how many and which of these factors contributed to the most accurate prediction of work satisfaction. It could be obvious that work satisfaction is more correctly predicted by the form of career, income, and years of full-time jobs, with the other variables that do not help predict work satisfaction. In the same way, when multiple regression is used, often researchers use the expression "independent variables" to describe certain variables that they believe would affect any other "dependent variable." Consequently, in the previous example above, the type of career, income and years of full-time occupation will appear as important predictor variables that enable us to approximate the criteria variable – how satisfied someone is in favor of being with their work. As we have indicated, human behavior is fundamentally noisy and so it is not possible to make fully reliable predictions, but multiple regressions help us to define a set of predictor variables that together provide a valuable approximation of the convincing score of a participant based on a dependent variable [203, 204].

3.12 Structural Equation Modelling (SEM)

The SEM methodology was used to analyze the relationship between the constructs in the research model. SEM is a multivariate strategy incorporating aspects of variable analysis and multiple regression that helps the researcher to concurrently analyze a sequence of interdependent relationships between observable variables and latent constructs [205]. The SEM analysis was carried out using the Analysis of Moment Structures (AMOS ver. 24) software.

3.13 Ethical Approval

This study involves gathering data from students, which is why the researcher has to consider both the participants and the community where the data is gathered [206]. In this thesis, many steps have been taken to ensure that the study complies with ethical research standards. Firstly, Atilim University Ethics Committee accepted the study with a project number 59394181-604.01.02-E.2589. Secondly, the researcher explained to the participants the goals and priorities of the study. The importance of cloud computing services, especially for students, has been emphasized in order to make students aware of the advantages that could be reaped when the cloud computing services are adopted. The researcher further demonstrated to the students how this study would enable decision-makers in universities and cloud service providers to consider the factors that affect student acceptance of cloud computing services adoption. Thirdly, the approval of the participants was obtained at the outset of the study. The participants were also informed that their data, including personal information, would be confidential and protected by the researcher even after publishing the thesis. Finally, voluntary participation was highlighted in order to grant students the freedom to join and to withdraw at any moment. The researcher included her contact details as well as those of the researcher's supervisor in the information sheet in relation to any further inquiry or ethical issues.

3.14 Chapter Summary

This chapter outlined the research methods used in this study. The objectives of this thesis contributed to the selection of a suitable research design, which was the quantitative approach survey questionnaire design. In this design, a quantitative technique was used for gathering and interpreting the related data. The justification for the selection of the research design was also explained in the chapter. As well as, the chapter identified the context of the study, the target population, sampling methods and sample size. Besides, the chapter described the analysis procedures employed in the quantitative approach. This chapter, finally, addressed the ethical considerations.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Analysis

This study applied hierarchical multiple linear regression to reveal the factors affecting both main and extended technology acceptance model (TAM) components, the main purpose of this analysis is to reveal the accounted variance and the coefficient of each predictor variables in a linear model by using a block of variables. In hierarchical multiple linear regression, several predictor variables were examined their impact on a predicted variable. Typically, such blocks are defined theoretically. In the present analysis, TAM related predictors were included in the first blocks, and the contributing factors were included in the second blocks. Each component of TAM was assigned as a predicted variable, and the factors were included as a predictor variable. In the current analysis, a stepwise model was chosen to eliminate factors that are unable to explain the TAM components significantly. Once all the components were analyzed, there were remaining factors for each component that did not achieve an effective impact. In the second phase of the analysis, all significant factors affecting each TAM components were combined into a comprehensive structural equation model. The estimations that did not yield a significant result were excluded from the model. The model has been iterated five times to access a good model fit. After obtaining the final form, a specific mediations were performed as suggested by Gaskin and Lim [207]. Especially, the mediations impacting BI and AU were examined. The TAM components used as predictors in the first blocks are listed with their corresponding predicted variables of listing below table:

Table 0.1 TAM Predictors

Predicted	AU	BI	Attitude	PU	PEOU
Predictor	• BI	• PU • PEOU • Trust • Attitude	• PU • PEOU	• PEOU • Trust • Anxiety • PR	• Trust • Anxiety • PR

The factors or predictors variables used as the second blocks in the analyses of TAM components are listed below:

1. Age
2. Gender
3. Education level
4. Using an external drive
5. Perceived knowledge level related to cloud computing
6. Opinion about cloud computing is a topic that should be offered as a university core course.
7. Opinion about cloud computing will be the next Revolution in IT technology.
8. The reason why cloud computing is being used:
 - 8.1. Perforce at university
 - 8.2. Voluntary personally
 - 8.3. Just to figure out its capability
9. Motives for using cloud computing
 - 9.1. Lower costs (Saving money through lower total costs)
 - 9.2. Elasticity (The ability to grow and shrink capacity on demand)
 - 9.3. Security (Access to a cloud is secure)
 - 9.4. A large set of services (Cloud providers offering additional services such as message busses, mailing and payment systems, image manipulation, and large-scale storage)
 - 9.5. Just like cloud (Generally positive feeling about using computing)
 - 9.6. Updates (Updates and security settings can be speedily rolled out or modified)
 - 9.7. Accessibility (Easier to control access from anywhere at any time using any smart device)

- 9.8. Learning new skills (Improving IT skills with available cloud computing technologies tools)
- 10. Concerns for using cloud computing
 - 10.1.Data privacy (Fears about leaking information when someone else manages it)
 - 10.2.High costs (Higher total cost of recurring utility bills)
 - 10.3.Availability (information anywhere anytime)
 - 10.4.Just do not like it (A general feeling of danger about cloud computing)
- 11. Cultural and contextual issues
 - 11.1.Language problems while using technology considered as a barrier in adopting cloud computing.
 - 11.2.Some services in cloud computing do not support Arabic language.
 - 11.3.Lack of laws to organize and keep Islamic boundaries while using cloud.
 - 11.4.Internet speed issues affect the intention to use cloud computing.
- 12. Perceived speed of cloud computing
- 13. Perceived cost of cloud computing
- 14. Social Influence to use cloud computing

4.2 Answering the study questions

Many steps were taken in order to address the questions. The first step was to conduct a comprehensive literature review to identify the factors that could potentially affect the adoption of cloud computing generally and in emerging countries specifically. The existing theories were reviewed, and the TAM model was found to match most of the selected factors. TAM was extended with Hofstede's theory to cover the cultural context. As a second step, the conceptual model was developed, and the factors were taken from previous studies. Then, such factors were combined into one study. The third step involved conducting the quantitative stage by distributing the survey questionnaire to universities groups throughout the internet by using google forms. The fourth step involved analyzing data throughout the study procedures. The suggested model was empirically examined the relationship between the variables. The quantitative results showed which factors encourage the uptake of cloud computing and which discourage it, which can be correlated with the categories in the following questions:

- What are the factors (concerns, motives, cost, speed, social influence, cultural and contextual issues, and using external storage) explaining TAM components?

4.3 Actual use (AU)

A hierarchical multiple linear regression revealed a significant model, $F(6, 413) = 46.452$, $p < .001$. The coefficients that explained AU significantly are illustrated in the following table. The accounted variance was 40.3%.

Table 0.2 Predictors affecting AU

Model	Unstandardized Coefficients		β	t	Collinearity Statistics	
	B	SE			Tolerance	VIF
Constant	2.290	.539		4,248**		
BI	.337	.028	,506	12,178**	,839	1,192
Perceived speed of CC	.059	.016	,145	3,637**	,907	1,103
Opinion about CC is a topic that should be offered as a university core course	.202	.075	,111	2,701**	,857	1,167
Lack of laws to organize and keep Islamic boundaries while using cloud	.134	.049	,109	2,747**	,912	1,096
Using an external drive	-.319	.125	-,099	-2,558*	,964	1,038
Internet speed issues	-.125	.062	-,080	-2,025*	,925	1,081
Note. $R = .635$, $R^2 = .403$, Adjusted $R^2 = .394$						
* $p < .05$, ** $p < .01$						

Behavioral Intention (BI) was the most influential TAM variable that positively impact actual use (AU) in the model. The perceived speed of cloud computing was the most influential factor after (BI). Using an external drive and internet speed issues were negatively impacting (AU) of cloud computing. The rest of the variables impacted actual use positively. Other factors that did not show a significant impact were eliminated from the table.

4.4 Behavioral intention (BI)

A hierarchical multiple linear regression revealed a significant model, $F(5, 414) = 81.550$, $p < .001$. The coefficients explained BI significantly are illustrated in the following table. The accounted variance was 49.6%.

Table 0.3 Predictors affecting BI

Model	Unstandardized Coefficients		β	t	Collinearity Statistics	
	B	SE			Tolerance	VIF
(Constant)	,925	,738		1,254		
Attitude	,376	,036	,477	10,432**	,583	1,715
PU	,169	,035	,218	4,897**	,614	1,630
Accessibility (Easier to control access from anywhere at any time using any smart device)	,327	,101	,117	3,244**	,941	1,063
Just do not like it (A general feeling of danger about cloud computing)	-,183	,058	-,114	-3,135**	,926	1,080
Social Influence to use cloud computing	,074	,032	,087	2,326*	,871	1,148
Note. $R = .704$, $R^2 = .496$, Adjusted $R^2 = .490$						
* $p < .05$, ** $p < .01$						

Attitude (ATT) was the most influential TAM variable that had a significant positive impact on behavioral intention (BI) to use cloud computing in the model. Followed by perceived usefulness (PU). The least influential factor was social influence (SI). A general feeling of danger about cloud computing was negatively impacting behavioral intention (BI). The rest of the variables impacted (BI) positively. Other variables that did not have a major effect were excluded from the table.

4.5 Attitude (ATT)

A hierarchical multiple linear regression revealed a significant model, $F(8, 411) = 54.368$, $p < .001$. The coefficients explained Attitude significantly are illustrated in the following table. The accounted variance was 51.4%.

Table 0.4 Predictors affecting ATT

Model	Unstandardized Coefficients		β	t	Collinearity Statistics	
	B	SE			Tolerance	VIF
Constant	-,500	1,065		-,469		
PU	,346	,043	,352	8,092**	,625	1,601
PEOU	,250	,032	,334	7,839*	,651	1,536
Opinion about CC is a topic that should be offered as a university core course.	,436	,134	,126	3,258*	,796	1,256
Lack of laws to organize and keep Islamic boundaries while using cloud computing	,264	,090	,113	2,927**	,790	1,266
Internet speed issues affect the intention to use CC	-,256	,105	-,086	-2,433**	,954	1,048
Accessibility (Easier to control access from anywhere at any time using any smart device)	,305	,128	,086	2,388*	,916	1,091
Social Influence	,094	,041	,087	2,307*		
Just do not like it (A general feeling of danger about CC)	-,170	,077	-,083	-2,209**	,834	1,199
Note. $R = .717$, $R^2 = .514$, Adjusted $R^2 = .505$ * $p < .05$, ** $p < .01$						

Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) were the most influential TAM variables that had a positive impact on Attitude (ATT) in the model. A general feeling of danger about cloud computing and internet speed issues were the only negative factors that impacting (ATT) significantly. The rest of the variables impacted (ATT) positively.

4.6 Perceived usefulness (PU)

A hierarchical multiple linear regression revealed a significant model, $F(8, 411) = 44.795$, $p < .001$. The coefficients explained PU significantly are illustrated in the following table. The accounted variance was 46.6%.

Table 0.5 Predictors affecting PU

Model	Unstandardized Coefficients		β	t	Collinearity Statistics	
	B	SE			Tolerance	VIF
(Constant)	6,338	,894		7,091**		
PEOU	,271	,032	,356	8,408**	,725	1,380
TR	,197	,033	,242	5,887**	,767	1,303
ANX	-,107	,030	-,169	-3,604**	,594	1,683
Opinion about CC is a topic that should be offered as a university core course.	,536	,150	,152	3,583**	,725	1,380
Opinion about CC will be the next Revolution in IT technology.	,480	,154	,132	3,120**	,728	1,373
PR	,085	,038	,107	2,237*	,565	1,771
Availability (information anywhere anytime)	,238	,099	,091	2,411*	,906	1,103
Perforce at university	,445	,203	,080	2,194*	,967	1,034
Note. $R = .682$, $R^2 = .466$, Adjusted $R^2 = .455$						
* $p < .05$, ** $p < .01$						

Perceived Ease of Use (PEOU) and Trust (TR) were the most influential TAM variables that had a positive impact on (PU) in the model. Anxiety (ANX) was the only negative factor impacting (PU) significantly. Opinion about cloud computing is a topic that should be offered as a university core course was also one of the most influential factors followed by opinion about cloud computing will be the next Revolution. The least influential factor was using cloud computing perforce at university, the remaining variables had a positive influence on the (PU).

4.7 Perceived ease of use (PEOU)

A hierarchical multiple linear regression revealed a significant model, $F(8, 411) = 29.799$, $p < .001$. The coefficients explained PEOU significantly are illustrated in the following table. The accounted variance was 36.7%.

Table 0.6 Predictors affecting PEOU

Model	Unstandardized Coefficients		β	t	Collinearity Statistics	
	B	SE			Tolerance	VIF
Constant	7,035	1,471		4,781**		
TR	,244	,048	,229	5,039**		
PR	,232	,047	,222	4,950**	,747	1,339
Perceived cost of CC	,256	,055	,204	4,644**	,876	1,141
Just like clouds (A general positive feeling about using cloud computing)	,592	,144	,172	4,111**	,763	1,311
Using an external drive	-1,019	,330	-,124	-3,092**	,801	1,248
Perceived speed of CC	,106	,047	,102	2,261*	,808	1,237
Availability (information anywhere anytime)	,343	,140	,100	2,456*	,953	1,049
Language problems while using cloud computing is considered as a barrier in adopting CC.	,299	,130	,100	2,293*	,925	1,082
Note. $R = .606$, $R^2 = .367$, Adjusted $R^2 = .355$						
* $p < .05$, ** $p < .01$						

Trust (TR), Perceived Risk (PR), Perceived Cost of Usage (PCU) and A general positive feeling about using cloud computing were the most influential TAM variables in the model. The least influential factors were language problems and Availability (information anywhere anytime). Using an external drive was the only negative factor that impacting (PEOU) significantly. The remaining variables had a positive impact on the (PEOU).

➤ **What are the factors (concerns, motives, cost, speed, social influence, cultural and contextual issues, and using external storage) explaining Trust of the cloud computing?**

A hierarchical multiple linear regression revealed a significant model, $F(7, 412) = 24.234$, $p < .001$. The coefficients explained Trust significantly are illustrated in the following table. The accounted variance was 29.2%.

Table 0.7 Factors that explain Trust of cloud computing

Model	Unstandardized Coefficients		β	t	Collinearity Statistics	
	B	SE			Tolerance	VIF
Constant	-,419	1,272		-,329		
Perceived cost of CC	,334	,052	,284	6,366**	,865	1,156
Perceived speed of CC	,151	,047	,154	3,190**	,735	1,360
Social Influence to use CC	,199	,064	,147	3,094**	,765	1,308
High costs (Higher total cost of recurring utility bills)	,333	,139	,101	2,398*	,963	1,039
Perforce at university	,679	,285	,100	2,377*	,977	1,023
Just like clouds (A general positive feeling about using cloud computing)	,304	,143	,095	2,131*	,873	1,145
Opinion about cloud computing will be the next Revolution in IT technology.	,383	,198	,085	1,939	,886	1,129
Note. $R = .638$, $R^2 = .408$, Adjusted $R^2 = .402$						
* $p < .05$, ** $p < .01$						

Perceived Cost of Usage (PCU), Perceived Speed of Access (PSA) and Social Influence (SI) of cloud computing were the most influential factors that impacted Trust (TR) positively. The least influential factor was Opinion about cloud computing will be the next Revolution in IT technology. All remaining variables had a positive influence on the Trust (TR).

➤ **What are the factors (concerns, motives, cost, speed, social influence, cultural and contextual issues, and using external storage) explaining Anxiety of the cloud computing?**

A hierarchical multiple linear regression revealed a significant model, $F(4, 415) = 71.374$, $p < .001$. The coefficients explained Anxiety significantly are illustrated in the following table. The accounted variance was 40.8%.

Table 0.8 Factors that explain Anxiety of cloud computing

Model	Unstandardized Coefficients		β	t	Collinearity Statistics	
	B	SE			Tolerance	VIF
Constant	9,399	1,206		7,796**		
Just do not like it (A general feeling of danger about cloud computing)	1,116	,137	,341	8,131**	,811	1,234
Lack of laws to organize and keep Islamic boundaries while using cloud	-,951	,164	-,255	-5,810**	,740	1,351
Language problems in using technology is considered as a barrier in adopting cloud computing.	-,546	,156	-,153	-3,501**	,748	1,336
Perceived speed of cloud computing	,180	,050	,145	3,617**	,891	1,123
Note. $R = .540$, $R^2 = .292$, Adjusted $R^2 = .280$ * $p < .05$, ** $p < .01$						

A general feeling of danger about cloud computing was the most influential factor that has been shown to increase the feeling of Anxiety. The least influential factor was perceived speed of cloud computing. Lack of laws to organize and keep Islamic boundaries while using cloud and language problems in using technology. Both variables have not shown any obstacle to the adoption of cloud computing as they had negative impacts on Anxiety, which meant that it would reduce (ANX).

➤ **What are the factors (concerns, motives, cost, speed, social influence, cultural and contextual issues, and using external storage) explaining the Perceived Risk of the cloud computing?**

A hierarchical multiple linear regression revealed a significant model, $F(8, 411) = 26.411$, $p < .001$. The coefficients explained PR significantly are illustrated in the following table. The accounted variance was 34.0%.

Table 0.9 Factors that explain Perceived risk of cloud computing

Model	Unstandardized Coefficients		β	t	Collinearity Statistics	
	B	SE			Tolerance	VIF
Constant	8,294	1,439		5,763**		
Just do not like it (A general feeling of danger about clouds)	,724	,117	,277	6,203**	,808	1,238
Language problems in using technology is considered as a barrier in adopting cloud computing.	-,618	,126	-,216	-4,913**	,830	1,206
Social influence	,209	,064	,151	3,261**	,745	1,342
Availability (information anywhere anytime)	,325	,140	,099	2,319*	,876	1,142
Perceived cost of CC	-,132	,051	-,110	-2,614**	,905	1,105
Perceived speed of CC	,091	,047	,092	1,961	,738	1,356
Data privacy (Concerns about leaking information when someone else manages it)	,325	,154	,089	2,118*	,908	1,101
Learning new skills (Improving IT skills with available cloud computing technologies tools)	,324	,157	,089	2,068*	,872	1,147
Note. $R = .583$, $R^2 = .340$, Adjusted $R^2 = .327$						
* $p < .05$, ** $p < .01$						

A general feeling of danger about clouds was the most influential factor that has been shown to increase (PR) as it had a positive impact on (PR). Language problems in using technology and perceived cost of cloud computing have not shown any obstacle to the adoption of cloud computing as they had negative impacts on (PR), which meant that it would decrease PR.

- **Can a comprehensive model combine the factors indicated as a significant impact at previous research questions, TAM components, Trust, Anxiety, and perceived risk of CC?**

To test a comprehensive model, all variables that indicated a significant impact in the previous research questions were combined. Then, IBM SPSS AMOS 24.0 to analyze the model was utilized. Before preceding to the analysis, the researcher checked univariate and multivariate normality which is a critical assumption of SEM [208]. For variance and covariance-based analysis, kurtosis values are more critical to examine than skewness values [209]; hence, while skewness affects tests based on means, kurtosis seriously impacts variance and covariance-based tests. Due to the fact that SEM is based on covariance matrices, this led the researcher to focus on the kurtosis value. The normality assessment (both univariate and multivariate) is presented in the following table.

Table 0.10 Normality assessment of factors

Variable	min	max	skew	c.r.	kurtosis	c.r.
Infrastructure control (Inability to dictate what happens to infrastructure, who can disable it, and who ultimately controls it)	1,000	5,000	-,485	-4,059	-,353	-1,478
Just like clouds (A general positive feeling about using computing)	1,000	5,000	-,828	-6,928	,278	1,164
Data privacy (Concerns about leaking information when someone else manages it)	1,000	5,000	-1,352	-11,316	1,756	7,347
Language problems in using technology is considered as a barrier in adopting cloud computing.	1,000	5,000	,397	3,325	-,852	-3,564
COST	8,000	25,000	-,630	-5,275	,918	3,842
Using cloud Perforce at university	,000	1,000	-,191	-1,601	-1,963	-8,213

High costs (Higher total cost of recurring utility bills)	1,000	5,000	-1,575	-13,180	1,775	7,426
Opinion about cloud computing will be the next Revolution in IT technology.	1,000	5,000	-1,563	-13,074	3,034	12,690
Networking costs	1,000	5,000	,080	,667	-1,134	-4,744
Accessibility (easier to control access from anywhere at any time using any smart device)	1,000	5,000	-2,124	-17,768	4,792	20,047
Social Influence	3,000	15,000	-,187	-1,567	-,207	-,867
Lack of laws to organize and keep Islamic boundaries while using cloud considered also as a barrier.	1,000	5,000	,464	3,879	-,378	-1,582
Cloud computing is a topic which should be offered as a university core course.	1,000	5,000	-1,352	-11,311	1,975	8,262
Using USB	,000	1,000	-1,069	-8,945	-,857	-3,585
SPEED	9,000	25,000	-,177	-1,479	-,439	-1,837
PR	4,000	20,000	-,585	-4,897	,062	,259
TR	4,000	20,000	-,865	-7,239	,917	3,835
ANX	4,000	20,000	,014	,119	-,859	-3,594
PEOU	9,600	30,000	-,755	-6,314	1,479	6,188
PU	10,000	25,000	-,757	-6,336	,727	3,041
ATT	4,000	20,000	-1,069	-8,945	1,913	8,004
BI	3,000	15,000	-1,260	-10,539	2,697	11,282
AU	2,000	10,000	-1,173	-9,817	2,302	9,629
Multivariate					102,864	31,082

When the parameters presented in the table are analyzed, the multivariate normality was not obtained. Hence, kurtosis value was 102.864, and critical ratio was 31.082. Hence, West, Finch, and Curran [210] indicated that critical ratio values of kurtosis higher than seven are a sign of non-normal univariate data. Moreover, according to Byrne [211], a critical ratio value for multivariate distribution higher than five is an indication of non-normal distribution. In this circumstance, the researcher utilized bootstrapped confidence intervals to check the significance level of estimates as suggested by Byrne [211]. At the first run of seem model, there were 11 relationships generated insignificant estimates after

bootstrapping, and all of them were removed. Then, the model was run again. These relationships are presented in the following table:

Table 0.11 Insignificant relationships indicated after bootstrapping at the first run

Relationships			Estimate	Lower	Upper	p
PEOU	<---	Availability (information anywhere anytime)	0,356	0,06	0,665	0,055
PEOU	<---	Language problems in using technology is considered as a barrier in adopting cloud computing.	0,266	0,029	0,58	0,053
ATT	<---	ANX	-0,045	-0,088	0,01	0,254
ATT	<---	Internet speed issue in my country effect on my intent to use cloud computing.	-0,23	-0,413	0,006	0,107
ATT	<---	PR	0,063	0,001	0,118	0,078
ATT	<---	Social Influence	0,061	0,011	0,129	0,056
AU	<---	Internet speed issue in my country effect on my intent to use cloud computing.	-0,125	-0,244	-0,013	0,061
PR	<---	Learning new skills (Improving IT skills with available cloud computing technologies tools)	0,34	-0,084	0,61	0,161
PR	<---	Data privacy (Concerns about leaking information when someone else manages it)	0,341	0,028	0,588	0,076
TR	<---	Opinion about cloud computing will be the next Revolution in IT technology.	0,354	-0,051	0,726	0,195
TR	<---	Lack of laws to organize and keep Islamic boundaries while using cloud.	0,242	0,048	0,467	0,061

At the second run of the model, there were two relationships generated insignificant estimates; there were Perceived Cost of cloud computing on Perceived Risk ($p = .381$) and Internet speed issue in my country effect on my intent to use cloud computing on Attitude ($p = .098$). After removing these relationships, the model was run again. At the third run of the model, only one relationship was not significant. It was Lack of laws to organize and keep Islamic boundaries while using cloud on ATT. Then, the model was run once again. At the fourth run of the model no insignificant relationship was spotted.

Then, all endogenous variables are associated with each other, and another analysis (5th run) was run again. After this run, modification indices were applied. The errors between ATT and PR were correlated. Once again, the analysis was run. Then, the regressions were added model with the guidance of modification indices. They were Language problems in using technology is considered as a barrier in adopting cloud computing, Availability, Lack of laws to organize and keep Islamic boundaries while using cloud, and a general feeling of danger about clouds on PR. There were significant. After all of these modifications, a good model fit have obtained, and the values are presented in the following table.

Table 0.12 Fit values for the comprehensive model

Fit Index	Initial Model Value	Criteria for Perfect Fit	Resource
χ^2 (df)	186.368 df = 103 p < .01	Low χ^2 value and p > .05	[212]
χ^2 /df	1.809 (df = 5)	χ^2 /df < 3	[213, 214]
RMSEA	.044	RMSEA < .05	[215, 216]
SRMR	.0349	SRMR ≤ .05	[217, 218]
GFI	.964	.95 ≤ GFI ≤ 1	[214, 219]
AGFI	.905	.85 ≤ AGF I ≤ 1	[214]
CFI	.889	.97 ≤ CFI ≤ 1	[215]
IFI	.970	.95 ≤ IFI ≤ .95	[219]
NNFI	.936	.97 ≤ NNFI ≤ 1	[215, 220]
AIC	Default model: 532.368 Saturated Mode: 552.000 Independence Model:2969.928	Default model should be the lowest values among others	[221]

The estimates of each endogenous variables on exogenous variables are presented in the following table.

Table 0.13 Estimates of the fit comprehensive model

Parameters			Unstandardized Estimate	β	S.E.	C.R.	P
TR	<---	Perceived cost of CC	0,352	0,300	0,051	6,862	0.000
TR	<---	Perceived speed of CC	0,158	0,162	0,047	3,384	0.000
TR	<---	Social Influence to use CC	0,207	0,153	0,064	3,252	0,001
TR	<---	Perforce at university	0,723	0,106	0,283	2,55	0,011
TR	<---	High costs (Higher total cost of recurring utility bills)	0,347	0,106	0,138	2,515	0,012
TR	<---	Just like clouds (Generally positive feeling about cc)	0,334	0,104	0,141	2,363	0,018
ANX	<---	Just do not like it (A general feeling of danger about clouds)	1,164	0,359	0,135	8,599	0.000
ANX	<---	Lack of laws to organize and keep Islamic boundaries while using cloud.	-0,839	-0,227	0,145	-5,792	0.000
ANX	<---	Language problems in using	-0,608	-0,172	0,153	-3,987	0.000

		technology is considered as a barrier in adopting cloud computing.					
PR	<---	Just do not like it (A general feeling of danger about clouds)	0,777	0,297	0,115	6,769	0.000
PR	<---	Language problems in using technology is considered as a barrier in adopting cloud computing.	-0,676	-0,237	0,124	-5,439	0.000
PR	<---	Availability (information anywhere anytime)	0,429	0,131	0,122	3,529	0.000
PR	<---	Data privacy (Concerns about leaking information when someone else manages it)	0,421	0,116	0,137	3,084	0,002
PEOU	<---	TR	0,267	0,250	0,047	5,666	0.000
PEOU	<---	PR	0,243	0,231	0,042	5,73	0.000
PEOU	<---	Perceived cost of CC	0,257	0,204	0,055	4,698	0.000
PEOU	<---	Just like clouds (Generally positive feeling about using computing)	0,679	0,197	0,143	4,749	0.000

PEOU	<---	Using an external drive	-1,176	-0,143	0,327	-3,591	0.000
PU	<---	PEOU	0,271	0,364	0,031	8,684	0.000
PU	<---	TR	0,197	0,247	0,033	6,039	0.000
PU	<---	ANX	-0,107	-0,170	0,029	-3,685	0.000
PU	<---	Opinion about CC will be the next Revolution in IT technology.	0,48	0,134	0,151	3,177	0,001
PU	<---	Opinion about CC is a topic that should be offered as a university core course.	0,536	0,155	0,147	3,653	0.000
PU	<---	PR	0,085	0,109	0,037	2,276	0,023
PU	<---	Perforce at university	0,445	0,082	0,2	2,221	0,026
ATT	<---	Just do not like it (A general feeling of danger about clouds)	-0,225	-0,112	0,072	-3,12	0,002
ATT	<---	Opinion about CC is a topic that should be offered as a university core course.	0,364	0,107	0,128	2,843	0,004
ATT	<---	Accessibility (Easier to control access from anywhere at any time using any smart device)	0,367	0,105	0,126	2,921	0,003

ATT	<---	PU	0,324	0,329	0,044	7,336	0.000
ATT	<---	PEOU	0,231	0,316	0,031	7,396	0.000
ATT	<---	TR	0,112	0,143	0,032	3,534	0.000
BI	<---	ATT	0,376	0,476	0,036	10,574	0.000
BI	<---	PU	0,169	0,218	0,035	4,874	0.000
BI	<---	Accessibility (Easier to control access from anywhere at any time using any smart device)	0,327	0,119	0,1	3,274	0,001
BI	<---	Just do not like it (A general feeling of danger about clouds)	-0,183	-0,116	0,058	-3,157	0,002
BI	<---	Social Influence to use CC	0,074	0,088	0,031	2,368	0,018
AU	<---	BI	0,346	0,517	0,027	12,904	0.000
AU	<---	Perceived speed of CC	0,06	0,148	0,016	3,716	0.000
AU	<---	Opinion about CC is a topic that should be offered as a university core course.	0,207	0,115	0,073	2,835	0,005
AU	<---	Lack of laws to organize and keep Islamic boundaries while using cloud.	0,123	0,101	0,048	2,547	0,011
AU	<---	Using an external drive	-0,282	-0,089	0,123	-2,284	0,022

Perceived Usefulness (PU) has been shown to have a positive influence on Attitude (ATT) and Behavior Intention (BI), Perceived Ease of Use (PEOU) it was proven to have a positive impact on Perceived Usefulness (PU) and Attitude (ATT), (ATT) it's been proven to have a positive influence on Behavior Intention (BI). As well as Behavior intention (BI) also was proven to have a positive influence on Actual Use (AU). As for the (BI) has a positive impact on (AU). Trust (TR) has been shown to have a positive influence on the (PU), (PEOU) and (ATT). Anxiety (ANX) has a negative impact on Perceived Usefulness (PU), but there was no observable impact on (PEOU). Perceived Risks (PR) has a positive effect on Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Perceived Cost of Usage (PCU) has been proven to have a positive impact on the (PEOU) and (TR). Perceived Speed of Access (PSA) has been shown to have a positive influence on the (AU) and (TR). Social Influence (SI) has proved a positive impact on trust (TR) and (BI). Perceived Benefits or motives (PB), specially, A general positive feeling about the cloud computing has been shown to have a significant positive impact on (PEOU) and (TR). As well as accessibility (Easier to control access from anywhere at any time using any smart device) it was also one of the (PB) that has been proven to have a positive impact on (BI) and (ATT), In contrast with the general negative feeling toward the cloud which is one of the (Perceived Overall Concerns (POC)) that has been shown to have a negative impact on attitude (ATT) and (BI), as well has a positive impact on perceived risk (PR) and anxiety (ANX) that's mean it will increase the feeling of anxiety and perceived risk. Along with, high costs (Higher total cost of recurring utility bills) as it's also one of the (POC) but, it has been shown to have a positive impact on (TR). Not only that, as a part of (POC), Availability (information anywhere anytime) and Data privacy (Concerns about leaking information when someone else manages it) were both proven to have a significant impact on perceived risk (PR). Cultural Context Issues (CCI) specifically, language problems in using technology, revealed a strong negative impact on anxiety (ANX) and perceived risk (PR) which implies it will decrease the feeling of (ANX) and (PR). Besides, as a part of (CCI), lack of laws to organize and keep Islamic boundaries while using the cloud, it also has proven to have a negative impact on (ANX) as well a positive impact on (AU). Using External storage (ES) cannot be neglected as it demonstrated a significant negative impact on perceived Ease of Use (PEOU) and actual

use (AU). The factor about the reason why cloud computing is being used, especially, performance at university has been observed to have a positive influence on (PU) and (TR). Opinion about cloud computing is a topic that should be offered as a university core course has been shown to have a significant impact on (PU), (ATT) and (AU). Finally, opinion about cloud computing will be the next revolution in IT technology, it has been demonstrated to have a positive influence on (PU).

➤ **If the comprehensive model is viable, can any mediation or moderation associations be indicated in the model?**

TAM is also proposing possible mediations and moderation among variables. For that purpose, the researcher checked the specific mediation impact suggested by Gaskin and Lim [207]. Indirect effects were estimated using the bootstrapping technique and illustrated in the following table. Specifically all possible mediations were listed in APPENDIX X.

Table 0.14 Indirect effects of factors on TAM components

	High costs (Higher total cost of recurring utility bills)	Just like clouds (Generally positive feeling about using computing)	Data privacy (Concerns about leaking information when someone else manages it)	Language problems in using technology is considered as a barrier in adopting cloud computing.	Perforce at university	Availability (information anywhere anytime)	Opinion about CC will be the next Revolution in IT technology	Just do not like it (A general feeling of danger about clouds)	Accessibility (Easier to control access from anywhere at any time using any smart device)	Lack of laws to organize and keep Islamic boundaries while using cloud.	Opinion about CC is a topic that should be offered as a university core course.
PR	-	-	-	-	-	-	-	-	-	-	-
TR	-	-	-	-	-	-	-	-	-	-	-
ANX	-	-	-	-	-	-	-	-	-	-	-
PEOU	.093**	.089*	.102**	-.164*	.193**	.104*	-	.189*	-	-	-
PU	.094**	.274*	.064**	-.037	.195**	.065**	-	-.007	-	.090**	-
ATT	.091*	.304*	.044*	-.050*	.333**	.122**	.155**	.041*	-	.029**	.173**
BI	.050*	.160*	.027**	-.025*	.233**	.097**	.140**	-.070*	.138*	.026**	.292*
AU	.017**	.055*	.009**	-.009*	.081**	.034**	.048**	-.088**	.161**	.009**	.101**
Note. Dashes indicate zero value. * p < .05, ** p < .01											

	Perceived cost of CC	Social Influence	Using an external drive	Perceived speed of CC	PR	TR	ANX	PEOU	PU	ATT	BI
PR	-	-	-	-	-	-	-	-	-	-	-
TR	-	-	-	-	-	-	-	-	-	-	-
ANX	-	-	-	-	-	-	-	-	-	-	-
PEOU	.094**	.098**	-	.042**	-	-	-	-	-	-	-
PU	.165*	.082**	-.318*	.028	.066*	.072**	-	-	-	-	-
ATT	.174*	.073**	-.375*	.037*	.105**	.149**	-.035**	.088*	-	-	-
BI	.093**	.041**	-.195*	.018*	.065**	.144**	-.031**	.166*	.122**	-	-
AU	.032**	.040**	-.067*	.006*	.022**	.050**	-.011**	.057**	.101**	.130*	-
Note. Dashes indicate zero value. * p < .05, ** p < .01											

Except for Language problems in using technology is considered as a barrier in adopting cloud computing, just do not like it (A general feeling of danger about clouds), and the Perceived speed of cloud computing on PU, the rest of indirect effects were significant. This result indicates that TAM components were mediated by the impact of factors found significant in the model on BI and AU.

➤ **What are the underlying reasons for not using the cloud computing?**

The participants (n = 92) stated that they have never used cloud computing were asked to state their reasons for not using. The following table illustrates the frequency distribution of their answers.

Table 0.15 The reasons for not using cloud computing

	1 Strongly disagree	2 Disagree	3 Undecided	4 Agree	5 Strongly agree
1. I do not trust “Cloud Computing”	7 7,6%	11 12,0%	25 27,2%	35 38,0%	14 15,2%
2. I do not know exactly what I can do with “Cloud Computing”	10 10,9%	23 25,0%	27 29,3%	23 25,0%	9 9,8%
3. I do not have access to high speed internet to be able to use “Cloud Computing”	1 1,1%	8 8,7%	9 9,8%	36 39,1%	38 41,3%
4. Using “Cloud Computing” is not popular	4 4,3%	15 16,3%	16 17,4%	46 50,0%	11 12,0%
5. Not sure about its future that can be succeed or fail	10 10,9%	23 25,0%	24 26,1%	29 31,5%	6 6,5%
6. I do not need “Cloud Computing”	5 5,4%	20 21,7%	26 28,3%	25 27,2%	16 17,4%
7. Honestly, I have never thought about using or not using “Cloud Computing”	8 8,7%	22 23,9%	25 27,2%	29 31,5%	8 8,7%
8. I do not trust any of Internet-based services which may be attacked by a group of hackers to steal data.	5 5,4%	11 12,0%	25 27,2%	34 37,0%	17 18,5%

9. I always think that the owners of Internet can always control and get my data whenever they want.	1	9	21	39	22
	1,1%	9,8%	22,8%	42,4%	23,9%
10. Just do not feel OK about it (A general, suspicious feeling).	3	10	27	42	10
	3,3%	10,9%	29,3%	45,7%	10,9%

To recognize the main reasons of rejecting cloud computing or being reluctant in using it, the researcher asked this question and gave respondents the opportunities to choose the reasons. More than half of the participants stated that they do not trust cloud computing (53.2%) and they don't have access to a high-speed internet connection (80.4%). Moreover, the majority of the participants (62%) thought cloud computing was not popular. On the other hand, participants were not sure about their knowledge related to clouds, so that responses distributed evenly at the center (See Question 2). The same response pattern observed in Question 5 related to the future of cloud computing and Question 7 never thinking to use clouds. More than 75% of participants stated they do not need cloud services (Question 6). Similar to Question 1, Question 8 emphasized (53.5%) the concerns related to trust and security, especially, hacking and information thief. Question 9 was similar to Question 1 and 8; however, it focused more on privacy. Of 76.3% of participants raised it as an issue. Finally, Question 10 explained that the participants do not feel OK about using clouds (56.6%). statistics show that advertising about cloud's advantages can motivate people to learn about cloud computing and improve their knowledge in order to use the benefits of it

4.8 Discussion of Study Findings

The findings of this study can be observed as follows. First, Perceived Usefulness (PU) has been shown to have a positive influence on Attitude (ATT) and Behavior Intention (BI), which is the same as the findings of Saudi Arabia's research [151]. Second, Perceived Ease of Use (PEOU) it was proven to have a positive impact on Perceived Usefulness (PU) and Attitude (ATT), that's also match the results of the study in Saudi Arabia [151]. Third, Attitude (ATT) it's been proven to have a positive influence on Behavior Intention (BI). As well as, Behavior intention (BI) also was proven to have a positive influence on Actual Use (AU), Those also precisely in line with the results of Saudi Arabia study [151]. As for the (BI) has a positive impact on (AU) Similar results were also confirmed in a study conducted in the United Arab Emirates [150]. Forth, Trust (TR) has been shown to have a positive influence on the Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Attitude (ATT). As compared to the study of Saudi Arabia [151], which is consistent with the Trust (TR) has a significant positive impact on Perceived Ease of Use (PEOU), but it has not seen any substantial effects on Perceived Usefulness (PU) or Attitude (ATT). Fifth, current study has been proven that Anxiety (ANX) has a negative impact on Perceived Usefulness (PU), but there was no observable impact on Perceived Ease of Use (PEOU), compared to Saudi Arabia's study [151], which corresponds with the Anxiety (ANX) having major negative effects on Perceived Usefulness (PU), but varies with Perceived Ease of Use (PEOU) as it has been a negative influence too. Sixth, the results of the present study indicated that Perceived Risks (PR) has a positive effect on Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), in contrast with the Saudi Arabia study [151], which is proved that (PR) has a negative impact on (PU) and (PEOU), The researcher interpreted that even though the students knew the risks, they still wanted to use it.

Seventh, the Perceived Cost of Usage (PCU) has been proven to have a positive impact on the (PEOU) and (TR). Eighth, the Perceived Speed of Access (PSA) has been shown to have a positive influence on the (AU) and (TR). Ninth, Social Influence (SI) has proved a positive impact on trust (TR) and (BI). Tenth, Perceived Benefits or motives (PB), specially, A general positive feeling about the cloud computing has been shown to have a

significant positive impact on (PEOU) and (TR). As well as accessibility (Easier to control access from anywhere at any time using any smart device) it was also one of the (PB) that has been proven to have a positive impact on (BI) and (ATT), In contrast with the general negative feeling toward the cloud which is one of the (Perceived Overall Concerns (POC)) that has been shown to have a negative impact on attitude (ATT) and (BI), as well has a positive impact on perceived risk (PR) and anxiety (ANX) that's mean it will increase the feeling of anxiety and perceived risk. Along with, high costs (Higher total cost of recurring utility bills) as it's also one of the (POC) but, it has been shown to have a positive impact on (TR), this could be interpreted based on the culture the higher the price, the higher the quality. Not only that, as a part of (POC), Availability (information anywhere anytime) and Data privacy (Concerns about leaking information when someone else manages it) were both proven to have a significant impact on perceived risk (PR).

Eleventh, Cultural Context Issues (CCI) specifically, language problems in using technology, the researcher expected it will be considered as a barrier in adopting cloud computing but, it proved the exact opposite, as it revealed a strong negative impact on anxiety (ANX) and perceived risk (PR) which implies it will decrease the feeling of (ANX) and (PR). That could be interpreted, as the questionnaire was in English and it was directed for the participants who can already speak English, therefore it's not a barrier to them to adopt cloud computing. Besides, as a part of (CCI), lack of laws to organize and keep Islamic boundaries while using the cloud, it also has proven to have a negative impact on (ANX) as well a positive impact on (AU), the rational justification for this, even though religion is a crucial cultural factor and a reliable marker in both global and regional political conflicts. it's also plays a major part in the lives of Arabs [198, 222]. Religion sets the basis for their values and ethical restraints. As far as the faith barrier is concerned, the implementation of modern technologies is usually opposed by certain people, since it gives access to unrestricted resources. Such uncommon access made possible by these innovations may not necessarily conform with the laws of faith. But such considerations didn't show any obstacles in the context of Iraqi culture. Twelfth, using External storage (ES) cannot be neglected as it demonstrated a significant negative impact on perceived Ease of Use (PEOU) and actual use (AU). Thirteenth, the factor about the reason why

cloud computing is being used, especially, performance at university has been observed to have a positive influence on (PU) and (TR). Fourteenth, opinion about cloud computing is a topic that should be offered as a university core course has been shown to have a significant impact on (PU), (ATT) and (AU). Finally, opinion about cloud computing will be the next revolution in IT technology, it has been demonstrated to have a positive influence on (PU). In conclusion, this comprehensive study has been shown many more correlations between such factors, since this study included extra factors from TAM based on previous different studies. This study has contributed to a more in-depth understanding of the students' intentions. It provided better insights towards the main factors that influence the students' intention to use cloud computing of the Iraqi universities. The findings have given valuable insight to colleges and students; with a clear understanding of the main variables involved, they are already in a proper position to prepare for the efficient usage of cloud computing services. Ultimately, the proposed model, including such factors, has been demonstrated to be a true predictor of user intentions, within the context of Iraq.

CHAPTER 5

CONCLUSION AND FUTURE WORK

5.1 Overview of the Study

The goal of this work was to investigate factors that affect the adoption of cloud computing technologies by Iraqi university students in order to increase their acceptance rate for such services. This would carry significant implications and feedback to decision-makers in Iraqi universities and cloud service providers so that students can easily adapt and use cloud computing technologies. One of the benefits of cloud-based technologies in education is to promote teaching, learning and research in a simple manner. This work was inspired by the lack of studies to explore factors impacting the adoption of cloud computing technologies by university students in developing countries in general and Iraq in particular. The study adopted the extended TAM model as a theoretical framework, which was modified to fit our research context. quantitative data has been collected using online student groups. As well as closed-ended questions included in the survey questionnaire as they are less time-consuming and contribute to complete and analyze them faster and was also used to clearly identify factors that could have an impact on the adoption process.

5.2 Research Contributions

This work contributes greatly to understanding the variables that influence the acceptance of cloud computing systems by university students in Iraq. This work applied the Technology Acceptance Model (TAM) for quantitative data with a view to an in-depth analysis of the research issue.

5.3 Theoretical Implications

This research contributes to a theoretical interpretation of the factors impacting the acceptance of cloud computing services by university students in Iraq. As well this is a significant contribution to knowledge that will lead researchers in understanding the factors that influence the adoption of cloud technologies by Iraqi university students, since Iraq is known to be one of the Arab countries that has little interest in the adoption of such technologies. This thesis is the first review that used modified TAM to examine and study variables that affect students' intention to use cloud computing in the context of higher education in Iraq. The first theoretical contribution is the development and validation of the conceptual model based on TAM. The second theoretical contribution is to incorporate external variables into the modified TAM model and to propose the relationship between them. Furthermore, the literature review on cloud-based adoption and the variables that affect behavioral intention to use and actual use of cloud services may help researchers in obtaining some empirical perspectives into these concepts and offer a platform for future research. On the theoretical aspect, apart from two main TAM variables, this research contains additional factors as significant factors that affect the behavioral intention to use and the actual usage of cloud computing. As well as, previous TAM-based research concentrated on the importance of perceived ease of use and perceived usefulness as core influences on the behavioral intention to use technology. likewise, the results of this study have demonstrated that both perceived usefulness (PU) and perceived ease of use (PEOU) have a significant influence on behavioral intention to utilize cloud computing.

This study adds to the current literature the resultant impacts of the TAM core factors besides the external variables on the behavioral intention and actual use of cloud computing. It also examined the interaction effect and the relationship between them. This is a valuable contribution to the existing literature on cloud computing adoption.

This research, coupled with the findings thereof, will become important since the study is the first of its kind that has extended TAM by adding additional factors, namely, perceived usefulness, perceived ease of use, attitudes, behavioral intention, perceived risk, trust, anxiety, actual use, cost of usage, speed of access, social influence, cultural context,

perceived benefits, perceived overall concerns, external storage. These significant factors derived in relevance to the adoption of cloud computing, contribute considerably to the literature on cloud computing implementation.

5.4 Practical Implications

This research has led to Cloud Computing technology adoption initiatives in higher education institutions by defining and analyzing the essential factors that affect students' intention to accept and adopt cloud computing services in Iraqi universities utilizing a modified TAM model. The factors in the proposed TAM based model were assessed using data collected by the survey questionnaire, and then the empirical findings were validated by analyzing these factors using SPSS software. The results of this study offered a detailed and in-depth overview of the factors that affect students' intention to apply cloud computing in Iraqi universities.

As a consequence, the findings of this study should be seen as a guidance for decision-makers in academic institutions in general, and in Iraq in particular, to help ensure the effective adoption of cloud technology by students. The findings would also help cloud technology providers better comprehend the factors that affect the intention of students to accept cloud technologies by Study and analyze the impact of these factors, know the relationship between them, and propose a practical framework to facilitate the process of adopting this technology according to international standards, taking into consideration the reality of Arab society. It is expected that the results of the research will help decision-makers in Iraqi universities and other Arab universities in emerging countries to identify important barriers to the application of this technology and try to overcome them in order to raise the level of universities to the modern technological level. Since when such considerations are understood, they will develop cloud technology solutions that can be utilized successfully by students.

In this research, students were positively and mainly affected by their perception of the potential benefits of cloud computing systems. Accordingly, Cloud service providers and university administration must prioritize issues that will boost students' academic success

through the use of cloud computing applications. As well as, on the grounds of the substantial effect of the adoption of cloud technologies, university administration should ensure that students are informed of the importance of cloud computing systems to study, research and other academic activities. Cloud services providers should also concentrate on apps that render cloud services simple to use, and various trust mechanisms should also be considered to increase students' intention to implement cloud computing applications. This is based on the positive influence of perception. Cloud services need to be secured so that students can safely collaborate, share their work and upload it in the cloud.

Similarly, the positive impact of perceived usefulness and perceived motivations in this study indicated that cloud apps should be designed in such a way that students felt secure and comfortable while utilizing cloud applications. The major effect of the behavioral attitude on picture indicates that universities should arrange customized seminars and workshops to promote the usage of cloud technologies for various research experiences and collaborative work in order to improve the reputation of students among their colleagues.

Finally, the considerable positive influence of expectations in this study indicates that the university should also include all the tools needed for students to utilize cloud technologies, such as the Internet, help, training classes, computer labs and other facilities.

Moreover, the results of the closed-ended questions raised major obstacles and concerns concerning the acceptance of cloud apps by students besides the significant factors described in the study. Decision-makers in Iraq and cloud application providers should, therefore, concentrate on barriers and concerns for colleges to improve the rate of student adoption of cloud computing apps.

5.5 Limitations and Future Research Directions

This study has certain limitations just like every other research. First, this work is limited to the application of extended TAM for the adoption of cloud computing. Future research can merge TAM and its extensions with other models such as TOE (Technology

Organization Environment) and DOI (Diffusion of Innovation) to recognize further constructs and provide a deeper view of cloud computing adoption. Consequently, more studies should be conducted to identify and examine other factors that have an impact on the adoption of cloud computing applications by university students.

Second, this work looked into students' views and attitudes regarding the adoption of cloud technologies through gathering data via an electronic questionnaire due to the circumstances and limited allocated time thus it might not a true representation of the suitable population. Therefore, in the future, there is a need to examine the behavioral intention and investigate such factors at different times and in different ways to collect data in order to obtain an in-depth understanding of the phenomena and to explore whether there is any change in the behavioral intention or use of cloud computing by university students.

Third, the search was conducted by certain student groups on Facebook as it was impossible to survey the whole population of Iraqi universities, due to time, critical situations and resource constraints. Therefore, more studies should be undertaken in the future to include all Iraqi institutions in order to render the results further comprehensive.

Eventually, Cloud computing services adoption by students at Iraqi universities are still at an early stage, so there is a shortage of studies conducted to define variables impacting the acceptance of Cloud technologies by students at Iraqi universities. Therefore, future studies, interviews and questionnaire surveys with students from different Iraqi universities should be undertaken in order to investigate and analyze new variables that may affect the adoption of cloud computing, this may contribute to a generalization of results or to the identification of certain factors that exist only in certain universities. furthermore, the perception of students, decision-makers, managerial, IT and other related personnel at Iraqi universities should be examined as they are assumed to play a significant role in the effective adoption and usage of cloud computing services.

5.6 Conclusion

Cloud Computing is an evolving concept that aims to offer a range of cloud services in a way not previously encountered. This is anticipated that this technology will continue to develop in both the public and private sectors. However, to increase the competitiveness of students in the education sector, it is the duty of educational establishments to ensure that their students are prepared with the awareness of this increasingly sought-after technology. Furthermore, in order to ensure the quality of the system implementation, it is vital for universities to investigate which variables play a significant role in motivating students to consider cloud computing as part of their curriculum. In view of this, this thesis concentrates on the user acceptance of cloud computing regarding behavioral intention to use and actual use of cloud services in Iraqi higher education institutions by employing a quantitative process methodology including data collection and analysis. The suggested model is reviewed and validated using a questionnaire survey designed on the basis of the proposed model. The measurement scales for all factors have been taken from the prior studies. Data were collected electronically from Iraqi students' university groups. The findings of this study indicate that all these variables, Perceived usefulness, Perceived ease of use, Trust, Attitude, Behavioral intention, Perceived speed of access, Perceived cost of usage, Social influence and Perceived benefits are factors that play a significant role in motivating students to adopt cloud computing as part of their core curriculum. On the contrary, factors such as Anxiety, Perceived risk, perceived overall concern, Cultural Context and Using External storage It has proven to have a negative impact on the student's intention to adopt cloud computing. Such considerations play a significant role in preventing students from embracing cloud computing as part of their education. In conclusion, this research has led to a greater comprehension of the students' intention to use cloud computing at Iraqi universities. This offered deeper insight into the key factors that affect students' decision to accept and use cloud computing services.

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APPENDIX A: INFORMATION SHEET

CLOUD COMPUTING

STUDY TITLE: FACTORS AFFECTING THE INTENTION OF ADOPTING CLOUD COMPUTING AMONG COLLEGE STUDENTS IN IRAQ.

INVESTIGATOR: ESTABRAQ ABBAS FADHIL, INFORMATION SYSTEMS ENGINEERING DEPARTMENT, ATILIM UNIVERSITY.

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STATEMENT

You are invited to participate in a research study about FACTORS AFFECTING THE INTENTION OF ADOPTING CLOUD COMPUTING AMONG COLLEGE STUDENTS IN IRAQ. If you agree to be part of the research study, you will be asked for your opinion about the cloud computing, as well as how you feel about the use of this technology, its (importance, risks, advantages and determine the main factors affecting adopting cloud computing in your country.)

What is the purpose of this study?

- ☐ The purpose of this study is to figure out why cloud computing still in an immature stage in Iraq, thus knowing the most important factors affecting the intention of adopting cloud computing.

What will I do in this study?

- ☐ If you decide to participate in my project, you will complete a short survey and return it through the link.

How long will it take me to do this?

- ☐ This online survey should take about [20 to 30] minutes to complete.

Are there any risks of participating in the study?

- ☐ There are no known risks or discomforts associated with this study the result which will be obtained may eventually aid to identify the main obstacles that facing college students from applying cloud computing technology in their daily life.

What are the benefits of participating in the study?

- ☐ There is no promise that you will receive a direct benefit from taking part in this study. But your participation in this study may help to share the project results with the administration in order to influence change so, it's a benefit. As well as providing a copy of the project results to participants upon request is a benefit.

Will anyone know what I do or say in this study (Confidentiality)?

- ☐ Participation is voluntary, and responses will be kept anonymous. I guarantee anonymity because the responses will not appear the participant's identities.

You are free to refuse to participate in this research project or to withdraw your consent and discontinue participation in the project at any time without penalty or loss of benefits to which you are otherwise entitled. Your participation will not affect your relationship with the institutions involved in this project. Submission of the survey will be interpreted as your informed consent to participate and that you affirm that you are at least 18 years of age.

If you have any questions about the research, please contact the principal investigator,
[ESTABRAQ ABBAS FADHIL], via email at [esta955@gmail.com]
OR the faculty advisor Dr. [SACIP TOKER] at [sacip.toker@atilim.edu.tr]
ATILIM UNIVERSITY / INCEK / ANKARA / TURKEY

I have read the above information and agree to participate in this research project. *

- ☐ Yes. Enter the survey
- ☐ No. Leave the survey (I'm sorry you didn't take part in this study. Thanks for trying to help. Please be advised that you can close the browser window directly and no related to you will be saved.)

APPENDIX B: A QUESTIONNAIRE

Section (1): Participants Demographics

1. Which of the categories below describes your age? *

- ☐ 18 – 24
- ☐ 25 – 34
- ☐ 35 – 44
- ☐ 45 – 54
- ☐ 55 – 64

2. Which of the categories below describes your age? *

- ☐ Female
- ☐ Male

3. What is the level of your education? *

- ☐ Bachelor degree
- ☐ Master degree
- ☐ Doctorate degree

4. Do you use a USB/flash drive to store or backup files? *

- ☐ Yes
- ☐ No

5. Are you familiar with "Cloud Computing"? *

- ☐ Yes
- ☐ No Skip to section ()

6. How do you rate your knowledge on "Cloud Computing"? *

- ☐ Very knowledgeable
- ☐ Somewhat knowledgeable
- ☐ Not very knowledgeable
- ☐ Not at all knowledgeable

7. Are you using "Cloud Computing"? *

- ☐ Yes
- ☐ No Skip to question 19

8. Where are you using "Cloud Computing"? *

- ☐ Perform at Work, university
- ☐ Voluntary Personally
- ☐ Just to figure out its capability

9. Which public "Cloud Providers" or "Cloud Services" are you using (Personally or at work)? *

- ☐ Google Apps Engine
- ☐ Amazon Web Services
- ☐ Microsoft Azure public cloud
- ☐ Dropbox
- ☐ VMware
- ☐ OpenStack
- ☐ Other:

10. What are your motivations to use "Cloud Computing"?		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Lower costs (Saving money through lower total costs)	1	2	3	4	5
2	Elasticity (The ability to grow and shrink capacity with demand)	1	2	3	4	5
3	Security (Access to a cloud is secure)	1	2	3	4	5
4	A large set of services (Cloud providers offering additional services such as message busses, mailing and payment systems, image manipulation, and large-scale storage)	1	2	3	4	5
5	Just like clouds (Generally positive feeling about using computing)	1	2	3	4	5
6	Updates (updates and security settings can be speedily rolled out or modified)	1	2	3	4	5
7	Accessibility (easier to control access from anywhere at any time using any smart device)	1	2	3	4	5
8	Learning new skills (Improving IT skills with available cloud computing technologies tools)	1	2	3	4	5

11. What are your overall concerns about Cloud Computing?		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Data privacy (Concerns about leaking information when someone else manages it)	1	2	3	4	5
2	Infrastructure control (Inability to dictate what happens to infrastructure, who can disable it, and who ultimately controls it)	1	2	3	4	5
3	High costs (Higher total cost of recurring utility bills)	1	2	3	4	5
4	Networking costs (Compared to the cost of moving bytes around, everything else is cheap. As clouds are elsewhere, networking costs will be high)	1	2	3	4	5
5	Job security (Concerns that private IT will lose its jobs to public providers)	1	2	3	4	5
6	Availability (information anywhere anytime)	1	2	3	4	5
7	Just don't like it (A general feeling of danger about clouds)	1	2	3	4	5

12. Do you agree with the following quotes?		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	"Cloud Computing will be the next Revolution in IT technology?"	1	2	3	4	5
2	Cloud computing is a topic which should be offered as a university core course.	1	2	3	4	5

13. Do you agree with the following quotes?		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	I would find cloud computing useful.	1	2	3	4	5
2	Using cloud computing would increase my efficiency.	1	2	3	4	5
3	Using cloud computing increases my productivity.	1	2	3	4	5
4	If I use cloud computing, I would accomplish my tasks more quickly.	1	2	3	4	5
5	I would find cloud computing effective for my tasks.	1	2	3	4	5
6	Learning to operate cloud computing would be easy for me.	1	2	3	4	5
7	Using cloud computing would require less mental effort.	1	2	3	4	5
8	My interaction with cloud computing would be clear and understandable.	1	2	3	4	5
9	It would be easy for me to become skillful at using cloud computing services.	1	2	3	4	5
10	In general, it is simple to use cloud computing.	1	2	3	4	5
11	Using cloud computing is a good idea.	1	2	3	4	5
12	I find using cloud computing enjoyable.	1	2	3	4	5
13	I'll keep using cloud computing in the next six months.	1	2	3	4	5
14	I expect to be a regular user of cloud computing.	1	2	3	4	5
15	I'll keep my intention to use cloud computing services in the next 6 months.	1	2	3	4	5
16	I believe the confidentiality and security of my data are not guaranteed when using cloud computing.	1	2	3	4	5
17	I am concerned about privacy in cloud computing.	1	2	3	4	5
18	I am concerned about cloud computing performance and reliability.	1	2	3	4	5
19	Overall, I consider the adoption of cloud computing to be risky.	1	2	3	4	5
20	I trust the cloud because its vendors are competent and professional.	1	2	3	4	5
21	I trust the cloud vendor because they keep my best interests in mind.	1	2	3	4	5
22	Overall, the cloud is trustworthy.	1	2	3	4	5
23	I feel worried about using cloud computing.	1	2	3	4	5
24	It scares me to think that I could lose a lot of information using cloud computing by doing any mistake.	1	2	3	4	5
25	I hesitate to use cloud computing for fear of making mistakes I cannot correct.	1	2	3	4	5
26	Cloud computing is somewhat scary to me.	1	2	3	4	5
27	I have used cloud services.	1	2	3	4	5
28	I am regularly using cloud services.	1	2	3	4	5

14. I believe that the COST of cloud computing is ...		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Inexpensive for the amount of storage provided.	1	2	3	4	5
2	less expensive than buying software applications for a laptop/PC.	1	2	3	4	5
3	Expensive compared to cost of using open source or Internet applications.	1	2	3	4	5
4	Decreases with volume, the more space you use, the cheaper it costs to buy more.	1	2	3	4	5
5	Inexpensive considering the cost of maintenance I have to spend if I use my own storage.	1	2	3	4	5

15. I believe that the SPEED of cloud computing is...		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	The same as working on files stored on a traditional laptop or PC.	1	2	3	4	5
2	Sufficient for backup and storage.	1	2	3	4	5
3	To upload/download files is the same as uploading/downloading to any other Internet website.	1	2	3	4	5
4	To work on files will mostly depend on the speed of the Internet connection being used.	1	2	3	4	5
5	Sufficient for my everyday work.	1	2	3	4	5

16. SOCIAL INFLUENCE		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	The people around me think I should use cloud computing services.	1	2	3	4	5
2	I have discussed cloud computing services with my family and friends.	1	2	3	4	5
3	I have used cloud computing services because I am influenced by my family and friends.	1	2	3	4	5

17. CULTURAL CONTEXT		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	Language problems in using technology is considered as a barrier in adopting cloud computing.	1	2	3	4	5
2	Some services in cloud computing don't support Arabic languages technology so it is considered as a barrier in adopting cloud computing.	1	2	3	4	5
3	Lack of laws to organize and keep Islamic boundaries while using cloud considered also as a barrier.	1	2	3	4	5
4	Internet speed problems in my country affect me not to adopt cloud computing.	1	2	3	4	5

18. *If you are not using "Cloud Computing", What are the reasons that you don't use "Cloud Computing"? Because,		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	I don't trust "Cloud Computing"	1	2	3	4	5
2	I don't know exactly what can I do with "Cloud Computing"	1	2	3	4	5
3	I don't have access to high speed internet to be able to use "Cloud Computing"	1	2	3	4	5
4	Using "Cloud Computing" is not popular.	1	2	3	4	5
5	Not sure about its future that can be succeed or fail.	1	2	3	4	5
6	I don't need "Cloud Computing"	1	2	3	4	5
7	Honestly, I have never thought about using or not using "Cloud Computing"	1	2	3	4	5
8	I don't trust any of Internet-based services which may be attacked by a group of hackers to steal data.	1	2	3	4	5
9	I always think that the owners of Internet can always control and get my data whenever they want.	1	2	3	4	5
10	Just don't feel OK about it (A general, suspicious feeling).	1	2	3	4	5

19. Do you have intention to use "Cloud Computing"?		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	I will use cloud computing in the next 6 months.	1	2	3	4	5
2	I intend to use cloud computing in the next 6 months.	1	2	3	4	5
3	I don't have any intention to use cloud computing.	1	2	3	4	5

APPENDIX X

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
ANX	PU	ATT					-0,035	-0,058	-0,017	-0,056**
	PU	ATT	BI				-0,013	-0,023	-0,006	-0,056***
	PU	ATT	BI	AU			-0,005	-0,008	-0,002	-0,056***
	PU	BI					-0,018	-0,031	-0,009	-0,037***
	PU	BI	AU				-0,006	-0,011	-0,003	-0,037***

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
ATT	BI	AU					0,13	0,093	0,174	0,246***

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
Data privacy (Concerns about leaking information when someone else manages it)	PR	PEOU					0,102	0,041	0,187	0,027**
	PR	PEOU	ATT				0,024	0,009	0,047	0,027**
	PR	PEOU	ATT	BI			0,009	0,003	0,019	0,027**
	PR	PEOU	ATT	BI	AU		0,003	0,001	0,007	0,027**
	PR	PEOU	PU				0,028	0,011	0,054	0,027**
	PR	PEOU	PU	ATT			0,009	0,004	0,019	0,027**
	PR	PEOU	PU	ATT	BI		0,003	0,001	0,008	0,027**
	PR	PEOU	PU	ATT	BI	AU	0,001	0	0,003	0,027**
	PR	PEOU	PU	BI			0,005	0,002	0,01	0,027**
	PR	PEOU	PU	BI	AU		0,002	0,001	0,004	0,027**
	PR	PU					0,036	0,01	0,081	0,013*
	PR	PU	ATT				0,012	0,003	0,028	0,013*
	PR	PU	ATT	BI			0,004	0,001	0,011	0,013*
	PR	PU	ATT	BI	AU		0,002	0	0,004	0,013**
	PR	PU	BI				0,006	0,002	0,015	0,013*
	PR	PU	BI	AU			0,002	0,001	0,005	0,013*

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
Opinion about CC is a topic that should be offered as a university core course.	ATT	BI					0,137	0,047	0,254	0,051*
	ATT	BI	AU				0,047	0,016	0,096	0,051**
	PU	ATT					0,173	0,088	0,287	0,051***
	PU	ATT	BI				0,065	0,034	0,11	0,051***

	PU	ATT	BI	AU			0,023	0,012	0,041	0,051***
	PU	BI					0,091	0,037	0,171	0,034***
	PU	BI	AU				0,031	0,013	0,061	0,034***

Factor	1	2	3	5	6	7	Unstandar dized Estimate	Lower	Upper	β
Accessibility (Easier to control access from anywhere at any time using any smart device)	ATT	BI					0,138	0,036	0,279	0,050*
	ATT	BI	AU				0,048	0,014	0,107	0,050*
	BI	AU					0,113	0,033	0,21	0,061*

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
High Perceived cost of CCs (Higher total Perceived cost of CC of recurring utility bills)	TR	ATT					0,039	0,014	0,081	0,015**
	TR	ATT	BI				0,015	0,006	0,033	0,015**
	TR	ATT	BI	AU			0,005	0,002	0,012	0,015**
	TR	PEOU					0,093	0,037	0,173	0,026*
	TR	PEOU	AT T				0,021	0,008	0,045	0,026**
	TR	PEOU	AT T	BI			0,008	0,003	0,018	0,026**
	TR	PEOU	AT T	BI	AU		0,003	0,001	0,007	0,026**
	TR	PEOU	PU				0,025	0,01	0,048	0,026**
	TR	PEOU	PU	AT T			0,008	0,003	0,016	0,026**
	TR	PEOU	PU	AT T	BI		0,003	0,001	0,007	0,026**
	TR	PEOU	PU	AT T	BI	AU	0,001	0	0,003	0,026**
	TR	PEOU	PU	BI			0,004	0,002	0,009	0,026**
	TR	PEOU	PU	BI	AU		0,001	0,001	0,003	0,026**
	TR	PU					0,068	0,027	0,135	0,026**
	TR	PU	AT T				0,022	0,009	0,05	0,026**
	TR	PU	AT T	BI			0,008	0,003	0,019	0,026**
	TR	PU	AT T	BI	AU		0,003	0,001	0,007	0,026**
	TR	PU	BI				0,012	0,005	0,025	0,026**
	TR	PU	BI	AU			0,004	0,002	0,009	0,026**

Factor	1	2	3	5	6	7	Unstandi zed Estimate	Lower	Upper	β
Availability (information anywhere anytime)	PR	PEOU					0,104	0,048	0,181	0,030***
	PR	PEOU	ATT				0,024	0,011	0,048	0,030***
	PR	PEOU	ATT	BI			0,009	0,004	0,018	0,030***
	PR	PEOU	ATT	BI	AU		0,003	0,001	0,007	0,030***
	PR	PEOU	PU				0,028	0,013	0,053	0,030***
	PR	PEOU	PU	ATT			0,009	0,004	0,019	0,030***
	PR	PEOU	PU	ATT	BI		0,003	0,001	0,007	0,030***
	PR	PEOU	PU	ATT	BI	AU	0,001	0	0,003	0,030***
	PR	PEOU	PU	BI			0,005	0,002	0,01	0,030***
	PR	PEOU	PU	BI	AU		0,002	0,001	0,004	0,030***
	PR	PU					0,037	0,012	0,078	0,014*
	PR	PU	ATT				0,012	0,004	0,028	0,014*
	PR	PU	ATT	BI			0,004	0,001	0,011	0,014*
	PR	PU	ATT	BI	AU		0,002	0	0,004	0,014*
	PR	PU	BI				0,006	0,002	0,015	0,014**
	PR	PU	BI	AU			0,002	0,001	0,005	0,014**
	PU	ATT					0,077	0,027	0,142	0,031*
	PU	ATT	BI				0,029	0,011	0,057	0,031**
	PU	ATT	BI	AU			0,01	0,004	0,021	0,031**
	PU	BI					0,04	0,015	0,082	0,020**
	PU	BI	AU				0,014	0,005	0,03	0,020**

Factor	1	2	3	5	6	7	Unstandi zed Estimate	Lower	Upper	β
Just do not like it (A general feeling of danger about clouds)	ANX	PU					-0,125	-0,189	-0,067	-0,061**
	ANX	PU	ATT				-0,04	-0,07	-0,02	-0,061***
	ANX	PU	ATT	BI			-0,015	-0,027	-0,007	-0,061***
	ANX	PU	ATT	BI	AU		-0,005	-0,01	-0,003	-0,061***
	ANX	PU	BI				-0,021	-0,038	-0,011	-0,061***
	ANX	PU	BI	AU			-0,007	-0,014	-0,004	-0,061***
	ATT	BI					-0,085	-0,145	-0,041	-0,053**
	ATT	BI	AU				-0,029	-0,055	-0,014	-0,053**
	BI	AU					-0,063	-0,099	-0,033	-0,060**
	PR	PEOU					0,189	0,121	0,285	0,069***
	PR	PEOU	ATT				0,044	0,024	0,074	0,069***
	PR	PEOU	ATT	BI			0,016	0,009	0,03	0,069***
	PR	PEOU	ATT	BI	AU		0,006	0,003	0,011	0,069***
	PR	PEOU	PU				0,051	0,033	0,08	0,069***
	PR	PEOU	PU	ATT			0,017	0,01	0,029	0,069***

Factor	1	2	3	5	6	7	Unstandardi zed Estimate	Lower	Upper	β
	PR	PEOU	PU	ATT	BI		0,006	0,004	0,011	0,069***
	PR	PEOU	PU	ATT	BI	AU	0,002	0,001	0,004	0,069***
	PR	PEOU	PU	BI			0,009	0,005	0,016	0,069***
	PR	PEOU	PU	BI	AU		0,003	0,002	0,006	0,069***
	PR	PU					0,066	0,019	0,12	0,032*
	PR	PU	ATT				0,021	0,006	0,044	0,032*
	PR	PU	ATT	BI			0,008	0,002	0,017	0,032*
	PR	PU	ATT	BI	AU		0,003	0,001	0,006	0,032*
	PR	PU	BI				0,011	0,004	0,024	0,032*
	PR	PU	BI	AU			0,004	0,001	0,008	0,032*

Factor	1	2	3	5	6	7	Unstandar dized Estimate	Lower	Upper	β
Perceived cost of CC	PEOU	ATT					0,059	0,036	0,094	0,065***
	PEOU	ATT	BI				0,022	0,013	0,038	0,065***
	PEOU	ATT	BI	AU			0,008	0,004	0,014	0,065***
	PEOU	PU					0,07	0,039	0,107	0,074***
	PEOU	PU	ATT				0,023	0,012	0,039	0,074***
	PEOU	PU	ATT	BI			0,008	0,004	0,015	0,074***
	PEOU	PU	ATT	BI	AU		0,003	0,001	0,006	0,074***
	PEOU	PU	BI				0,012	0,006	0,023	0,074***
	PEOU	PU	BI	AU			0,004	0,002	0,008	0,074***
	TR	ATT					0,04	0,02	0,066	0,043***
	TR	ATT	BI				0,015	0,007	0,026	0,043***
	TR	ATT	BI	AU			0,005	0,002	0,01	0,043***
	TR	PEOU					0,094	0,055	0,149	0,075***
	TR	PEOU	ATT				0,022	0,011	0,04	0,075***
	TR	PEOU	ATT	BI			0,008	0,004	0,016	0,075***
	TR	PEOU	ATT	BI	AU		0,003	0,001	0,006	0,075***
	TR	PEOU	PU				0,026	0,015	0,041	0,075***
	TR	PEOU	PU	ATT			0,008	0,005	0,015	0,075***
	TR	PEOU	PU	ATT	BI		0,003	0,002	0,006	0,075***
	TR	PEOU	PU	ATT	BI	AU	0,001	0,001	0,002	0,075***
	TR	PEOU	PU	BI			0,004	0,002	0,008	0,075***
	TR	PEOU	PU	BI	AU		0,001	0,001	0,003	0,075***
	TR	PU					0,069	0,044	0,112	0,074***
	TR	PU	ATT				0,022	0,012	0,041	0,074***
	TR	PU	ATT	BI			0,008	0,004	0,016	0,074***
	TR	PU	ATT	BI	AU		0,003	0,002	0,006	0,074***

Factor	1	2	3	5	6	7	Unstandar dized Estimate	Lower	Upper	β
	TR	PU	BI				0,012	0,006	0,021	0,074***
	TR	PU	BI	AU			0,004	0,002	0,008	0,074***

Factor	1	2	3	5	6	7	Unstandar dized Estimate	Lower	Upper	β
Language problems in using technology is considered as a barrier in adopting cloud computing.	ANX	PU					0,065	0,029	0,121	0,029***
	ANX	PU	ATT				0,021	0,008	0,043	0,029***
	ANX	PU	ATT	BI			0,008	0,003	0,017	0,029***
	ANX	PU	ATT	BI	AU		0,003	0,001	0,006	0,029***
	ANX	PU	BI				0,011	0,005	0,025	0,029***
	ANX	PU	BI	AU			0,004	0,002	0,008	0,029***
	PR	PEOU					-0,164	-0,243	-0,097	-0,055***
	PR	PEOU	ATT				-0,038	-0,065	-0,021	-0,055***
	PR	PEOU	ATT	BI			-0,014	-0,027	-0,007	-0,055***
	PR	PEOU	ATT	BI	AU		-0,005	-0,01	-0,002	-0,055***
	PR	PEOU	PU				-0,044	-0,071	-0,026	-0,055***
	PR	PEOU	PU	ATT			-0,014	-0,026	-0,008	-0,055***
	PR	PEOU	PU	ATT	BI		-0,005	-0,01	-0,003	-0,055***
	PR	PEOU	PU	ATT	BI	AU	-0,002	-0,004	-0,001	-0,055***
	PR	PEOU	PU	BI			-0,008	-0,015	-0,004	-0,055***
	PR	PEOU	PU	BI	AU		-0,003	-0,005	-0,001	-0,055***
	PR	PU					-0,058	-0,117	-0,015	-0,026*
	PR	PU	ATT				-0,019	-0,042	-0,004	-0,026*
	PR	PU	ATT	BI			-0,007	-0,016	-0,002	-0,026*
	PR	PU	ATT	BI	AU		-0,002	-0,006	-0,001	-0,026*
	PR	PU	BI				-0,01	-0,023	-0,003	-0,026*
	PR	PU	BI	AU			-0,003	-0,008	-0,001	-0,026*

Factor	1	2	3	5	6	7	Unstandar dized Estimate	Lower	Upper	β
Lack of laws to organize and keep Islamic boundaries while using cloud.	ANX	PU					0,09	0,048	0,147	0,039***
	ANX	PU	ATT				0,029	0,013	0,052	0,039***
	ANX	PU	ATT	BI			0,011	0,005	0,021	0,039***
	ANX	PU	ATT	BI	AU		0,004	0,002	0,008	0,039***
	ANX	PU	BI				0,015	0,008	0,029	0,039***
	ANX	PU	BI	AU			0,005	0,003	0,01	0,039***

Factor	1	2	3	5	6	7	Unstandi zed Estimate	Lower	Upper	β
Just like clouds (Generally positive feeling about using computing)	PEOU	ATT					0,157	0,092	0,252	0,062***
	PEOU	ATT	BI				0,059	0,034	0,101	0,062***
	PEOU	ATT	BI	AU			0,02	0,011	0,036	0,062***
	PEOU	PU					0,184	0,098	0,282	0,072***
	PEOU	PU	ATT				0,06	0,03	0,105	0,072***
	PEOU	PU	ATT	BI			0,022	0,012	0,04	0,072***
	PEOU	PU	ATT	BI	AU		0,008	0,004	0,014	0,072***
	PEOU	PU	BI				0,031	0,014	0,059	0,072***
	PEOU	PU	BI	AU			0,011	0,005	0,021	0,072***
	TR	ATT					0,038	0,011	0,082	0,015*
	TR	ATT	BI				0,014	0,004	0,032	0,015*
	TR	ATT	BI	AU			0,005	0,002	0,012	0,015*
	TR	PEOU					0,089	0,027	0,185	0,026*
	TR	PEOU	ATT				0,021	0,006	0,046	0,026*
	TR	PEOU	ATT	BI			0,008	0,002	0,019	0,026*
	TR	PEOU	ATT	BI	AU		0,003	0,001	0,007	0,026*
	TR	PEOU	PU				0,024	0,007	0,051	0,026*
	TR	PEOU	PU	ATT			0,008	0,003	0,019	0,026*
	TR	PEOU	PU	ATT	BI		0,003	0,001	0,007	0,026*
	TR	PEOU	PU	ATT	BI	AU	0,001	0	0,003	0,026*
	TR	PEOU	PU	BI			0,004	0,001	0,01	0,026*
	TR	PEOU	PU	BI	AU		0,001	0	0,003	0,026*
	TR	PU					0,066	0,019	0,133	0,026*
	TR	PU	ATT				0,021	0,006	0,05	0,026*
	TR	PU	ATT	BI			0,008	0,002	0,019	0,026*
	TR	PU	ATT	BI	AU		0,003	0,001	0,007	0,026*
	TR	PU	BI				0,011	0,003	0,026	0,026*
	TR	PU	BI	AU			0,004	0,001	0,009	0,026*

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
PU	ATT	BI					0,122	0,085	0,168	0,157***
	ATT	BI	AU				0,042	0,028	0,064	0,157***
	BI	AU					0,058	0,035	0,086	0,113***

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
PEOU	ATT	BI					0,087	0,056	0,122	0,150***
	ATT	BI	AU				0,03	0,018	0,046	0,150***
	PU	ATT					0,088	0,057	0,127	0,120***
	PU	ATT	BI				0,033	0,022	0,05	0,120***
	PU	ATT	BI	AU			0,011	0,007	0,019	0,120***
	PU	BI					0,046	0,025	0,072	0,079***
	PU	BI	AU				0,016	0,009	0,026	0,079***

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
PR	PEOU	ATT					0,056	0,033	0,086	0,073***
	PEOU	ATT	BI				0,021	0,011	0,036	0,073***
	PEOU	ATT	BI	AU			0,007	0,004	0,014	0,073***
	PEOU	PU					0,066	0,043	0,096	0,084***
	PEOU	PU	ATT				0,021	0,013	0,035	0,084***
	PEOU	PU	ATT	BI			0,008	0,005	0,014	0,084***
	PEOU	PU	ATT	BI	AU		0,003	0,002	0,005	0,084***
	PEOU	PU	BI				0,011	0,006	0,02	0,084***
	PEOU	PU	BI	AU			0,004	0,002	0,007	0,084***
	PU	ATT					0,028	0,007	0,053	0,036*
	PU	ATT	BI				0,01	0,003	0,021	0,036*
	PU	ATT	BI	AU			0,004	0,001	0,008	0,036*
	PU	BI					0,014	0,005	0,031	0,024*
	PU	BI	AU				0,005	0,002	0,011	0,024*

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
Opinion about CC will be the next Revolution in IT technology.	PU	ATT					0,155	0,071	0,267	0,044**
	PU	ATT	BI				0,058	0,026	0,107	0,044***
	PU	ATT	BI	AU			0,02	0,009	0,038	0,044***
	PU	BI					0,081	0,036	0,153	0,029***
	PU	BI	AU				0,028	0,013	0,053	0,029***

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
Using external drive	PEOU	ATT					-0,272	-0,456	-0,137	-0,045***
	PEOU	ATT	BI				-0,102	-0,184	-0,048	-0,045***
	PEOU	ATT	BI	AU			-0,035	-0,069	-0,016	-0,045***
	PEOU	PU					-0,318	-0,485	-0,152	-0,052**
	PEOU	PU	ATT				-0,103	-0,178	-0,051	-0,052***
	PEOU	PU	ATT	BI			-0,039	-0,069	-0,019	-0,052***
	PEOU	PU	ATT	BI	AU		-0,013	-0,026	-0,006	-0,052***
	PEOU	PU	BI				-0,054	-0,104	-0,025	-0,052***
	PEOU	PU	BI	AU			-0,019	-0,038	-0,008	-0,052***

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
Social influence	BI	AU					0,026	0,009	0,046	0,046*
	PR	PEOU					0,043	0,02	0,073	0,030***
	PR	PEOU	ATT				0,01	0,004	0,019	0,030***
	PR	PEOU	ATT	BI			0,004	0,002	0,008	0,030***
	PR	PEOU	ATT	BI	AU		0,001	0,001	0,003	0,030***
	PR	PEOU	PU				0,012	0,005	0,021	0,030***
	PR	PEOU	PU	ATT			0,004	0,002	0,008	0,030***
	PR	PEOU	PU	ATT	BI		0,001	0,001	0,003	0,030***
	PR	PEOU	PU	ATT	BI	AU	0	0	0,001	0,030***
	PR	PEOU	PU	BI			0,002	0,001	0,004	0,030***
	PR	PEOU	PU	BI	AU		0,001	0	0,002	0,030***
	PR	PU					0,015	0,004	0,033	0,014*
	PR	PU	ATT				0,005	0,001	0,012	0,014*
	PR	PU	ATT	BI			0,002	0	0,005	0,014*
	PR	PU	ATT	BI	AU		0,001	0	0,002	0,014*
	PR	PU	BI				0,003	0,001	0,006	0,014*

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
	PR	PU	BI	AU			0,001	0	0,002	0,014*
	TR	ATT					0,023	0,007	0,049	0,022**
	TR	ATT	BI				0,009	0,003	0,019	0,022**
	TR	ATT	BI	AU			0,003	0,001	0,007	0,022**
	TR	PEOU					0,055	0,02	0,106	0,038**
	TR	PEOU	ATT				0,013	0,005	0,028	0,038**
	TR	PEOU	ATT	BI			0,005	0,002	0,011	0,038**
	TR	PEOU	ATT	BI	AU		0,002	0,001	0,004	0,038**
	TR	PEOU	PU				0,015	0,006	0,03	0,038**
	TR	PEOU	PU	ATT			0,005	0,002	0,011	0,038**
	TR	PEOU	PU	ATT	BI		0,002	0,001	0,005	0,038**
	TR	PEOU	PU	ATT	BI	AU	0,001	0	0,002	0,038**
	TR	PEOU	PU	BI			0,003	0,001	0,006	0,038**
	TR	PEOU	PU	BI	AU		0,001	0	0,002	0,038**
	TR	PU					0,041	0,014	0,076	0,038**
	TR	PU	ATT				0,013	0,004	0,028	0,038**
	TR	PU	ATT	BI			0,005	0,002	0,011	0,038**
	TR	PU	ATT	BI	AU		0,002	0,001	0,004	0,038**
	TR	PU	BI				0,007	0,002	0,015	0,038**
	TR	PU	BI	AU			0,002	0,001	0,005	0,038**

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
Perceived speed of CC	ANX	PU					-0,015	-0,028	-0,007	-0,019**
	ANX	PU	ATT				-0,005	-0,01	-0,002	-0,019**
	ANX	PU	ATT	BI			-0,002	-0,004	-0,001	-0,019**
	ANX	PU	ATT	BI	AU		-0,001	-0,001	0	-0,019***
	ANX	PU	BI				-0,003	-0,006	-0,001	-0,019***
	ANX	PU	BI	AU			-0,001	-0,002	0	-0,019***
	TR	ATT					0,018	0,007	0,035	0,023**
	TR	ATT	BI				0,007	0,002	0,014	0,023**
	TR	ATT	BI	AU			0,002	0,001	0,005	0,023**
	TR	PEOU					0,042	0,016	0,077	0,041**
	TR	PEOU	ATT				0,01	0,003	0,02	0,041**
	TR	PEOU	ATT	BI			0,004	0,001	0,008	0,041**
	TR	PEOU	ATT	BI	AU		0,001	0	0,003	0,041**
	TR	PEOU	PU				0,011	0,005	0,022	0,041**
	TR	PEOU	PU	ATT			0,004	0,002	0,008	0,041**
	TR	PEOU	PU	ATT	BI		0,001	0,001	0,003	0,041**

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
	TR	PEOU	PU	ATT	BI	AU	0	0	0,001	0,041**
	TR	PEOU	PU	BI			0,002	0,001	0,005	0,041**
	TR	PEOU	PU	BI	AU		0,001	0	0,002	0,041**
	TR	PU					0,031	0,013	0,058	0,040**
	TR	PU	ATT				0,01	0,004	0,021	0,040**
	TR	PU	ATT	BI			0,004	0,002	0,008	0,040**
	TR	PU	ATT	BI	AU		0,001	0,001	0,003	0,040**
	TR	PU	BI				0,005	0,002	0,011	0,040**
	TR	PU	BI	AU			0,002	0,001	0,004	0,040**

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
TR	ATT	BI					0,042	0,021	0,069	0,068**
	ATT	BI	AU				0,015	0,007	0,026	0,068***
	PEOU	ATT					0,062	0,032	0,098	0,079**
	PEOU	ATT	BI				0,023	0,011	0,04	0,079***
	PEOU	ATT	BI	AU			0,008	0,004	0,015	0,079***
	PEOU	PU					0,072	0,044	0,105	0,091***
	PEOU	PU	ATT				0,023	0,014	0,038	0,091***
	PEOU	PU	ATT	BI			0,009	0,005	0,016	0,091***
	PEOU	PU	ATT	BI	AU		0,003	0,002	0,006	0,091***
	PEOU	PU	BI				0,012	0,006	0,022	0,091***
	PEOU	PU	BI	AU			0,004	0,002	0,008	0,091***
	PU	ATT					0,064	0,035	0,104	0,081***
	PU	ATT	BI				0,024	0,013	0,041	0,081***
	PU	ATT	BI	AU			0,008	0,004	0,015	0,081***
	PU	BI					0,033	0,02	0,055	0,054***
	PU	BI	AU				0,012	0,006	0,019	0,054***

Factor	1	2	3	5	6	7	Unstandardized Estimate	Lower	Upper	β
Perforce at university	PU	ATT					0,144	0,046	0,291	0,027*
	PU	ATT	BI				0,054	0,017	0,109	0,027*
	PU	ATT	BI	AU			0,019	0,006	0,039	0,027*
	PU	BI					0,075	0,025	0,157	0,018*
	PU	BI	AU				0,026	0,009	0,056	0,018*
	TR	ATT					0,081	0,027	0,174	0,015**
	TR	ATT	BI				0,031	0,01	0,069	0,015**
	TR	ATT	BI	AU			0,011	0,004	0,026	0,015**
	TR	PEOU					0,193	0,07	0,372	0,026**
	TR	PEOU	ATT				0,045	0,016	0,096	0,026**
	TR	PEOU	ATT	BI			0,017	0,006	0,04	0,026**
	TR	PEOU	ATT	BI	AU		0,006	0,002	0,015	0,026**
	TR	PEOU	PU				0,052	0,019	0,104	0,026**
	TR	PEOU	PU	ATT			0,017	0,006	0,036	0,026**
	TR	PEOU	PU	ATT	BI		0,006	0,002	0,014	0,026**
	TR	PEOU	PU	ATT	BI	AU	0,002	0,001	0,005	0,026**
	TR	PEOU	PU	BI			0,009	0,003	0,021	0,026**
	TR	PEOU	PU	BI	AU		0,003	0,001	0,007	0,026**
	TR	PU					0,142	0,059	0,267	0,026**
	TR	PU	ATT				0,046	0,018	0,101	0,026**
	TR	PU	ATT	BI			0,017	0,007	0,04	0,026**
	TR	PU	ATT	BI	AU		0,006	0,002	0,014	0,026**
	TR	PU	BI				0,024	0,01	0,052	0,026**
	TR	PU	BI	AU			0,008	0,003	0,019	0,026**