A THESIS SUBMITTED TO THE GRADUATE SCHOOL OF NATURAL

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MASTER THESIS

CLOUD COMPUTING IMPACT ON COMMUNICATION AND SERVICE SECTOR: IRAQ CASE STUDY

Sabah Salam Hussein Almafrchi

February 2018

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ABSTRACT

CLOUD COMPUTING IMPACT ON COMMUNICATION AND SERVICE SECTOR: IRAQ CASE STUDY

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Rapid advancements in technology have enhanced the significance of the use of cloud technology. The deployment of cloud computing as effective technology integration has been successful, particularly across the developed states of the world. However, there have been certain behavioural issues regarding the cloud technology activation in certain developing regions, rather than the technical limitations. In the context, the current research aims to evaluate the impact of deployment of cloud computing on the communication and service sector of Iraq. Even though the cloud computing approach seems appealing, yet certain challenges of adverse extent are encountered across the states where internet penetration and technology acceptance is not considerable. Similar is the case with Iraq; hence, the researcher has targeted the communication and service sector of Iraq with respect to assessing the deployment of cloud computing. In this regard, the constructs of UTAUT model as identified dependent and independent variables of the study have been employed, in terms of conducting a multiple-item 5-point scale online survey across 251 IT experts of the targeted domain. Resultantly, it has been established that there have been certain challenges of disregarding cloud computing as an effective measure of enhancing productivity, and efficiency of the employees in a secure and feasible manner. Therefore, the study has recommended training and awareness programs that must present the

credibility and integrity of cloud computing as an effective technological deployment.

These programs assist accepting the cloud computing technology by the employees in the communication sector, which enables the employees, as well as the organizations, providing more efficient tasks by reducing the costs and efforts needed to perform the exact same tasks without the use of cloud computing technologies. This improvement also assists other employees and organization to accept that technology, which eventually leads to more and more acceptance to the cloud computing technology in the communication and service sector.

Keywords: Cloud Computing, UTAUT, Communication Sector, Service Sector, Productivity Effectiveness

ÖZ

İLETİŞİM VE HİZMET SEKTÖRÜ'NDE BULUT BİLİŞİMİN ETKİSİ: IRAK DURUM ÇALIŞMASI

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Yüksek Lisans, Bilgisayar Mühendisliği Anabilim Dalı

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Danışman: Yrd. Doç. Dr. Sibel Tarıyan Özyer

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Teknolojideki hızlı ilerlemeler, bulut bilişimin kullanımının önemini arttırmıştır. Etkili teknoloji integrasyonu olarak bulut bilişimin yayılması, özellikle dünyanın gelişmiş devletleri üzerinde başarılı olmuştur. Ancak, teknik kısıtlamalardan ziyade, belli başlı gelişen bölgelerde bulut bilişim etkinleşmesine ilişkin bazı davranışsal sorunlar olmuştur. Bu bağlamda, mevcut araştırma, Irak'ın iletişim ve hizmet sektöründe bulut bilişimin yayılmasının etkisini değerlendirmeyi amaçlamaktadır. Bulut bilişim yaklaşımı cazip görünüyor olsa da, henüz internet yayılması ve teknoloji kabulünün çok önemli olmadığı devletlerde olumsuz boyutta belli başlı zorluklara rastlanılmaktadır. Irak'taki durum benzerdir; dolayısı ile araştırmacı, bulut bilişimin yayılmasını değerlendirme ile ilgili olarak Irak'ın iletişim ve hizmet sektörünü hedef almıştır. Bu bakımdan, çalışmanın tanımlanmış bağımlı ve bağımsız değişkenleri olarak UTAUT modelinin yapısı, hedeflenen alanın 251 BT uzmanı arasında çoklu bir 5 öçekli madde yürütülmesi açısından, çalışılmıştır. Sonuç olarak, verimliliği artırmanın etkili bir önlemi ve güvenilir ve uygulanabilir bir tutumda çalışanların yeterliliği olarak bulut bilişimi dikkate almamanın belli zorlukları olduğu saptanmıştır. Bu nedenle çalışma, etkili bir teknolojik yayılma olarak bulut bilişimin güvenirliliğini sunması gereken eğitim ve farkındalık programlarını önermiştir.

Bu programlar, bulut bilişimi kullanmaksızın kesin aynı görevleri gerçekleştirmek üzere gereken maliyet ve gayretleri azaltarak daha fazla verim sağlayarak, organizasyonun yanı sıra çalışanlara da olanak veren, iletişim sektöründe çalışanlar tarafından bulut bilişim teknolojisini kabul etmeye yardımcı olmaktadır. Bu ilerleme, ayrıca nihayetinde iletişim ve hizmet sektöründe bulut bilişim teknolojisinin kabulüne gittikçe neden olan, teknolojinin kabul edilmesinde diğer çalışanlar ve organizasyona da yardımcı olmaktadır.

Anahtar Kelimeler: Bulut Bilişim, UTAUT, İletişim Sektörü, Hizmet Sektörü, Verimlilik Etkinliği

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LIST OF ABBREVIATIONS

BI	Behavioural Intention
CaaS	Communication as a Service
EE	Efforts Expectancy
FC	Facilitating Conditions
IaaS	Infrastructure as a Service
ICT	Information and Communications Technology
NaaS	Networking as a Service
NIST	National Institute for Standards and Technology
PaaS	Platform as a Service
PE	Performance Expectancy
SaaS	Software as a Service
SAIL	Scalable and Adaptive Internet Solutions
SI	Social Influence
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
UB	User Behaviour
UTAUT	Unified Theory of Acceptance and Use of Technology
XaaS	Anything-as-a-Service

CHAPTER 1

INTRODUCTION

1.1 Introduction

This section of the research presents the significant information regarding the focus of the study. It contains the background context of the research that facilitates the understanding of the research agenda. The section also contains the conceptual framework describing the topic of the research aligned with distinctive and organised ideas. Accordingly, the section entails the defined problem statement, the research purpose, the devised research questions based on the formulated research objectives, and the adopted methodology for accomplishing the objectives of the research.

1.2 Background

The implications of Information and Communication Technologies (ICTs) have acquired increasing proficiencies with the effectiveness of cloud computing technology. Based on the significance of e-services or cloud computing, the organisations across the world have been attaining multiple benefits as new horisons are opened [1-3]. The accessibility and feasibility is enhanced with respect to the important domains of huge customer base, broadened prospects of market reach, lowered threats of entrants along with minimised cost consumption in getting new customers, increased customer services, and communication with the customers through alternative channels. Besides, the effectiveness of deploying cloud computing technology within the communicational service sector of the organisations also results in enhancing the perceived image of the firm, improving the competitive advantage, and resulting in potentially increased customer knowledge as well [4-6].

According to the study of Satyanarayana [7], the inception of cloud technology has acquired much significance among the technology related researchers and practitioners. It has been the competence of cloud technology that facilitates

both the software and hardware needs of the targeted sector. The entire service needs are facilitated with minimal capital investment, having the added benefits of minimal interaction with the service provider [7, 8, 9, 10]. It reflects the basic concept of cloud that entails the prospects of making business activities accessible from anywhere, regardless of the constraints of timing [11, 12]. Its potential has been aligned with scalability of the massive IT-related assets that are offered to the external customers as services [13].

Technical prospects of the cloud computing offer significant research potential, particularly with respect to the telecommunication needs of the society. Numerous studies have explored the technical barriers instilled within the technology of cloud that could have impacted its deployment in certain service sectors [1, 14-16]. Besides, certain other shortcomings have also been there with respect to the hardware, software, and infrastructure essentials of the business entities that are significant towards the successful deployment of cloud computing technology. Regardless of all the technical related barriers or constraints, a considerable amount of concerned knowledge data has also been presented pertaining to the behavioral side of the technology activation. It has been contended that this particular challenge has been severely effective on the activation of cloud technology within the targeted sectors [17, 18].

Considering the implications of cloud technology in the developed states across the globe, the associated benefits have been proficient in serving the needs of the consumers from distant locations regardless of time-related constraints. Even the database management concerns have also been mitigated; thus, increasing dependency over the cloud system. On the other hand, the acceptance of cloud technology within the developing states has not been worth-mentioning that is mainly due to the behavioural constraints rather than the technicalities of cloud. With respect to the technological potential of Iraqi service sectors, there is less evidence of successful activation, since the personnel involved and the potential targets are not aligned with the technological potential of cloud that eventually results in denial. Even though the use of internet and mobile services has acquired notable prominence within the commonplace, yet the extent of its acceptance is still limited as compared to other states. According to the statistics of Internet World Stats (2017), Iraq had just 37.3% penetration of internet by June 30 of 2016 (shown below). It reflects that

the technology has achieved comparative penetration; however, it cannot be regarded as being exceptional yet.

Table 1: Iraq's Technological penetration

Year	User	Population	% Pop.
2000	12.500	26.628.187	0.1%
2002	25.000	26.221.181	0.1%
2008	275.000	28.221.181	1.0%
2009	300.000	28.945.569	1.0%
2010	325.000	29.671.605	1.1%
2012	2.211.860	31.129.225	7.1%
2016	14.000.000	37.547.689	37.3%

Source: (Internet World Stats 2017)

Consequently, this particular research has intended to explore the reasons or the probable constraints or challenges that have been hindering the activation of cloud computing technology within the telecommunication sector of Iraq.

1.3 Conceptual Framework

The Technology Acceptance Model (TAM), proposed by Davis [69], aims to explain computer technologies acceptance determinants by evaluating a relatively small number of variables. The two key believes that TAM relies on are the perceived ease of use and the perceived usefulness. Where the ease of use represents the degree that the usage of the system being evaluated is expected to be effort-free, while the usefulness refers to the user's expectations of how far the usage of the system being evaluated improves the performance of the job that the user is practicing within the organization. TAM supposes that the Behavioral Intention to Use is a determinant of the technology usage and this intention to Use is a result of the technology's perceived usefulness and the user's Attitude Toward Using it.

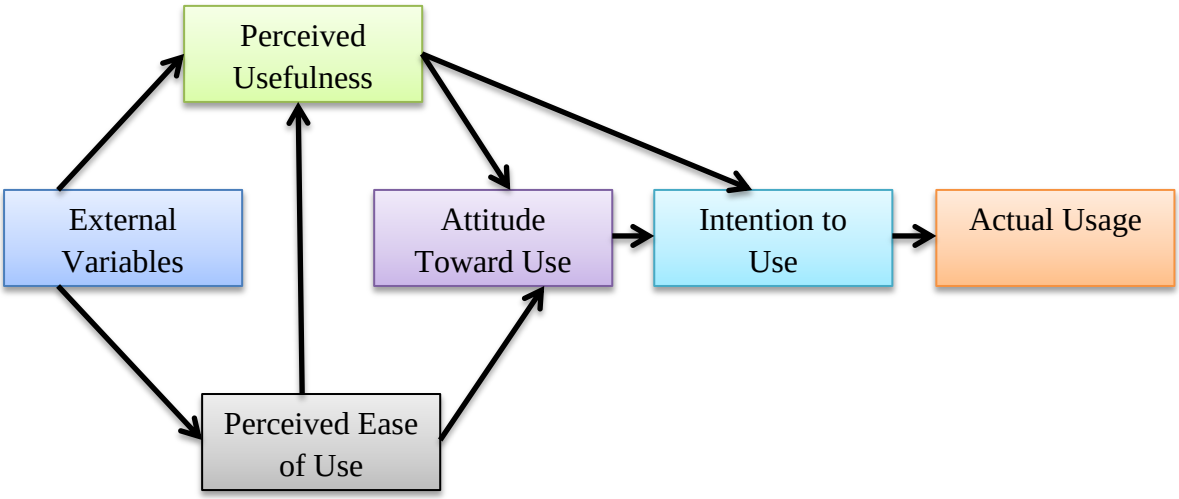

Figure 1: Technology Acceptance Model (TAM)

Furthermore, TAM2, which is an extension of the TAM, is proposed by Venkatesh [78]. This model integrates two additional processes to the basic TAM. These processes are the Cognitive Instrumental Processes and the Social Influence Processes. These processes are expected to be mandatory to evaluate the user acceptance. In this model, the perceived usefulness is determined using the four Cognitive Instrumental Processes Job Relevance, Output Quality, Result Demonstrability and Perceived Usefulness, while the user acceptance is reflected using the Social Influence Processes, which are the Subjective Norm, Voluntariness and Image.

It has been affirmed that there is a need of comprehending the key factors related to the adoption of the technology among the users. Therefore, proficient decision making needs to be there while deploying the future related technological solutions, as the successful deployment depends on the level of informed designs' potential to meet the needs of the potential users. In this regard, numerous researchers have devised the approach of TAM "Technology Acceptance Model" that facilitated the analysis of users' adoption and the intentions of adopting the technology in future in terms of usability and perceived opinions or ideas regarding

the usefulness of the technology or the respective ease of use as well [19, 20, 21, 22] Accordingly, the users' acceptance model of TAM has been facilitating the researchers of diverse fields in making informed decisions regarding the deployment of technologies in serving the needs of the consumers. However, with the passage of time, there have been certain advancements in research area that led to the formulation of UTAUT "Unified Theory of Acceptance and Use of Technology" model as the most comprehensive version of assessing the acceptance of technological interventions among the potential users [23-25].

The model of UTAUT (Figure 2) has been used as the validation gadget to capture the needs of the users along with the prospects of behavioural intention and use behaviour. UTAUT model is affirmed to entail the essentials of TAM as well, thus, incorporating the psychological perspectives of TRA "Theory of Reasoned Action". The knowledge acquisition regarding the acceptance of technology based on the behavioural aspects of the users is greatly facilitated by the Theory of reasoned action as it highlighted the assessment of the users' intentions towards adopting technology that is significantly affected by the perceived beliefs; thus, influencing the actions of the users. The researcher in this particular study has selected the UTAUT model in order to acquire considerable amount of data regarding the behaviour of the users towards cloud technology in the telecom sector of Iraq, in this thesis identified variables will be Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC) as the independent variables, and the dependent variables of Use Behaviour (UB) and Behavioural Intention (BI). In addition to these variables, the influences of gender, age, experience, and even voluntariness of the use of technology have also been assessed.

However, some social barriers may have influence on the acceptance of new technologies. The influence of these barriers may vary according to the new technology and the location where the acceptance of this technology is being evaluated. Thus, the UTAUT model includes the investigation of user variances such as age, gender, user experience and education [80, 81].

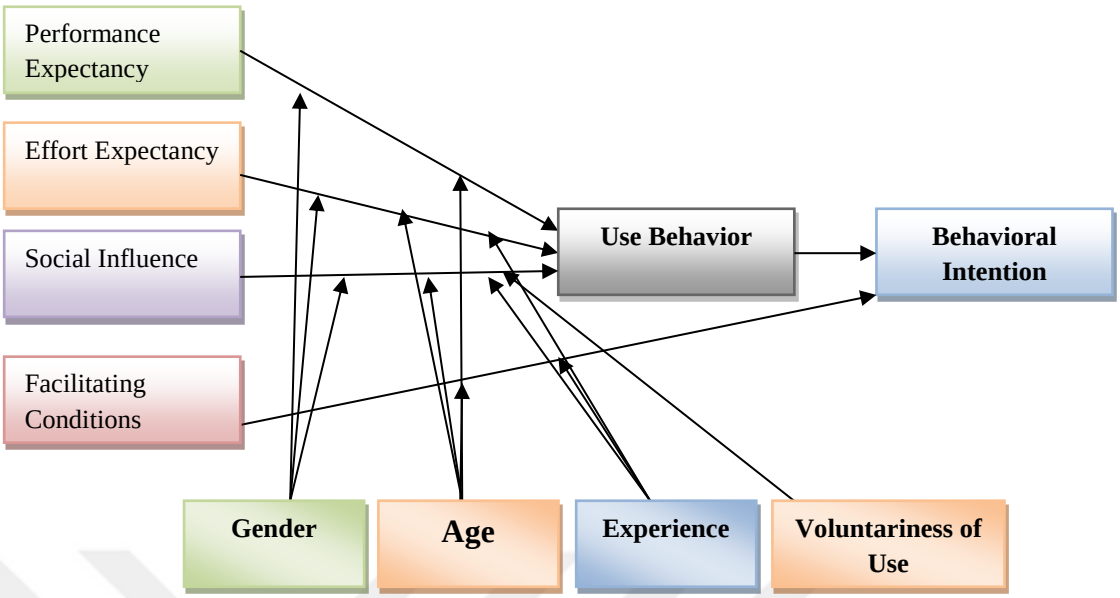

Figure 2: UTAUT Model

1.4 Problem Statement

The innovative integration of technology within all the business sectors has undoubtedly been aligned with the intentions of serving the consumer needs in the most feasible manner. The entire world has experienced the advancements of technology in diverse fields, including both the developed and developing regions of the world. The services to the consumers have been made available and even readily accessible to the potential customers by the cloud computing technology, regardless of the distance, time and other associated concerns. However, there have been certain behavioural issues regarding the activation of cloud technology in certain developing regions, rather than the technical limitations. In this regard, the case of Iraqi telecommunication and service sector has been studied to better assess the challenges encountered while activating cloud technology. The constraints from the users' perspectives needed to be evaluated, thus, the implications of UTAUT model has been regarded as the most effective one. It is expected that the potential challenges in this regard would be highlighted that could facilitate the proposition of certain recommendations as well.

1.5 Research Question

The significance of the research question is the utmost in the success of a study. Therefore, it is important that the research question(s) be formulated to depict the focus of the researcher in order to attain the aim of the study. With respect to the quality formulation of the research question(s), it needs to be considered that the formulated research question(s) are "just right", neither quite narrow nor excessively broad. It is asserted based on the fact that this prospect would govern the comprehensive and adequate assessment within the pre-determined timeframe in the particular research setting [26].

Below are the devised research questions, with an anticipation of accomplishing the research objectives:

Q1: What is the significance of cloud computing in controlling the business and management needs of the organisations?

Q2: What are the expected effects of cloud computing for communication and service sector?

Q3: What have been the challenges affecting the implementation of cloud computing in the Telecom and Service sector of Iraq?

Q4: How the challenges or the constraints encountered in implementing cloud computing in the Telecom and Service sector of Iraq can be mitigated?

1.6 Purpose of the Research

The research is intended to explore the challenges encountered while activating certain technological measures that are eventually directed to serve the users' needs in the most proficient and feasible manner. In this regard, the telecommunication sector of Iraq has been targeted, based on its potential lacking in integrating the technology of cloud successfully. More specifically, the research has focused the evaluation of users' adoption issues rather than the technical issues, as the technical issues are manageable to some extent, but the behavioural issues are uncontrollable that ultimately ruins the intended potential of the technology deployment. Therefore, the use of UTAUT model has been preferred to better assess the challenges posed by the users towards the cloud technology in Iraq.

1.7 Aims and Objectives

According to the study of Zikmund [27], the aims and objectives of the study reflect the researcher's level of understanding related to the problem being focused. The clearly articulated statements represent the direction of the study as adopted by the research to complete the study. Based on the significance of research aims and objectives, this particular study aims at exploring the impacts of cloud computing or service deployment on the communication and service sector of Iraq, along with identifying the challenges or the constraints faced in the activation of cloud computing. Subsequently, the research has formulated the following objectives to achieve the aimed undertaking:

- To identify the concept and the significance of cloud computing.
- To identify the implications of cloud computing for communication and service sector.
- To investigate the expected effects of cloud computing on Telecom and Service Sector.
- To examine the constraints or challenges encountered in the implementation of cloud computing, particularly in the Telecom and Service Sector of Iraq.
- To explore the effectiveness of "**Unified Theory of Acceptance and Use of Technology (UTAUT)**" in determining the acceptance of Cloud implementation within the Telecom and Service Sector.
- To present recommendations to the Iraqi Telecom and Service sector for successful deployment of cloud computing.

1.8 Research Methodology

The researcher has adopted the mixed methodology for accomplishing the objectives of this study. Mixed method has mitigated the relative limitations of the other, and has facilitated the researcher in adding to the cohesiveness and coherence of the study outcomes [28]. By means of qualitative approach, the researcher has explored the relevant literature and acquired insightful findings regarding the significance of cloud computing within the Telecom and Service Sector, along with the implications of UTAUT model in analysing the challenging activation of cloud computing within the respective sector. In addition to this, the quantitative approach has facilitated the collection of direct data through survey questionnaire that was

conducted across 251 IT specialists of Iraqi Telecommunication and service sector. The responses of the survey questionnaire have been analysed through descriptive and inferential statistics tests.

The survey questions are selected based on the UTAUT model recommendations, so that, the model can be implemented to answer the questions of this study, according to the acceptance of the cloud computing technology in communications sector in Iraq. The questions are set up, so that, the different combinations of these questions give answers to different research questions, i.e. the combination of two or more questions may give the answer to a certain question, but when one of these question is combined with other question, the answer to a different research question may be concluded.

1.9 Structure of the Research

The entire research is structured as:

Chapter 1 Introduction**:** This chapter presents the introductory level information regarding the research topic, including the background information, conceptual framework, problem statement, and the formulated research questions based on the pre-determined objectives of the research. Moreover, the adopted research method has also been described briefly to represent the direction of the research.

Chapter 2 Literature Review**:** In this section, the relevant literary findings have been presented in a descriptive manner.

Chapter 3 Research Methodology**:** This section comprises of the detailed description of the adopted methodological approach of the study.

Chapter 4 Implementation and Evaluation**:** This chapter presents the discussion and analysis of the survey responses, leading towards the generation of concluding remarks.

Chapter 5 Conclusion and Future Work**:** This section presents the conclusion and the relevant recommendations of this study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This section of the research presents the descriptive comprehension of the topic under consideration. The researcher has explored the past studies in an intense manner, in order to acquire better grip over the research focus. Besides, it has also been supported with the deployment of UTAUT model to better acquire the insights of users' adoption of cloud technology. The proceeding section entails the overview of cloud computing, its adoption and the associated benefits or constraints of adoption, and the specific issues encountered while activating cloud technology within the developing regions having less technological awareness.

2.2 Overview of Cloud Computing

According to the definition of cloud proposed by the US National Institute for Standards and Technology - NIST [29], cloud computing has been developed as a model that would enable convenient and ubiquitous access to the on-demand networks that are facilitated in terms of shared pool of services having configurable computations. The shared pool includes the networks, storage, servers, and the services and applications that are offered to the consumers [9, 29, 30]. As a result, the entire package seems to have feasible provisional mechanism that requires minimal efforts of management along with nominal interaction needs as well [29]. Cloud computing being a technological measure of facilitating the needs of the consumers is distinguished from other existing technologies in terms of its offered layers of services for the users. Cloud offers its three prime layers as the technological solution to the target users that are referred as:

First layer - Software as a Service (SaaS)

Second layer - Platform as a Service (PaaS), and

Third layer - Infrastructure as a Service (IaaS)

The competence of the cloud computing models as compared to the on premise methods of managing the applications and service needs of the consumers is reflected from the figure below:

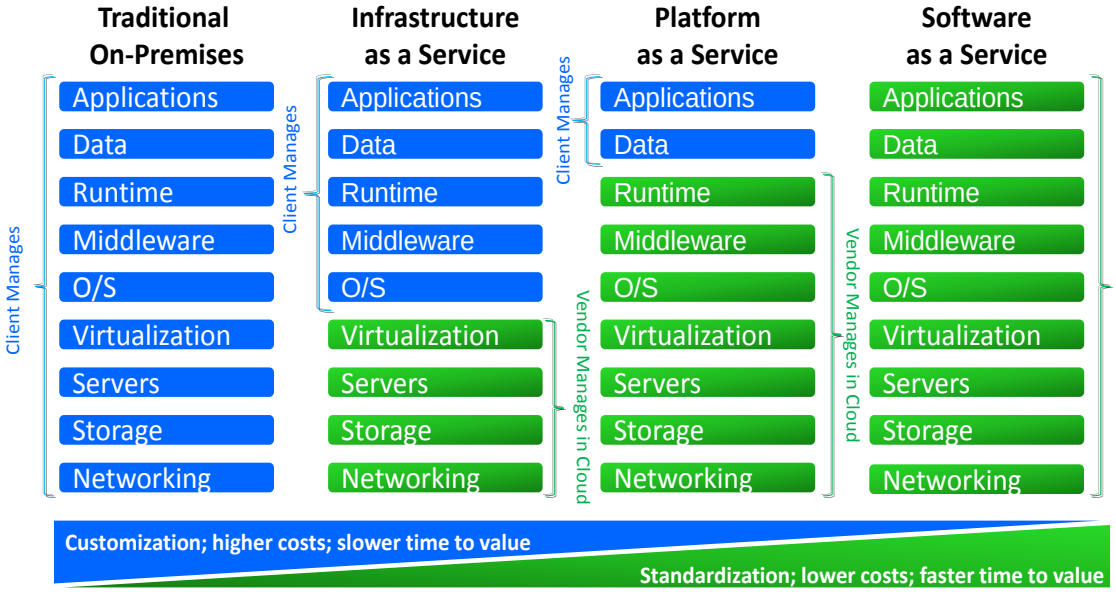

Figure 3: Cloud computing vs. On-premises model

It reflects that the most prominent prospect of cloud services has been the "virtualisation" it offers. Virtualisation serves as the potential strength of cloud computing technology, since it facilitates the segregation of the physical infrastructures in a way that multiple dedicated resources are created. It is accomplished through virtualisation that a single server offers multiple applications and operating systems to the diverse clients at the same time [31-33]. However, it merely serves as an added feature of cloud computing that makes cloud computing a wholesome service package for the clients. By means of virtualisation, the cloud services are deployed in terms of four different models: Public, Private, Hybrid, and Community clouds. According to the study of Wang [34], public clouds are offered as cheaper but accessible services, but having the concerns of security to certain extent.

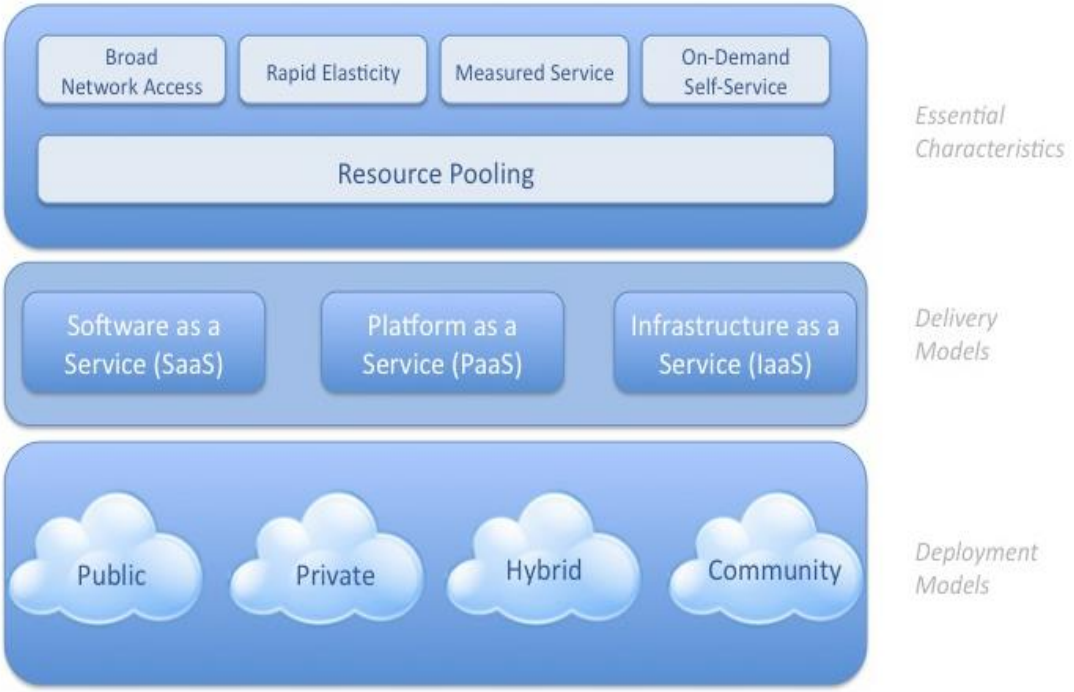

Figure 4: Cloud computing Models and Architectural Framework

Conversely, the private clouds tend to mitigate the limitations of the public cloud by means of adding the element of security. On the other hand, the Hybrid clouds are increasingly proficient in terms of security and affordability prospects, which acquire the potential of Community clouds when integrated in a manner to serve the organisational needs. Considering the prospect of virtualisation within cloud computing, the private cloud computing offers the client with personalised model of consumption [35-37]. The client has the opportunity of accessing the system in a flexibly controlling environment. Conversely, if it is a public cloud, the environment is open for other users as well, since the system is intended to offer multi-purpose attributes. At all the levels, the virtualised cloud computing system offers maximisation of the resources as the physical deployment is minimal. Nonetheless, the system to be deployed depends on the consideration of all the organisational, technical, and even behavioural factors as well [38].

2.3 Implications of Adoption of Cloud Services

The concept of cloud computing is much differentiated from network computing, based on its shared pool of [15, 39-41]. The adoption of cloud services is aligned with the diverse needs of the organisations, including:

Broadened Access to the Network: Cloud computing provides accessibility to the offered services over the network. There are certain protocols that are standardised to facilitate the clients with ease of accessibility of the required services or applications, regardless of the devices (desktop, mobile or even handheld devices) [15, 39-41].

On Demand Service Packages: There is no need of human interaction while accessing the service packages over the cloud network. The storage over the network and the access time is in accordance with the demands of the client. As a result, the all-time concern of managing the resources is mitigated, since the cloud providers facilitate in this regard [15, 39, 41].

Resource Pooling: The clients utilising cloud services have access to the pools of the resources that are managed at the cloud providers' end, without bothering the clients at any level. Even the available storage, network bandwidth and the memory of the cloud server has the competence of facilitating multiple clients [15, 41].

Measured Service: The most significant attribute of cloud-based services is its facilitation for the firms having minimum or inadequate capital to be invested within the hardware or software frameworks. The clients are charged at the end for their respective usage of the network bandwidth, processing, and storage [15, 39].

Flexibility: The business framework offered at the cloud servers offers significant scalability and flexibility meeting the business needs. The clients are offered elasticity in terms of linear scaling of the available shared pool of resources, which can be used on the demanded aspects for which the clients have to pay depending on the consumed quantity [15, 40, 41].

2.4 Implications of Cloud Computing for Communication and Service Sector

The service potential of the cloud is affirmed to facilitate the needs of almost all the business and service sectors. It brings in the concept of Anything-as-a-Service "XaaS" that integrates different service packages within a single model, depending on the needs of the system. For this purpose, hybrid model of cloud is adopted to facilitate the demanded service needs of the clients. With respect to the needs of communication sector, the implications of cloud computing are affirmed to be immeasurable as the communication sector is strictly aligned with the networking

needs. Cloud technology has Communication-as-a-Service "CaaS" for facilitating the users with communicating needs of video calls, voice chats, e-mails, and other prospects of interactive environment [42-45]. According to the study of Luo [43], the service models offered through the cloud technology are maximally aligned with the customer's requirement of Quality-of-service "QoS" that are operated at strict measures of SLAs "Service Level Agreements".

The study of Wenyu and Yong [45] has presented the approach that the incessantly maturing technologies of data centres and virtualisation are going to be catered as the potential cloud environment. Even the operators of networking would be facilitated through cloud technologies. The implications of cloud within the communication sector have been affirmed as a source of improving the offered services of the vendors, who are reluctant towards investing into their respective cloud solutions. The service providers across the communication sector are well-versed with the cloud competencies of security and trust needs. Considering the offered competencies of cloud communication services, the networking enterprises are at ease of facilitating the consumers in the most secure and reliable manner.

According to the study of Nishimura [46], cloud computing technology facilitates the service providers of communication sector with new opportunities of conquering the domain of Information and Communication technology (ICT). As compared to other industries, utilising the adoption benefits of cloud computing technology, the network and communication domain has certain potential benefits. At first the communication service providers acquire connectivity control all across the business and even domestic regions. It turns out to be the most significant prospect of cloud computing as it facilitates the personnel involved with the highest possible closeness or interactivity with the consumers, as compared to any other business or service sector. As a result of this proximity, the providers of network services through cloud computing technology are potentially capable of instantiating the functionality of cloud that are usually regarded as somewhat minimally latent.

In addition to this, the cloud-based network service providers are capable of tailoring the needs of their consumers based on their respective desired needs. For instance, the service providers can dynamically upgrade or improve the connectivity offered, in between the sites or locations that are to be accessed with respect to the needs of high-definition accessibility. It can be asserted in a different way that the

cloud network providers have the aptitude of allocating on-demand service packages. This particular prospect of on-demand availability and accessibility is associated with the resources of the cloud server, which include the data centres, and even the interconnecting bandwidth pipes among the clients and the data centres. The significant element of scalability offered by the cloud computing has greater implication within the communication and service sector. The communication services offered at the cloud servers are integrated with the dynamic measures of scalable communication, which brings in the concept of NaaS "Networking-as-a-Service", as the evolution of networking and communication. As a result, a unified framework of managing and controlling the communicating and computing needs of the clients is developed [47]. Moreover, even the resource allocation for managing the respective communicational prospects is also minimised.

Considering the implications of cloud computing within the communication and service sectors, it has been documented that even the traditional or typical frameworks of management are potentially up to standard of being transformed or upgraded to the cloud needs. Accordingly, there would be the definite availability and provision of both the communication and computing needs of the clients in the respective service sectors, based on the SLAs [47]. For instance, even the applications requiring large scale networking both at the data centric an information centric levels are provided within the cloud-based communication network. Consequently, it has also been documented that there comes the development of SAIL "Scalable and Adaptive Internet Solutions".

With respect to the integration of computing and communication, IBM has been quite responsive in exploring the respective area. According to the report of IBM (2012), compiled by Fox [48] the industry or service sector of telecommunication and cloud computing has long been a controversial prospect to be studied, when compared with the respective acceptance within the domain. However, the corresponding assertions based on conflicted perceptions regarding the implications of cloud within the communication sector have acquired transparencies. The network service providers have acquired proficiencies in deploying the strategic moves of cloud-enabled processes that are ascertained to generate substantial revenue generation and growth potential as well. , compiled by Fox [48] has affirmed that the communication service providers are increasingly exploiting the

potential of creating and delivering value to the service sector. For instance, the communication providers (Amazon, Google, and others) that are referred as "Over the top providers of communication" have potentially acquired the benefits of cloud services. Undoubtedly, the adoption of cloud services is affirmed to be the major source of revenue generation, which eventually demands no notable capital investment or even resource allocation.

In order to highlight the significant contribution of cloud to the communication and service sector, the survey results generated by the IBM report have also been exceptional. The survey included the respondents from the entire globe, comprising of 572 entities, having almost eighty eight respondents from the telecommunication sector of both the developed and developing markets. The survey results highlighted that the developed markets have significantly adopted the beneficial integration of cloud within the respective service sector. However, the trend of cloud adoption has been minimally accepted within the developing states. Still, there is an observed trend of exploiting the cloud potential in driving the existing value chains of the businesses [48]. In this regard, there has been the appearance of certain business models or frameworks, reflecting the innovative approaches of deploying the potential of cloud up to the maximum level.

Among the notable propositions, there are Optimisers as the trendsetters who have deployed cloud services in the most efficient and effective manner that has resulted in the incremental generation of value propositions of the consumers. In addition to this, there are Innovators who are observed to use cloud in terms of leveraging innovative and distinctive measures, in order to enhance the customer value. With the innovative integration of cloud into the communication services, there is a definite appearance of revenue streams, based on the enhancement of the respective value chains [48] Likewise, there are Disruptors as well; who eventually exploit the potential of cloud within the respective service sector, and come up with the newly generated customer segments and alongside the enhancement of end-user, experience is a must outcome.

With respect to the communication sector of Iraq, the statistics of internet networking reflect that the service sector has quite limited facilitating conditions for the end-users. The Iraqi communication sector has almost 37 percent penetration of internet services, which reflect that there is a notable issue with respect to the

acceptance of technological measures. In accordance with the identified variables of UTAUT model of analysing the acceptance of technology, in terms of the behavioural intentions and user behaviour, the projected results or the impacts on the service sector are effectively analysed. According to the study of Nishimura [46], the most significant issue affecting the activation of cloud computing technology has been the level of technological awareness among the target users. In this regard, the implications of Theory of Reasoned Action (TRA) hold greater significance as it tends to facilitate the comprehension of the users' willingness towards the adoption of a particular innovative measure [49]. If the integration of computing within the communication processes is perceived as somewhat complex, along with the concerns of usefulness, trust, security, performance expectancy, efforts expectancy, and even the absence of facilitating conditions as well, the activation of any potentially beneficial technology would be a definite failure. Therefore, the successful deployment of cloud computing within the communication and service sector of Iraq also requires a thorough analysis of the users' expectations and willingness towards technological advancements. It demands the exploration of the associated challenges or constraints that is entailed within the proceeding section of this research.

2.5 Constraints or Challenges in the Implementation of Cloud Computing in Communication Sector

On the basis of UTAUT model, it has been established that a number of factors are involved in influencing the behavioural intention of the users to adopt the technology of cloud communication, specifically in the communication sector. According to Phaphoom [50], some of the most prominent factors include the expectancy of the consumers towards the performance of the technology, social influence, facilitating conditions, experience, etc. The present section incorporates the analysis of the constraints or challenges that are involved in the implementation of the cloud computing in the communication sector.

It has been suggested by Opitz [51] that the implementation of cloud computing in communication sector is heavily dependent on the trustfulness of the potential users of the services. Singh and Chand [52] had presented an idea that the trustfulness and trust over the technology hold remarkable importance in cloud’s

solution. In particular, it can be stated that trust on cloud services has undeniable importance in its successful deployment. In more precise words, it can be affirmed that there is a direct link amid the behavioural intention as well as the trust of the users to adopt the cloud technology. However, people usually show alack of trust in the cloud services due to diverse reasons. These include perceived security related issues, technological complexities, etc. It is observed that all of these factors ultimately lead the users towards having limited trust on the cloud technology; thereby, restricting them from its adoption.

The analysis of the study of Wu [53] has revealed that the social influence is one of the prominent factors that are responsible for constraining the adoption of cloud technology in the communication sector. Social influence is nothing more than the normative impact of the key referent groups, like co-workers or peer on the behavioural choice of an individual. It has been noticed that the subjective norms also acts as an originator of the intentions of the individuals to carry out specific activities or to show particular behaviour. In accordance with the research work of Opitz [51], the UTATU has suggested that social influence plays a substantial role in the adoption of the technological tools. Therefore, in the same context, it can be established that the social influence has remarkable impacts on the user adoption rate of cloud technology in the communication sector. When the users find bad reviews and experiences of their peers, they intentionally avoid using the cloud services.

Low, Chen, and Wu [12] have presented an idea that the adoption of cloud computing in communication sector is heavily affected by the expectancy of the user towards the performance. More specifically, the users usually find it unsafe and insecure to communicate and share their information in the cloud-based environment. It has been stated by Mokhtar [54] that one of the greatest concerns that are associated with the adoption of cloud technology is ‘security’. The potential users of cloud usually perceive that they will have to encounter adverse situations, regarding the security of their information if they switch to the cloud based environment. This theory of reasoned action ultimately leads people to avoid the adoption of cloud technology for the sake of performing their day to day communication, in a virtualised environment.

The UTATU model suggests that weak facilitating conditions of the country or an organisation also hinder the adoption or implementation of cloud technology in

the communication sector. More specifically, the fragile facilitating conditions influences the use behaviour of the users that eventually leads them to avoid the adoption of cloud technology. The analysis of the study of Gangwar [55] have presented an idea that the appropriate facilitating conditions, like the availability of the reliable technology infrastructure, internet bandwidth, and robust security frameworks encourage the users to adopt cloud based solutions. However, the limited availability of all of these features directly impacts the use behaviour of the individuals; thereby, leading them to avoid or resist the adoption of cloud computing in the communication sector. Mokhtar [54] have stated that in the communication sector, the implementation and adoption of cloud computing are heavily reliant on the facilitating conditions. If these conditions are fragile, then there is not any possibility of successful implementation of cloud based services.

Opitz [51] has established that effort expectancy is one of the greatest factors that are associated with the limited implementation of cloud computing in the communication sector. Effort expectancy can be understood as the degree of ease related with the adoption or utilisation of any particular technology. In the context of the implementation of cloud computing in the communication sector, it has been recognised that the people usually find it difficult to use an entirely new system that does not even have physical presence. [56] Have highlighted that the communication organisations usually have no confidence in the scalability, responsiveness, availability, and security of the technology; therefore, leading them to avoid adopting and implementing this technology. On the other hand, Mokhtar [54] have suggested that because of having an entirely new framework, users usually find it complex to understand and adopt the technology of cloud computing. These features act as an obstacle to the successful deployment of cloud computing in the communication sector. In more precise words, it can be said that the effort expectancy has greater impacts on the behavioural intention of the communication sector to implement and adopt cloud computing technology.

It has been documented in the study of Min [56] that the lack of compatibility of the newly implemented cloud based system with the traditional system directly impacts the adoption of cloud technology in the communication sector. It is observed that the implementation of cloud computing in communication sector needs major adjustments and changes in the traditional practices; thereby, limiting the

communication industry from the deployment of cloud based system. In other words, it can be asserted that the excessive needs of learning about the newly implemented cloud based system; major changes in the day-to-day practices, etc. are the core factors that make the implementation of cloud computing, challenging in the communication sector.

2.6 Summary

The entire section has presented the significance of cloud computing in serving the virtualised networking and communication needs of the business sectors. It has been established that cloud computing facilitates the business needs of minimal resource allocation, less capital investment even in the development phase, and ensured or guaranteed success of the deployed measures. The concerns of bulk amount of data, and the respective management needs have been mitigated with the technology of cloud computing. Moreover, the service sector of communication has been affirmed to have increasing benefits of cloud computing, once integrated, and deployed throughout the value chain. However, it has also been observed that the regions lacking in technological awareness are lagging behind the potential growth opportunities offered by the cloud integration. Still, the advancing nature of technology and its penetration all across the globe presents bright chances for the developing regions as well. For instance the Iraqi communication sector has significant growth potential; however, there is a need of mitigating the associated challenges posed by the end users towards the acceptance of computing within the communication zone.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This section is based on the adopted methodology for the accomplishment of the pre-determined objectives. The implications of credible and authentic data are significant with respect to the process of research. Therefore, the importance of the method of data collection and analysis is undeniable from the perspective of a successful study [26]. In this regard, the study of Bryman [28] has emphasized the cautious selection of the research method, since it keeps the entire research process aligned with the objectives of the research [57]. The research is focused on the evaluation of the challenges or constraints encountered during the implementation of cloud computing within the Telecom and service sector of Iraq. In order to acquire the perspectives or opinions of the personnel involved in the service sectors, questionnaire has been conducted, and the outcomes have been evaluated on the basis of UTAUT model. The proceeding section presents the detailed description of the significant constituents of the research methodology that are carried out vigilantly.

3.2 Research Approach

The entire research plan is represented from the selected approach of the research, as it includes the detailed description of the methods and techniques adopted for the collection and analysis of the data. In this regard, has documented that the success of a study demands the researcher to have the objectives of the study formulated prior to the selection of the research approach. It has been asserted based on the fact that the accomplishment of the objectives is anticipated in an integrated manner with the constituents of the research approach. Likewise, it has also been contended in the study of Bryman and Bell [26] that a successful study is ascertained with the appropriateness of the adopted research. Accordingly, the experts have

formulated three research approaches that could be adopted with respect to the nature of the study and the objectives as well.

Qualitative Research Approach: According to the study of Bryman [28], qualitative study offers extreme flexibility with respect to the concerns of accessing the data sources. The potential sources of data are readily available that inculcate an element of ease for the researcher, facilitating the accomplishment of the objectives [58]. On the other hand, the analysis of such data is carried out mostly by the adoption of narrative techniques, which is apt for the data collection tools of participants' observation, interviews, and even the literary findings that are extracted from the most relevant past studies (peer-reviewed journals, published articles, annual reports, textbooks, existing survey results, and others). Resultantly, the outcomes of the research are affirmed to have cohesiveness and coherence [59].

Quantitative Research Approach: Quantitative research approach is regarded as comparatively more feasible with respect to the credibility of the research outcomes. It has been established based on the fact that the data is acquired as the first-hand information [28, 60]. Therefore, the increasingly interactive research environment tends to determine the credibility of the research. Besides, there is an inclusion of "Cause-and-effect" thinking among the selected research variables. In order to collect the quantitative data, 3 methods as the research instruments are used, based on the theme of statistical tests. As a result, the acquired results are affirmed to be consistent, reliable, alongside the element of objectivity is also observed [58].

Mixed Research Approach: A research having mixed approach entails the adoption of both the qualitative and quantitative measures of data collection and analysis. Mixed research carries all the potential efficacies of the respective methods, along with mitigating the associated limitations of the other ones [61, 62]. As a result, the credibility of the research outcomes is further enhanced; however, the researcher needs to be intensely vigilant, as the nature of the study must have association with the adopted approach [61].

This particular study has adopted the research approach of Mixed Method for acquiring maximally efficacious outcomes of the study, as it would facilitate the

deployment of cloud computing within the telecom and service sector of Iraq. It reflects that the research approach of this particular study is aligned with the nature of the study, since the constraints faced during the implementation of cloud computing within the service sector of Iraq have been evaluated from both the perspectives of literary support and the affected personnel (Questionnaire Survey). In this regard, the model of UTAUT has been deployed to better analyse the outcomes of the research, particularly in terms of the Behavioural intention and the Use behaviour. Consequently, the significant constraints affecting the activation of cloud computing within the Iraqi service sector have been highlighted that would be mitigated or controlled based on the suggested recommendations.

3.3 Research Purpose

It has been established from the study of Jackson [57] that the research purpose represents the direction of the entire research plan. Having a concise and clear purpose at the commencement of the research facilitates the directed success of the study, in accordance with the projected outcomes [63]. It reflects that the significance of appropriateness of the research approach needs to be credibly recognised by the researcher, which is carried out by the extensive exploration of the relevant research area [57, 64]. Primarily, a study may be characterised based on the following three purposes of the research:

Exploratory Purpose: The problem focus that has not been considerably explored within the relevant research area comes under this purpose of the research. Based on this prospect, the researcher is expected to be more reasonable as the research outcomes are going to serve as the baseline for further research in future [65, 66]. Besides, the data sources for this particular research are mostly secondary sources, as credible data is requires due to the limited availability of the data. However, open-ended questionnaire surveys are also selected for the collection of data, depending on the nature of the study.

Descriptive: Descriptive purpose is followed by the exploratory stage of a research that regards it as being Conclusive of the preceding research outcomes. Accordingly, the guidelines are formulated to carry out the research in the future

directions [65]. At this stage, comparatively large amount of data is required that is aligned with the accomplishment of the objectives that have already been formulated on the basis of previous literary findings. Accordingly, the descriptive research purpose tends to be an extension of exploratory purpose in a differentiated manner [67]. In addition to this, the study leads to certain variables having particular dependence or are autonomous with respect to the objectives of the study. It is mostly carried out through the deployment of the most relevant statistical measures.

Explanatory: It is referred as the Causal purpose of the research, as it is adopted when certain variables are targeted in terms of evaluating the relationship in between the variables, along with facilitating the accomplishment of the objectives. Accordingly, the evaluation entails the use of cause-and-effect thinking that is differentiated from the aforementioned two purposes of the research [63, 65].

With respect to the objectives of exploring and highlighting the constraints encountered while activating cloud computing within the service sector of Iraq, the researcher has selected the "Explanatory" purpose. The problem focus has been studied in different sectors, with respect to diverse perspectives of challenges encountered in cloud activation. The researcher has evaluated the respective aspects through UTAUT model, as it entails the necessary factors associated with the deployment of cloud computing in the service sectors.

3.4 Research Design

Research design includes the essentials that are required for strategic execution of the research process. Appropriately followed design of the research makes the research completion systematic and efficient, along with the prospects of timeliness, cost-effectiveness, flexibility and feasibility as well [27, 68]. It incorporates the basics of data collection and analysis that are deployed in different manners, including the form of experimental design, semi-experimental design, review-based design, meta-analytics, correlational, descriptive and others [26, 57, 68-70]. In this particular study, different research designs have been adopted, meeting the needs of the objectives of the study. Primarily, Review-based design, Descriptive Survey, and Correlational designs have been selected for the accomplishment of the objectives.

At first, the significance of cloud computing in association with the needs of service sector has been explored through the Review-based design. Accordingly, relevant past researchers have been inspected with respect to the factors affecting the activation of cloud computing within the service sector of Iraq. Consequently, UTAUT model has been utilised to assess the responses of the potential users of cloud, who might be reluctant towards the acceptance of cloud computing services. In this regard, the design of Descriptive (Survey) has facilitated the accumulation of users' defiant responses towards cloud computing activation. In addition to this, the entire discussion has led to the correlational perspectives for assessing the inter-relationship of the variables of the study, in terms of describing the contribution to resisting the activation of cloud computing within the service sector of Iraq. Significant emphasis has been given on the dependent variables of Behavioural intention and Use behaviour of the potential users.

3.5 Data Sources

With respect to the success of a study, the most important element is the collection of data that carries along the significance of the sources of data. Therefore, it is contended that the sources of data must be credible, authentic, and recent most, so that the research outcomes could be regarded as coherent and cohesive with respect to the formulated objectives [63, 66]. Among the accessed sources, there are either primary or secondary sources that offer significant amount of data. The primary sources are defined by the characteristic of being direct, as first-hand information is gathered that favours the accomplishment of the objectives of the study. On the other hand, secondary sources provide indirect ways of collecting the data that are available through the online databases, websites, textbooks, company reports and others survey results that could be used as secondary data [63, 66].

In this particular research, the researcher has utilised both the sources of data, in order to enhance the credibility of the research outcomes. With respect to the secondary sources, the researcher has extensively explored the online databases, using the most relevant keywords and certain Boolean operators of AND/OR and other searching tactics. The databases that were accessed included Science Direct, Google Scholar, ProQuest, EBSCOhost and others. Multiple peer-reviewed journals, published articles, certain reports, publications, and other relevant material was

reviewed that led to the extraction of the most relevant literary findings. In this way, the researcher has potentially collected huge amount of data in a credible, but cost-effective and well-timed manner.

Besides, it also facilitated the researcher in designing the survey questionnaire for the collection of the primary data. The survey has been collected among 251 specialists of Telecommunication and service sector of Iraq, in order to assess the factors affecting the activation of the cloud computing in the respective sector. The questions included in the survey were focused on the demographic, psychological and informational attitude of the service specialists of Iraq, so that the detailed analysis of resistant activation of cloud computing can be carried out. The identified dependent variables of Behavioural Intention and User behaviour have been explored in terms of assessing the personnel attitude towards cloud computing. It has been evaluated based on the prospects of Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions as well.

The findings of the study of Crano [71] are in accordance with the current standing of this particular research, since there are certain insightful findings acquired from both the participants' responses, and the literary findings as well. Even though, the process of questionnaire analysis has been a bit time-consuming, yet the coherence and cohesiveness of the research outcomes has mitigated all the associated concerns [72, 73].

3.6 Population of the Study

The participants of the research are also important to the credibility of the study outcomes. In this regard, the researcher needs to target the population of the research carefully, considering the aspect that the individuals involved must have similar interests or expertise that might contribute to the research agenda [74]. In this particular research, the researcher has considered this element, while targeting the population for survey questionnaire. The IT specialists serving in the Telecommunication and service sectors of Iraq have been selected as the potential participants of this research, regardless of the age or gender related concerns. As a result, the researcher has collected different perspectives regarding the challenging activation of cloud computing within the respective service sector.

3.7 Sampling Strategy

Sampling is aligned with the primary data collection, since the direct or first-hand information requires proper target population. Besides, the importance of the data towards the success of the study makes the sampling strategy equally important as well. Therefore, the researcher must select the sampling strategy that is extremely proficient in its services [75]. According to Mendenhall [76] Sampling is the division of the whole population into particular segments that are most relatable to the objectives of the study. Even though primary data collection carries the impacts of timing, cost consumption, and geographical concerns as well, yet the appropriate selection of the sampling strategy mitigates all the respective concerns [75].

Mendenhall [76] have emphasized another significant aspect of sampling that is associated with the biased responses of the participants. Since the participants are somehow outsiders whose responses might have certain ambiguities or biasness, as they might have no belonging to the study; therefore, the sampling of the study must be "Representative", as it governs the biasness related concerns. In addition to this, there comes the need of selecting the strategy of sampling to be either convenience or probability. If it is convenience sampling, the participants are selected on random basis, while probability sampling entails the consideration of specific measures [76]. In this particular study, the researcher has selected convenience sampling, which has been focused within the specific sector of Telecommunication and e-services of Iraq. Moreover, it has been considered that the participants must be specialists within the respective areas. As a result, the researcher has feasibly acquired the survey responses from the field's active participants.

3.7.1 Sample size

The study has selected the sample size of 251 specialists of Telecommunication and service sector of Iraq. Among the respondents, gender and age group were also noted, in terms of evaluating the behavioural intention and use behaviour of the cloud computing among the IT specialists of Iraq.

3.8 Statistical Technique

The data which has been collected through survey questionnaire has been analysed by using IBM (SPSS) Statistics v21, through descriptive and inferential statistics, including frequency and percentage analysis, correlation, and regression analysis. The data has been gathered from the IT specialists of Iraq, in terms of their demographic details, and their attitudinal data towards accepting cloud computing through 5-point scale. Consequently, the model of UTAUT has been used to analyse the responses of the participants towards the issues of activating the cloud computing within the Telecommunication and service sector of Iraq.

3.9 Research Instrument

The research instrument used for the collection of quantitative data has been the survey questionnaire. Questionnaire is the collection of relevant questions that offers the respondents with options to represent their answers or responses [77]. It depends on the study nature that determines the adopted type of the questionnaire to be either open-ended or close-ended. If it is open-ended, the respondents are allowed to give their opinions in an unstructured manner that eventually contributes to the study success. Conversely, there is close-ended questionnaire that offers list of options to be used for giving the most relevant answer on the basis of their personal opinions, experiences or even needs [61]. With respect to the nature of this particular study, the questionnaire has been close-ended, including the questions based on the demographic details, and the opinion of the IT specialists towards the challenges of cloud computing that might have influenced its activation in the Telecom and service sector of Iraq. The responses have been collected on the 5-point scale of Likert that measured the responses in terms of 1-5, where one indicates that the participant disagrees with the suggested opinion, while five indicated that the participant strongly agrees with the suggested opinion.

3.10 Variable Description

The identified variables of the study based on the model of UTAUT have been affirmed as:

Independent Variables:

- Performance Expectancy (PE),
- Effort Expectancy (EE),
- Social Influence (SI), and
- Facilitating Conditions (FC)

Dependent Variables:

- Use Behaviour – (UB)
- Behavioural Intention – (BI)

The independent variables have been evaluated in terms of the expected quality of the information system among the potential users. Besides, the influence of social aspects along with the essentials of facilitating environment has also been analysed. Accordingly, the dependent variables of Behavioural intention and Use behaviour have been explored as well.

Table 2: Description of Factors

Factors	Description
Performance expectancy	Is the belief degree of an individual to the improvement that the usage and acceptance of a specific system may provide to the performance of the job being practiced by that individual. In this study, this factor describes the usage and acceptance of the cloud computing technology in the service of telecom in Iraq.
Effort expectancy	Represents the expected easiness of using a system. This factor is expected to moderate the effect of gender, experience and age on the behavioral intention. In this study, this factor measures the expected easiness of using cloud computing in Iraq based on the participant's responses.
Social influence	The acceptance of the new system by other people from the participant's point of view. In other words, it describes how important it is that other people, such as partners, co-workers and friends, would appreciate the system according to the participant opinion.
Facilitating conditions	Describes the participant’s opinion upon how ready is the existing infrastructure to support the new system, so that the system becomes applicable and would work without any performance issues.

3.11 Ethical Consideration

Since the study included human participants, there has been the crucial perspective of ensuring the ethical abidance. None of the participants were forced, but offered sound confidentiality, privacy, and information rights regarding the study purpose. Moreover, there has been no issue of discrimination or biasness, as ascertained through openness and integrity throughout the data collection phase. In addition to this, the secondary data has also been collected in an adequate manner, as no manipulation of the actual data was carried out to generate the anticipated outcomes. The contribution of the authors has been well-cited within each section, rather than asserting as personal opinions.

3.12 Methodological Summary

The adopted methodology is summarised as:

Research Approach	Qualitative and Quantitative Approach - Mixed Method Approach
Research Purpose	Explanatory Research
Research Design	Review-based (Literature Review), Descriptive (Questionnaire Survey), and Correlational Design.
Data Source	Primary and Secondary
Population of the Study	IT specialists of Iraq (from professional positions and age groups of Telecom and service sector)
Sampling Strategy	Convenience
Sample size	251
Research Instrument	Multiple item 5-point Questionnaire Survey
Statistical Analysis	Descriptive Statistics, Correlation analysis, and Regression analysis.

CHAPTER 4

IMPLEMENTATION AND EVALUATION

4.1 Introduction

In this section, the researcher has presented the analysis of the acquired findings through the survey questionnaire, pertaining to the attainment of the study objectives. The survey was designed in accordance with the assessment needs of exploring the impacts of cloud computing or service deployment on the communication and service sector of Iraq, along with identifying the challenges or the constraints faced in the activation of cloud computing. The credibility of the outcomes is governed from the fact that the survey was conducted across 251 IT specialists only, in order to assess their willingness or acceptance of deploying cloud computing across the communication and service sector of Iraq.

4.2 External Variables

With respect to the conceptual framework of UTAUT model, (which has been employed to assess the impacts of cloud computing or service deployment on the communication and service sector of Iraq, along with identifying the challenges or the constraints faced in the activation of cloud computing) it has been comprehended that the external variables (gender, age, experience, and voluntariness of use) are significantly influential over the identified dependent and independent variables. In this regard, the section below presents the statistical significance of these external variables in relation to the employed UTAUT model for cloud computing deployment.

Figure 4 represents the contribution of the survey participants to the study in terms of their gender. It has been noted that majority of the respondents are males 63.3% with only 36.7% females. Eventually, it reflects the proportion of limited female presence across the IT sector of Iraq, as the society has the notions of male-dominance to a considerable extent. These statistics could be utilised in interpreting

the acceptance of cloud across the Iraq's communication and service sector, and even in gaining insights of the challenges encountered in this regard. The impacts of gender have been contended to be significant on the performance expectancy, effort expectancy and social influence aspects; thus, affecting the behavioural intentions. Therefore, the deployment of cloud computing needs to be equally adopted, regardless of the gender differences; however, there would be certain efforts required in this regard to encourage the target.

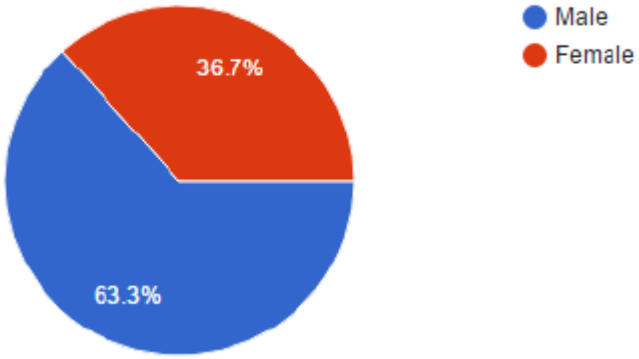

Figure 4: Gender of the survey participants

Likewise, the impacts of education level and age group have also been assessed. (Figure 5) represents that most of the respondents (almost 67%) have higher education levels (Master's Degree = 33.5%, and Higher Diploma = 33.1%. Therefore, it can be established that acceptance of cloud computing deployment would be supported in a considerable manner. However, the impacts of age are increasingly influential in this regard, since the higher is the age, the lesser are the prospects of adaptability of innovation or advancements. In this particular study, majority of the respondents (almost 71%) are observed to be young and middle-aged adults or millennial generation (Figure 6). It leads to the assertion that the adaptability or acceptance of cloud computing across the Iraq's telecommunication and service sector has significant probability, since the impacts of age are effective on all the identified independent variables of UTAUT model (Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC)).

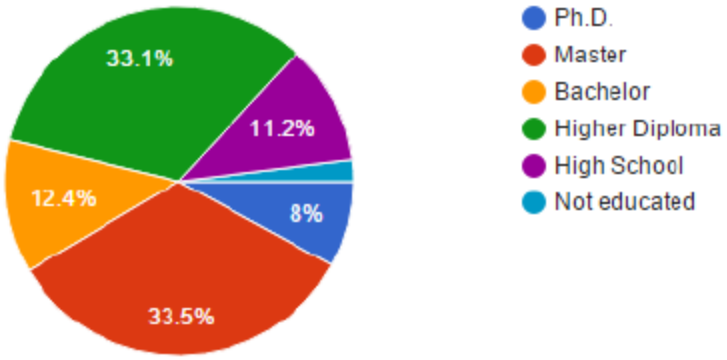

Figure 5: Education Level of the Survey Participants

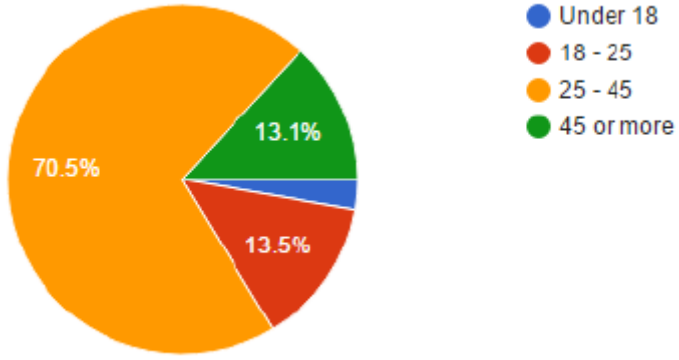

Figure 6: Age Group of the Survey Participants

The impacts of respondents' experience with cloud computing and the willingness of voluntariness of using the innovation in the ICT service sector are also contended to be significant in relation to determine the behavioural intention towards cloud deployment across the sector. (Figure 5) represents that over half of the respondents (59%) have 1-3 experience with cloud computing, and almost 22% have been using it for 3-5 years. It means that almost 82% of the target population is aligned with the notions of cloud computing; thus, the behavioural intention would be having significant results, since the prospects of EE, SI, and FC variables are already comprehended across the target segment. Consequently, these assertions are further supported by the results of respondents' affirmation of voluntary use of cloud computing (almost 76%) in the respective field (Figure 6).

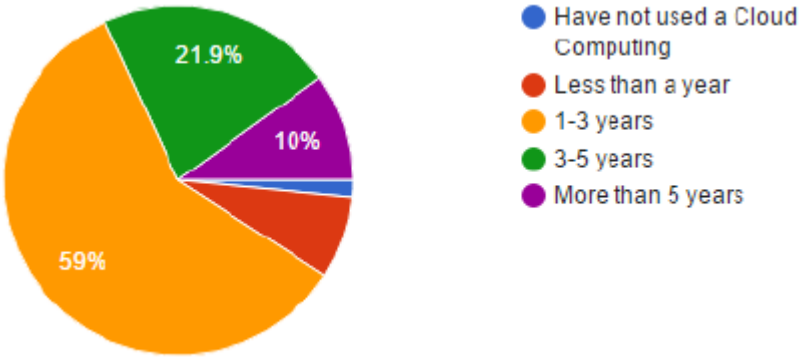

Figure 7: Experience with Cloud Computing

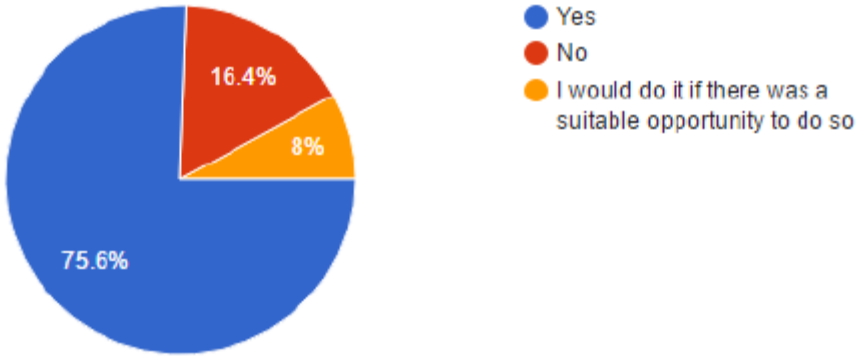

Figure 8: Voluntariness of Use of Cloud Computing Across the ICT Service Field

Besides, the aforementioned impacts of the external variables of gender, age, experience, and voluntariness of use, the dependent variables of Behavioural Intention (BI), and User Behaviour (UB) are also assessed in terms of the independent variables of Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). In accordance with the adopted conceptual framework of UTAUT model in this particular study, it has been contended that the BI is dependent on the independent variables of PE, EE, and SI, while UB is determined by the independent variable of FC and the dependent variable of BI. The results of these aspects of determining the adoption of cloud computing across Iraqi's Telecommunication and service sector are discussed in the section below.

The responses of the participants, regarding each variable, are divided into two categories, valid and missing. Valid responses are the responses where participant selected one of the five available options, while the missing responses are the number of responses that sis not respond to that specific question. Then, four values are calculated for each valid response per variable, which are the frequency, percent, valid percent and cumulative percent. The frequency represents the number participants who selected that answer for that question and the percent is the percentage ratio of that answer's frequency to the total number of participants, while the valid percent is measured with respect to the number of valid responses. Then, these valid percent values are summed incrementally for the valid responses, so that the last cumulative percent should have the value of 100. On the other hand, only frequency and percent values are computed for the missing responses.

4.3 Independent Variables

4.3.1 Performance Expectancy (PE)

The independent variable of Performance Expectancy (PE) has been assessed in a possibly extensive manner. The survey comprised of five questions, focusing on the analysis of PE across the target segment of IT specialists of Iraq. Table 2 presents the findings of respondents' opinion towards the positive impacts of cloud computing on the user-behaviour in e-service sector.

It has been noted that most of the respondents have rated this construct as 2 on the scale of 1-5, which represents that the respondents have not agreed to a considerable extent in this regard. Moreover, almost 24 percent of the respondents are noted to be undecided in this regard. However, the rate of agreement has been only 27 percent that represents a potential constraint towards the deployment of cloud computing, as its implications are not considered as positively influential over the behaviour of the user (UB). The instability of the internet connections may by the main factor that is affecting the opinions of the participants, similar to the case studied by Lin[75], where localized services are preferred in in regions where internet connection is slow or instable.

Table 3: Impacts of Cloud Computing on User Behaviour

PE01 Cloud computing positively affects the use behaviour in e-services sector					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**27**	**10.8**	**10.8**	**10.8**
	2.00	**94**	**37.5**	**37.6**	**48.4**
	3.00	**61**	**24.3**	**24.4**	**72.8**
	4.00	**55**	**21.9**	**22.0**	**94.8**
	5.00	**13**	**5.2**	**5.2**	**100.0**
	Total	**250**	**99.6**	**100.0**	
Missing	**System**	**1**	**0.4**		
Total		**251**	**100.0**		

Consequently, the respondents have also been inquired about the positive impacts of their performance expectancy on their behavioural intention towards using cloud computing as a service (Table 3). In this regard, the gathered survey findings represent that almost half of the respondents (51 percent) have agreed, while 27 percent have somewhat disagreed with 22 percent to be undecided. It leads to the assertion that the credibility of cloud computing in terms of performance expectancy would enhance the users in terms of their behavioural intention to use it.

Table 4: Performance Expectancy and Behavioural Intention

PE02 Performance Expectancy positively affects the users' behavioural intention to use cloud computing as services					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	1.00	22	8.8	8.8	8.8
	2.00	45	17.9	18.0	26.8
	3.00	56	22.3	22.4	49.2
	4.00	96	38.2	38.4	87.6
	5.00	31	12.4	12.4	100.0
	Total	250	99.6	100.0	
Missing	System	1	0.4		
Total		251	100.0		

Table below represents a potential construct of PE, as whether the increased productivity of the individuals is associated with the adoption of cloud computing. It has been noted that only 32 percent of the respondents from Iraq have agreed in this regard, while almost 45 percent have disagreed with 21 percent undecided (Table 4). It reflects that cloud computing is not perceived as an effective measure of improving the individuals' productivity across the institutions, which seems another constraint of challenge of deploying cloud computing in the same sector.

Table 5: Cloud Computing and Productivity

PE03 The Use of Cloud computing, provided by my institution, increases productivity					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**68**	**27.1**	**27.6**	**27.6**
	2.00	**44**	**17.5**	**17.9**	**45.5**
	3.00	**53**	**21.1**	**21.5**	**67.1**
	4.00	**35**	**13.9**	**14.2**	**81.3**
	5.00	**46**	**18.3**	**18.7**	**100.0**
	Total	**246**	**98.0**	**100.0**	
Missing	**System**	**5**	**2.0**		
Total		**251**	**100.0**		

The survey respondents, being the potential users of Cloud computing across the communication and service sector of Iraq, have also been inquired for their beliefs towards the efficacy of cloud computing in improving the overall performance (Table 5). Since the users are aware of the potential benefits of various cloud services such as ‘emails’, almost 46 percent of the participants have responded in agreement, while 24 percent of the respondents have been undeceive in this regard. However, still the rate of disagreement being 30 percent (Table 5) seems to be a potential constraint towards the deployment of cloud computing as well.

Table 6: Cloud Computing and Performance

PE04 Cloud computing would improve performance in communication, service sector					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**29**	**11.6**	**11.7**	**11.7**
	2.00	**44**	**17.5**	**17.7**	**29.4**
	3.00	**61**	**24.3**	**24.6**	**54.0**
	4.00	**59**	**23.5**	**23.8**	**77.8**
	5.00	**55**	**21.9**	**22.2**	**100.0**
	Total	**248**	**98.8**	**100.0**	
Missing	**System**	**3**	**1.2**		
Total		**251**	**100.0**		

In response to the construct of making the task accomplishment to be time efficient, cloud computing is believed to be a potential technological integration among 42 percent of the survey participants. In this regard, 22 percent of the respondents have disagreed, and 35.9 percent have been indecisive (Table 6). These results show that a fair foundation for the use of cloud computing services exists, where the understanding of the benefits of using cloud computing services, such as the high availability of the services and the cooperation ability as these services may be shared among many users simultaneously.

Table 7: Cloud Computing and Efficient Task Completion

PE05 Cloud computing would enable tasks accomplishment in time manner					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**20**	**8.0**	**8.0**	**8.0**
	2.00	**35**	**13.9**	**13.9**	**21.9**
	3.00	**90**	**35.9**	**35.9**	**57.8**
	4.00	**72**	**28.7**	**28.7**	**86.5**
	5.00	**34**	**13.5**	**13.5**	**100.0**
	Total	**251**	**100.0**	**100.0**	

4.3.2 Effort Expectancy

There have been four constructs focused on assessing the effort expectancy towards the adaptability of Cloud computing across the e-service sector of Iraq. At first, the technology integration was inquired in terms of being clear and easy in understanding (particularly for the new users). It is argued that cloud computing provides easy solutions, and increase clarity. The results represent that almost 45 percent of the respondents have disagreed with the ease and clarity of understanding cloud, and almost 21 percent were undecided in this regard (Table 7). Accordingly, almost 66 percent have not favoured this prospect; thus, it turns out to be another constraint towards cloud's adaptability across the target segment. An efficient solution for such behaviour is suggested by Dillon [75] is to encourage the usage of the open application programming interfaces (APIs) shared by the community. For example, the open cloud plat formed launched by Sun company in 2009, had a significant contribution toward encourage people to use the cloud computing services.

Table 8: Expected Ease in Understanding Cloud Computing

EE01 Cloud computing Technology is clear, easy to understand					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	36	14.3	14.4	14.4
	2.00	77	30.7	30.8	45.2
	3.00	52	20.7	20.8	66.0
	4.00	55	21.9	22.0	88.0
	5.00	30	12.0	12.0	100.0
	Total	250	99.6	100.0	
Missing	System	1	0.4		
Total		251	100.0		

The respondents were also inquired for their expected efforts in becoming skilled Cloud users across the sector. Almost 48 percent have agreed to the ease of becoming skilled Cloud users, while 30 percent have disagreed with 22 percent undecided responses (Table 8). It reflects that the adaptability of the Cloud would improve if the potential users are better motivated and supported.

Table 9: Skilled at Cloud Computing

EE02 It is easy to become skilful at using the Cloud computing Technology					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	30	12.0	12.0	12.0
	2.00	44	17.5	17.6	29.6
	3.00	55	21.9	22.0	51.6
	4.00	88	35.1	35.2	86.8
	5.00	33	13.1	13.2	100.0
	Total	250	99.6	100.0	
Missing	System	1	0.4		
Total		251	100.0		

Even though the potential users of Cloud have shown considerable agreement towards being skilled at Cloud with time, yet the responses towards its implications for efficient resource management have not been favouring. Resources may include time, human capital (employees), inventory etc. Most of cloud computing services providers provides support teams to assist the clients overcoming problems and managing their services. On the other hand, the hardware management is the responsibility of the service provider; thus, the clients have the same capabilities with less resources to manage compared to using an on premises servers. 41 percent of the responses represent disagreement with almost 25 percent undecided responses. Only 35 percent of the respondents have agreed to the statement that Cloud computing eventually reduces the efforts in managing resources (Table 8).

Table 10: Cloud Computing and Resource Management

EE03 Cloud computing Technology helps reduce the effort to manage resources					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**52**	**20.7**	**20.7**	**20.7**
	2.00	**50**	**19.9**	**19.9**	**40.6**
	3.00	**62**	**24.7**	**24.7**	**65.3**
	4.00	**53**	**21.1**	**21.1**	**86.5**
	5.00	**34**	**13.5**	**13.5**	**100.0**
	Total	**251**	**100.0**	**100.0**	

Most importantly, the effort expectancy of Cloud has been assessed with respect to the telecommunication and service sector of Iraq. When inquired about the cost-effectiveness of Cloud across the targeted domain, almost 42 percent responses reflect agreement, but 30 percent of the respondents have disagreed in this regard. It reflects that the adaptability of Cloud across the Iraqi communication and service sector would be improved with additional efforts of making the potential users informed of its efficacies.

Table 11: Cloud Computing and Cost of Communication Service and E-service

PE04 Cloud computing Technology Reduces the cost of delivering communication service, e-service					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**27**	**10.8**	**10.8**	**10.8**
	2.00	**47**	**18.7**	**18.7**	**29.5**
	3.00	**72**	**28.7**	**28.7**	**58.2**
	4.00	**43**	**17.1**	**17.1**	**75.3**
	5.00	**62**	**24.7**	**24.7**	**100.0**
	Total	**251**	**100.0**	**100.0**	

4.3.3 Social Influence

The acceptance of Cloud across the targeted sector of Iraq has also been assessed in terms of the factor of social influence, as it might enhance the adaptability or could even hinder the acceptance as well. (Table 11) represents the perceptions of the potential users across the communication and e-service sector of Iraq towards integrating Cloud. Almost 29 percent of the respondents did not agree with the idea, while 46 percent agreement was received. In addition to this, the respondents were also inquired for their opinion about other IT experts in a way if they would recommend its adoption or not (Table 12). Greater recommendations from the experts would lead to the conclusion that they believe in the implementation of cloud services in the Iraqi context. This also measures the will of the participants to recommend these services to other co-workers, as these participants are most likely to recommend the use of such services when they believe that more colleges are willing to support their opinions. 41 percent responses were based on disagreement with only 37 percent agreeing responses (Table 12); thus, it seems a significant construct of social influence affecting the adoption of Cloud.

Table 12: Perceptions of Cloud Adoption

SI01 Most workers in communication service, e-service think it is a good idea to use Cloud Computing as a service					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**28**	**11.2**	**11.2**	**11.2**
	2.00	**69**	**27.5**	**27.5**	**38.6**
	3.00	**46**	**18.3**	**18.3**	**57.0**
	4.00	**71**	**28.3**	**28.3**	**85.3**
	5.00	**37**	**14.7**	**14.7**	**100.0**
	Total	**251**	**100.0**	**100.0**	

Table 13: Recommended Adoption of Cloud Computing

SI02 Most ICT experts recommend using Cloud Computing technologies					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**38**	**15.1**	**15.1**	**15.1**
	2.00	**65**	**25.9**	**25.9**	**41.0**
	3.00	**55**	**21.9**	**21.9**	**62.9**
	4.00	**63**	**25.1**	**25.1**	**88.0**
	5.00	**30**	**12.0**	**12.0**	**100.0**
	Total	**251**	**100.0**	**100.0**	

Table below represents the awareness of the potential users of Iraqi communication and service sector pertaining to the global level adoption of cloud computing. It has been noted that 40 percent of the respondents acknowledged that majority of global companies have already adopted Cloud computing, while 33 percent disagreed with this prospect (Table 13). As a result, it also turns out to be a notable element that demands consideration with respect to the assessment of cloud adoption. (Table 14) presents another important construct determining the social influence over Cloud adoption. 38 percent of the respondents have knowledge of the

literature-based importance of the Cloud, while 35 percent are not aware of this prospect.

Table 14: Global Adoption of Cloud Computing

SI03 Most major companies around the world use Cloud Computing technology					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**46**	**18.3**	**18.3**	**18.3**
	2.00	**37**	**14.7**	**14.7**	**33.1**
	3.00	**67**	**26.7**	**26.7**	**59.8**
	4.00	**53**	**21.1**	**21.1**	**80.9**
	5.00	**48**	**19.1**	**19.1**	**100.0**
	Total	**251**	**100.0**	**100.0**	

Table 15: Research Strength on Cloud Computing

SI04 There are many studies and conferences that explain the importance of using Cloud Computing technology.					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**40**	**15.9**	**15.9**	**15.9**
	2.00	**47**	**18.7**	**18.7**	**34.7**
	3.00	**69**	**27.5**	**27.5**	**62.2**
	4.00	**55**	**21.9**	**21.9**	**84.1**
	5.00	**40**	**15.9**	**15.9**	**100.0**
	Total	**251**	**100.0**	**100.0**	

4.3.4 Facilitating Conditions

Another important construct has been of the facilitating conditions, as these conditions are greatly influential over the behaviour of the user (UB) towards Cloud. In this regard, it has been noted that almost 39 percent of the potential users have no means resources of using computing, while 40 percent of the respondents affirmed to this query (Table 15). Additionally, the respondents were also asked for their opinion

about the reliability of Cloud service providers (Table 16). It has been observed that the service providers are regarded as supportive by only 36 percent of the participants and 38 percent have not showed their trust in receiving support in times of difficulties (Table 16).

Table 16: Individual level Competence

FC01 Many resources that are necessary to use the Cloud computing are available					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**26**	**10.4**	**10.4**	**10.4**
	2.00	**70**	**27.9**	**28.0**	**38.4**
	3.00	**53**	**21.1**	**21.2**	**59.6**
	4.00	**71**	**28.3**	**28.4**	**88.0**
	5.00	**30**	**12.0**	**12.0**	**100.0**
	Total	**250**	**99.6**	**100.0**	
Missing	**System**	**1**	**0.4**		
Total		**251**	**100.0**		

Table 17: Credibility of Cloud Service Providers

FC02 In case of any difficulties occur with the cloud computing technology, service providers can offer me solution					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	37	14.7	14.7	14.7
	2.00	57	22.7	22.7	37.5
	3.00	67	26.7	26.7	64.1
	4.00	63	25.1	25.1	89.2
	5.00	27	10.8	10.8	100.0
	Total	251	100.0	100.0	

Moreover, the users' respective knowledge level, along with the institutional competence has also been assessed towards cloud adoption. Only 41 percent of the respondents considered them as capable of using Cloud (Table 17), and almost 44 percent of the potential users of cloud have responded in favour of their institutional competence towards Cloud integration (Table 18).

Table 18: Knowledge Level of Users

FC03 I think I have the knowledge necessary to use Cloud computing					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	43	17.1	17.3	17.3
	2.00	37	14.7	14.9	32.3
	3.00	65	25.9	26.2	58.5
	4.00	60	23.9	24.2	82.7
	5.00	43	17.1	17.3	100.0
	Total	248	98.8	100.0	
Missing	System	3	1.2		
Total		251	100.0		

Table 19: Institutional Competence for Cloud Adoption

FC04 The institution I work in has all the capabilities required to move to use Cloud computing					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**29**	**11.6**	**11.6**	**11.6**
	2.00	**46**	**18.3**	**18.4**	**30.0**
	3.00	**66**	**26.3**	**26.4**	**56.4**
	4.00	**59**	**23.5**	**23.6**	**80.0**
	5.00	**50**	**19.9**	**20.0**	**100.0**
	Total	**250**	**99.6**	**100.0**	
Missing	**System**	**1**	**0.4**		
Total		**251**	**100.0**		

4.4 Dependent Variables

4.4.1 Behavioural Intention

The dependent variable of Behavioural Intention (BI) has also been explored with specific constructs, besides the constructs of independent variables. 41 percent of the survey respondents have agreed that they would like to use cloud computing, while 41 percent of the respondents could not agree in this regard (Table 19). Moreover, 46 percent of the users have regarded cloud use challenging, while 29 percent have not agreed to the challenging prospect of cloud (Table 20). On the other hand, another significant construct determining the Behavioural intention towards cloud use has been the security element. Only 39 percent of the respondents have been found of the view that high security prospects of Cloud tend to positively affect the behavioural intention towards its adoption (Table 21).

Table 20: Willingness to use Cloud Computing

BI01 I would like to use Cloud Computing Technologies					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	37	14.7	14.7	14.7
	2.00	65	25.9	25.9	40.6
	3.00	46	18.3	18.3	59.0
	4.00	62	24.7	24.7	83.7
	5.00	41	16.3	16.3	100.0
	Total	251	100.0	100.0	

Table 21: Expected Challenging role of Cloud Computing

BI02 I believe that working with Cloud Computing Technologies would be Challenging to me					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	26	10.4	10.4	10.4
	2.00	47	18.7	18.7	29.1
	3.00	62	24.7	24.7	53.8
	4.00	90	35.9	35.9	89.6
	5.00	26	10.4	10.4	100.0
	Total	251	100.0	100.0	

Table 22: Expected Security Offered by Cloud Computing

BI03 High security available in cloud computing has positive effect on the behavioural intention to adopt					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**47**	**18.7**	**18.8**	**18.8**
	2.00	**39**	**15.5**	**15.6**	**34.4**
	3.00	**67**	**26.7**	**26.8**	**61.2**
	4.00	**59**	**23.5**	**23.6**	**84.8**
	5.00	**38**	**15.1**	**15.2**	**100.0**
	Total	**250**	**99.6**	**100.0**	
Missing	**System**	**1**	**0.4**		
Total		**251**	**100.0**		

4.4.2 User Behaviour

Besides the constructs of BI and FC, User Behaviour (UB) towards Cloud computing has also been analysed with distinctive queries. (Table 22) presents the factor of trust availability of cloud technology to be significantly affecting the user behaviour with 46 percent agreement. Moreover, 35 percent of the IT experts have agreed that they would aspire to provide cloud based services to their potential consumers across the communication and service sector of Iraq (Table 23). More specifically, 37 percent of the respondents have straight agreed that the facilitating conditions have direct impacts on their adoption of cloud computing (Table 24).

Table 23: Trust Availability of Using Cloud Computing

UB01 High trust availability of using Cloud computing are affected positively to the users' behavioural					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	27	10.8	10.8	10.8
	2.00	58	23.1	23.2	34.0
	3.00	50	19.9	20.0	54.0
	4.00	82	32.7	32.8	86.8
	5.00	33	13.1	13.2	100.0
	Total	250	99.6	100.0	
Missing	System	1	0.4		
Total		251	100.0		

Table 24: Likelihood of Using Cloud

UB02 The use of cloud computing is a service I aspire to provide					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	42	16.7	16.8	16.8
	2.00	59	23.5	23.6	40.4
	3.00	61	24.3	24.4	64.8
	4.00	60	23.9	24.0	88.8
	5.00	28	11.2	11.2	100.0
	Total	250	99.6	100.0	
Missing	System	1	0.4		
Total		251	100.0		

Table 25: Facilitating Conditions and Cloud Computing

UB03 Facilitating condition affects positively the use behaviour of cloud computing services					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1.00**	**35**	**13.9**	**14.1**	**14.1**
	2.00	**42**	**16.7**	**16.9**	**30.9**
	3.00	**79**	**31.5**	**31.7**	**62.7**
	4.00	**48**	**19.1**	**19.3**	**81.9**
	5.00	**45**	**17.9**	**18.1**	**100.0**
	Total	**249**	**99.2**	**100.0**	
Missing	**System**	**2**	**0.8**		
Total		**251**	**100.0**		

4.5 Descriptive Statistics

By means of mean and standard deviation as the descriptive statistics, it is affirmed that people have rated high (as Agree) to the constructs of the survey. The values of standard deviation are minimum that supports the assertion based on gaining considerable agreeing responses on average (Table below).

Table 26: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PE01	**250**	**1.00**	**5.00**	**2.7320**	**1.08113**
PE02	**250**	**1.00**	**5.00**	**3.2760**	**1.15810**
PE03	**246**	**1.00**	**5.00**	**207846**	**1.46187**
PE04	**248**	**1.00**	**5.00**	**3.2702**	**1.30539**
PE05	**251**	**1.00**	**5.00**	**3.2590**	**1.10665**
EE01	**250**	**1.00**	**5.00**	**2.8640**	**1.25371**
EE02	**250**	**1.00**	**5.00**	**3.2000**	**1.22556**
EE03	**251**	**1.00**	**5.00**	**2.8685**	**1.33066**
EE04	**251**	**1.00**	**5.00**	**3.2629**	**1.30942**
SI01	**251**	**1.00**	**5.00**	**3.0797**	**1.26239**
SI02	**251**	**1.00**	**5.00**	**2.9283**	**1.26287**
SI03	**251**	**1.00**	**5.00**	**3.0797**	**1.36295**
SI04	**251**	**1.00**	**5.00**	**3.0319**	**1.29884**
FC01	**250**	**1.00**	**5.00**	**3.0360**	**1.21019**
FC02	**251**	**1.00**	**5.00**	**2.9442**	**1.22510**
FC03	**248**	**1.00**	**5.00**	**3.0927**	**1.44296**
FC04	**250**	**1.00**	**5.00**	**3.2200**	**1.28147**
BI01	**251**	**1.00**	**5.00**	**3.0199**	**1.32499**
BI02	**251**	**1.00**	**5.00**	**3.1713**	**1.16212**
BI03	**250**	**1.00**	**5.00**	**3.0080**	**1.32626**
UB01	**250**	**1.00**	**5.00**	**3.1440**	**1.22690**
UB02	**250**	**1.00**	**5.00**	**2.8920**	**1.26123**
UB03	**249**	**1.00**	**5.00**	**3.1044**	**1.28151**
Valid N (List Wise)			**229**		

- **PE01** Cloud computing affects positively the use behaviour in e-services sector.
- **PE02** Performance expectancy positively affects the users' behavioural intention to use cloud computing as services.
- **PE03** The Use of Cloud computing, provided by my institution, increases productivity.
- **PE04** Cloud computing would improve performance in communication and service sector.
- **PE05** Cloud computing would enable tasks accomplishment in time manner.
- **EE01** Cloud computing Technology is clear and easy to understand.
- **EE02** It is easy to become skilful at using the Cloud computing Technology.
- **EE03** Cloud computing Technology helps reduce the effort to manage resources.
- **EE04** Cloud computing Technology Reduces the cost of delivering communication service and e-service
- **SI01** Most workers in communication service and e-service think it is a good idea to use Cloud Computing as a service.
- **SI02** Most ICT experts recommend using Cloud Computing technologies.
- **SI03** Most major companies around the world use Cloud Computing technology.
- **SI04** There are many studies and conferences that explain the importance of using Cloud Computing technology.
- **FC01** Many resources that are necessary to use the Cloud computing are available**.**
- **FC02** In case of any difficulties occur with the cloud computing technology, service providers can offer me solution**.**
- **FC03** I think I have the knowledge necessary to use Cloud computing**.**
- **FC04** The institution I work in has all the capabilities required to move to use Cloud computing**.**
- **BI01** I would like to use Cloud computing technologies.
- **BI02** I believe that working with Cloud computing technologies would be challenging to me**.**
- **BI03** High security available in cloud computing has positive effect on the behavioural intention to adopt**.**
- **UB01** High trust availability of using Cloud computing are affected positively to the users' behavioural**.**
- **BI01** I would like to use Cloud computing technologies**.**
- **UB02** The use of cloud computing is a service I aspire to provide**.**
- **UB03** Facilitating condition affects positively the use behaviour of cloud computing

4.6 Correlation Analysis

Afterwards, Correlation analysis (two-tailed test) has been performed to examine the association between the given constructs. Table 26 shows that user behaviour (UB) is significantly and positively correlated with performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) at 0.01 level. These variables, under that UTAUT model, are also having significant positive association with Behavioural intention (BI). It suggests that increasing performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) with respect to cloud computing positively influence user behaviour and enhance behavioural intention to use the service.

Table 27: Pearson Correlation

Correlations							
		PE	**EE**	**SI**	**FC**	**UB**	**BI**
PE	**Pearson Correlation**	**1**	**.605****	**.514****	**.497****	**.410****	**.580****
	Sig. (2-tailed)		**.000**	**.000**	**.000**	**.000**	**.000**
	N	**251**	**251**	**251**	**251**	**251**	**251**
EE	**Pearson Correlation**	**.605****	**1**	**.532****	**.559****	**.488****	**.528****
	Sig. (2-tailed)	**.000**		**.000**	**.000**	**.000**	**.000**
	N	**251**	**251**	**251**	**251**	**251**	**251**
SI	**Pearson Correlation**	**.514****	**.532****	**1**	**.524****	**.459****	**.442****
	Sig. (2-tailed)	**.000**	**.000**		**.000**	**0.000**	**.000**
	N	**251**	**251**	**251**	**251**	**251**	**251**
FC	**Pearson Correlation**	**.497****	**.559****	**.524****	**1**	**.417****	**.497****
	Sig. (2-tailed)	**.000**	**.000**	**.000**		**.000**	**.000**
	N	**251**	**251**	**251**	**251**	**251**	**251**
UB	**Pearson**	**.410****	**.488****	**.459****	**.417****	**1**	**.361****
	Correlation						
	Sig. (2-tailed)	**.000**	**.000**	**.000**	**.000**		**.000**
	N	**251**	**251**	**251**	**251**	**251**	**251**
BI	**Pearson Correlation**	**.580****	**.528****	**.442****	**.497****	**.361****	**1**
	Sig. (2-tailed)	**.000**	**.000**	**.000**	**.000**	**.000**	
	N	**251**	**251**	**251**	**251**	**251**	**251**
**. Correlation is significant at the 0.01 level (2-tailed).							

4.7 Regression Analysis

Followed by the confirmed presence of correlation among the identified variables, multiple regression analysis has yielded the respective relationships in between the variables under consideration.

4.7.1 For Behavioural Intention (BI) - Dependent Variable

For BI as the dependent variable (under the influence of SI, EE, and PE as the independent variables), the value of R has is 0.629; thus, representing the correlation to be stronger (closer to 1). Besides, it asserts that almost 39 percent of variance is explained by the set of predictors (Table 27). Moreover, ANOVA test has also been run on the resulting values that have led to F-test value, at the significant value of 0.05. (Table 28) represents that the sig value for ANOVA test is considerably less than 0.05; thus, affirming the presence of significant relationship between the variables under consideration.

Table 28: Model Summary for Behavioural Intention

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	**.629[a]**	**.396**	**.389**	**.48966**
a. Predictors: (Constant), SI, PE, EE				

Table 29: ANOVA Test for Behavioural Intention

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	**38.871**	**3**	**12.957**	**54.039**	**.000[b]**
	Residual	**59.222**	**247**	**.240**		
	Total	**98.093**	**250**			
a. Dependent Variable: BI						
b. Predictors: (Constant), SI, PE, EE						

After confirming the significance of the overall regression model, t-test has been carried out to assess the impact of individual independent variables on the dependent variable (Table 29). The impacts of PE and EE as the independent variables have been significant on BI, since the sig value is 0.00 (lower than 0.05), and SI is also affirmed to be impacting the BI of cloud computing to some extent across the communication and service sector of Iraq with 0.042 sig value (closer to 0.05).

Table 30: Coefficients for Regression among PE, EE,SI and Dependent Variable: BI

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	**(Constant)**	**.568**	**.203**		**2.794**	**.006**
	PE	**.416**	**.072**	**.373**	**5.758**	**.000**
	EE	**.254**	**.070**	**.236**	**3.602**	**.000**
	SI	**.142**	**.070**	**.124**	**2.040**	**.042**
a. Dependent Variable: BI						

4.7.2 For User Behaviour (UB) - Dependent Variable

UB being dependent on the independent variables of BI and FC has acquired R value of 0.454 (Table 31); thus, representing moderate level of correlation (with almost 20 percent of variance explained). Consequently, (Table 31) has affirmed the impact of BI, and FC on UB with sig value of 0.00 (less than 0.05 sig value).

Table 31: Model Summary for User Behaviour

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	**.454[a]**	**.206**	**.199**	**.62881**
a. Predictors: (Constant), BI, FC				

Table 32: ANOVA test for User Behaviour

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	**25.394**	**2**	**12.697**	**32.111**	**.000[b]**
	Residual	**98.060**	**248**	**.395**		
	Total	**123.454**	**250**			
a. Dependent Variable: UB						
b. Predictors: (Constant), BI, FC						

Afterwards, t-test has confirmed the relationship between the variables at an individual level (Table 32). The impacts of BI and FC have been significant on UB as reflected from the sig. values of less than 0.05.

Table 33: Coefficients for Regression among FC, BI and Dependent variable UB

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.018	.259		3.927	.000
	FC	.439	.091	.316	4.846	.000
	BI	.229	.073	.204	3.133	.002
a. Dependent Variable: UB						

The variance in intention to use has been noticed to be 70% better in the UTAUT model than any of TAM sole study, Venkatesh [78]. Moreover, the UTAUT model's standards combine many scales from earlier methods, where their feasibility has been tested. Thus, the UTAUT model shows great chances of providing an improved understanding of the adoption of a specific technology.

CHAPTER 5

CONCLUSION AND FUTURE WORK

Technology integration has been the most considered element across the existing business models, across the developed and even developing states as well. It represents that the increasing pace of technology advancement has been compelling the industries to get aligned with its implications. Among the mostly adopted technology, cloud computing has been significant across diverse industries or businesses. Accordingly, the current study has explored the impacts of cloud computing or service deployment on the communication and service sector of Iraq, along with identifying the challenges or the constraints faced in the activation of cloud computing. The researcher has adopted the methodology of quantitative survey for this research purpose, which has resulted in gaining valued results. The credibility of the research is governed from the prospect that the researcher has vigilantly targeted IT experts with respect to their willingness of deploying cloud across the communication and service sector of Iraq.

The researcher has conducted a thorough research across the past studies, in order to present insightful information and knowledge of the technology of cloud. It has been acknowledged that cloud computing offers exceptional benefits to the communication and service sector. However, Iraq being potentially behind in terms of internet penetration and technology awareness turns out to pose certain challenges or constraints pertaining to the intended deployment of cloud computing across its communication and service sector. Therefore, the study has prudently implied the UTAUT model for assessing the likelihood of successful cloud computing deployment across the targeted sector of Iraq. For this purpose, the survey questionnaire has been developed focusing the essential constructs of UTAUT model, including Performance Expectancy (PE), Efforts Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC), as the Independent variables, and Behavioural Intention (BI) and User Behaviour (UB) as the dependent variables, with certain external variables of Gender, Age, Experience, and Voluntariness of use. According

to the results of the regression analysis, the impact of performance expectancy (PE), effort expectancy (EE), social influence (SI) is statistically significant on behavioral intention. Moreover, the influence of facilitating conditions (FC) and behavioral intention (BI) is significant on user behavior (UB) towards cloud computing. It suggests these factors play an important role, in the view of the IT experts, to enhance cloud computing acceptance and usage.

The study also sought to answer these questions:

What is the significance of cloud computing in controlling the business and management needs of the organisations?

What are the expected effects of cloud computing for communication and service sector?

What have been the challenges affecting the implementation of cloud computing in the Telecom and Service sector of Iraq?

How the challenges or the constraints encountered in implementing cloud computing in the Telecom and Service sector of Iraq can be mitigated?

5.1 Findings:

This section will synthesize the empirical findings to answer the study's research questions through a survey conducted on 251 IT experts in the Iraqi high educational institutes and other institutions. According to the needs of the cloud computing importance, the survey questionnaire was designed with respect to the conceptual framework of UTAUT model. Many external variables affected the results such as gender, age, experience, and voluntariness of use.

It has been noted that female presence across the IT is lower than males. Education level has had their impacts on the survey, the results showed that most of the respondents have higher education levels (Master Degree and Higher Diploma). Age is influential too, majority of the respondents are young and middle-aged adults.

The respondents' experience has been also assessed to measure willingness of voluntariness of using the innovation in the ICT service sector in addition to voluntariness of use of cloud computing across the ICT service field.

Besides, the aforementioned impacts of the external variables of gender, age, experience, and voluntariness of use, the dependent variables of Behavioural Intention (BI), and User Behaviour (UB) are also assessed in terms of the

independent variables of Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). In accordance with the adopted conceptual framework of UTAUT model in this particular study, it has been contended that the BI is dependent on the independent variables of PE, EE, and SI, while UB is determined by the independent variable of FC and the dependent variable of BI.

5.2 Limitation

The study is based on limited sample size, which may influence generalisability of the results to the entire population. Moreover, it does not account demographic factors such as income level, marital status, occupation, etc., in the estimation process.

Also, the time was one of the limitations, since this study was limited in the certain period. Furthermore, the current research was limited studying the public sector without involved the privet sector.

Another limitation of the study is the selected sampling technique, i.e. convenience sampling, which may not consider the principle of representativeness (equal chance of selection).

5.3 Conclusion

In the light of presented findings, we conclude that the potential impact of applying cloud computing in the IT sector in Iraq can give us enormous benefits in spite of the challenges the encounter deploying ICT. Therefore, the following research questions targeted in the study have been approached and encouraging positive answers have been found:

What is the significance of cloud computing in controlling the business and management needs of the organisations?

There are many benefits of deploying cloud computing in an organization represented by reducing the costs because every device in the organization could reach the cloud with high processing pace in any time everywhere. Moreover, there is no need for maintenance as with real physical environment.

What are the expected effects of cloud computing for communication and service sector?

Simplicity in getting the tasks done is aligned with the cloud computing technology. Credibility of results is also inherited with that innovation in addition to high level of security.

What have been the challenges affecting the implementation of cloud computing in the Telecom and Service sector of Iraq?

People can be number challenge of almost new technology, the fear of using it, the consequences and even more the benefits. In Iraq specifically, the infrastructure Telecommunication sector is considered low in comparison to the neighbor countries.

How the challenges or the constraints encountered in implementing cloud computing in the Telecom and Service sector of Iraq can be mitigated?

The challenges can be mitigated through educating and training people in general and employees in particular, and informing them about the positive factors of deploying cloud computing technology. Consequently, it affects the IT sector and puts it in an up to date with the rest of the advance states.

5.4 Recommendations

The collected findings across the sample size of 251 IT experts, based on the dependent and dependent variables of UTAUT model, have been analysed in terms of frequencies, descriptive statistics, correlation, and regression analysis techniques. It has been established that the average ratings on the scale of 1-5 (Disagree-Agree) represent agreeing perspectives, as interpreted from the Descriptive statistics of Mean and Standard Deviation. Consequently, the analysis techniques of correlation and regression have also yielded significant results in terms of ascertaining the relationships in between the identified independent and dependent variables of EE, PE, SI, FC, BI, and UB, in a respective manner.

Nonetheless, it has also been established that the implications of cloud computing are not considerably comprehended among the IT experts. Accordingly, certain recommendations are presented to the responsible personnel, in order to enhance the adoptability of cloud computing across the communication and service sector of Iraq. The credibility of cloud computing needs to be elucidated for its potential implications in terms of enhanced productivity, efficiency, and feasibility as well; thus, requiring relevant training sessions and awareness programs. More specifically, the concerns of reliability or trustworthiness of cloud computing must

be mitigated, as it has been observed to be suspected for its integrity in terms of secure procedures.

5.5 Future Work

Since this research included several limitations, so we can suggest some recommendations for future studies as follow:

1- Using a larger sample size may lead to better generalisability of the results to the entire population.

2- Selecting another sampling technique for increasing the sample representative.

3- Involving other demographic factors that are not included in this study, such as income level, marital status, occupation, etc., in the estimation process.

4- Conducting the same research in the privet sector may give a good comparison about the degree of effectiveness of cloud computing on these two sectors.

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Appendix

QUESTIONNAIRE FORM

CLOUD COMPUTING IMPACT ON COMMUNICATION AND SERVICE SECTOR: IRAQ CASE STUDY

This questionnaire is prepared regarding my Master's Degree. Answering the questionnaire will only take 10-15 minutes of your time; meanwhile I am sure the results which will be obtained by this questionnaire will have an important positive effect on Evaluating the CLOUD COMPUTING IMPACT ON COMMUNICATION AND SERVICE SECTOR: IRAQ CASE STUDY. Since the data obtained from the survey will be used for scientific objectives, there is no need for your identity information. It will be highly appreciated if you answer all the questions without leaving any blanks. Thank you for your contribution.

EXTERNAL VARIABLES

Demographic Information

i. **Gender**

- ☐ Male
- ☐ Female

ii. **Education level**

- ☐ Ph. D.
- ☐ Master
- ☐ Bachelor
- ☐ Higher Diploma
- ☐ High School
- ☐ Not education

iii. **Age group**

☐ Under 18

☐ 18-25

☐ 25-45

☐ 45 or more

iv. Experience in ICT Service Field

☐ Have not used a cloud computing

☐ Less than a year

☐ 1-3 years

☐ 3-5 years

☐ 3-5 years

☐ More than 5 years

v. Voluntariness work in ICT Service Field and Cloud Computing

☐ Yes

☐ No

☐ I would do it if there was a suitable opportunity to do so

Performance Expectancy (PE)

Cloud computing has been developed as a model that would enable convenient and ubiquitous access to the on-demand networks that are facilitated in terms of shared pool of services having configurable computations. The shared pool includes the networks, storage, servers, and the services and applications that are offered as a service to the consumers, service potential of the cloud is affirmed to facilitate the needs of almost all the business and service sectors. It brings in the concept of

Anything-as-a-Service.

Performance Expectancy (PE)					
PE01 Cloud computing positively affects the use behaviour in e-services sector					
PE02 Performance Expectancy positively affects the users' behavioural intention to use cloud computing as services					
PE03 The Use of Cloud computing, provided by my institution, increases productivity					
PE04 Cloud computing would improve performance in communication, service sector.					
PE05 Cloud computing would enable tasks accomplishment in time manner					

Effort Expectancy

Cloud computing has been developed as a model that would enable convenient and ubiquitous access to the on-demand networks that are facilitated in terms of shared pool of services having configurable computations. The shared pool includes the networks, storage, servers, and the services and applications that are offered as a service to the consumers, service potential of the cloud is affirmed to facilitate the needs of almost all the business and service sectors. It brings in the concept of Anything-as-a-Service.

Effort Expectancy (EE)					
EE01 Cloud computing Technology is clear, easy to understand					
EE02 It is easy to become skilful at using the Cloud computing Technology					
EE03 Cloud computing Technology helps reduce the effort to manage resources					
PE04 Cloud computing Technology Reduces the cost of delivering communication service and e-service					

Social Influence

Cloud computing has been developed as a model that would enable convenient and ubiquitous access to the on-demand networks that are facilitated in terms of shared pool of services having configurable computations. The shared pool includes the networks, storage, servers, and the services and applications that are offered as a service to the consumers, service potential of the cloud is affirmed to facilitate the needs of almost all the business and service sectors. It brings in the concept of Anything-as-a-Service.

Social Influence (SI)					
SI01 Most workers in communication service e-service think, it is a good idea to use Cloud Computing as a service.					
SI02 Most ICT experts recommend using Cloud Computing technologies.					
SI03 Most major companies around the world use Cloud Computing technology.					
SI04 There are many studies, conferences that explain the importance of using Cloud Computing technology.					

Facilitating Conditions (FC)

Cloud computing has been developed as a model that would enable convenient and ubiquitous access to the on-demand networks that are facilitated in terms of shared pool of services having configurable computations. The shared pool includes the networks, storage, servers, and the services and applications that are offered as a service to the consumers, service potential of the cloud is affirmed to facilitate the needs of almost all the business and service sectors. It brings in the concept of Anything-as-a-Service.

Facilitating Condition (FC)					
FC01 Many resources that are necessary to use the Cloud computing are available.					
FC02 In case of any difficulties occur with the cloud computing technology, service providers can offer me solution.					
FC03 I think I have the knowledge necessary to use Cloud computing.					
FC04 The institution I work in has all the capabilities required to move to use Cloud computing.					

Use Behaviour

Cloud computing has been developed as a model that would enable convenient and ubiquitous access to the on-demand networks that are facilitated in terms of shared pool of services having configurable computations. The shared pool includes the networks, storage, servers, and the services and applications that are offered as a service to the consumers, service potential of the cloud is affirmed to facilitate the needs of almost all the business and service sectors. It brings in the concept of Anything-as-a-Service.

Use Behavioural (UB)					
UB01 High trust availability of using Cloud computing are affected positively to the users' behavioural.					
UB02 The use of cloud computing is a service I aspire to provide.					
UB03 Facilitating condition affects positively the use behaviour of cloud computing services.					

Behavioural Intention (BI)

Cloud computing has been developed as a model that would enable convenient and ubiquitous access to the on-demand networks that are facilitated in terms of shared pool of services having configurable computations. The shared pool includes the networks, storage, servers, and the services and applications that are offered as a service to the consumers, service potential of the cloud is affirmed to facilitate the needs of almost all the business and service sectors. It brings in the concept of Anything-as-a-Service.

Behavioural Intention (BI)					
BI01 I would like to use Cloud Computing Technologies.					
BI02 I believe that working with Cloud Computing Technologies would be Challenging to me.					
BI03 High security available in cloud computing has positive effect on the behavioural intention to adopt.					

Thank you for your contribution to this research

CURRICULUM VITAE

PERSONAL INFORMATION

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EDUCATION

Degree	Institution	Year of Graduation
M.Sc.	Çankaya University	2018
B.Sc.	Al-Turath University College	2013
High School	Secondary al-warka	2009

FOREIN LANGUAGES

- English: Good
- Turkish: Intermediate
- Arabic: Native

HOBBIES

- Traveling.
- Reading.
- Computing.
- Photographer.
- Reading poets.
- Running.