THE IMPACT OF CLOUD COMPUTING IN DELIVERING SUSTAINABLE BUSINESS WELFARES AS PART OF A GREEN ICT STRATEGY IN DEVELOPING COUNTRIES

BAWAR HADI SALIH

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Submitted by: **Bawar Hadi SALIH**

Approval of the Graduate School of Natural and Applied Sciences, Çankaya University.

Prof. Dr. Can ÇOĞUN
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

Prof. Dr. Erdoğan DOĞDU
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

Assoc. Prof. Dr. Reza HASSANPOUR
Supervisor

Examination Date: 11.01.2018

Examining Committee Members

Assoc. Prof. Dr. Reza HASSANPOUR	(Çankaya Univ.)	
Prof. Dr. Mehmet TOLUN	(Başkent Univ.)	
Assist. Prof. Dr. Sibel TARIYAN	(Çankaya Univ.)	

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Name, Last Name	:	Bawar, Baban
Signature	:	
Date	:	11.01.2018

ABSTRACT

THE IMPACT OF CLOUD COMPUTING IN DELIVERING SUSTAINABLE BUSINESS WELFARES AS PART OF A GREEN ICT STRATEGY IN DEVELOPING COUNTRIES

Bawar Hadi SALIH

M.Sc., Department of Computer Engineering

Supervisor: Assist. Prof. Dr. Reza Hassanpour

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The research is intended to assess the role of cloud computing in delivering sustainable business welfare in the developing countries, specifically in Iraq. In order to collected pertinent information, the researcher had adopted quantitative research approach. In this account, primary data was collected by conducting a survey with 152 IT professionals, working in the Iraqi companies. However, secondary data was collected through pertinent literature, by accessing Google Scholar and EBSCOhost. The collected data was analysed by using descriptive analysis. The analysis has revealed that cloud computing has great significance in the implementation of green ICT strategy; however, Iraqi companies are needed to put more focus on the improvement of their employee's skills and expertise so as to accelerate cloud adoption in Iraq.

Keywords: C*loud Computing, Green ICT Strategy Green ICT strategy, Heek's Factor, EBSCOhost, Google Scholar, Google form.*

ÖZ

BULUT BILIŞIM TEKNOLOJİSİNİN, GELİŞMEKTE OLAN ÜLKELERDE YEŞİL BİT STRATEJİ OLARAK SÜRDÜRÜLEBILIR İŞ REFAHI SAĞLAMA KONUSUNDAKİ ETKİSİ

Bawar Hadi SALIH
Yüksek Lisans, Bilgisayar Mühendisliği Anabilim Dalı
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Bu araştırmada gelişmekte olan ülkelerde ve özellikle Irak'taki sürdürülebilir iş refahı sağlama konusundaki bulut bilişim işleminin rolünü analiz ve değerlendirmek amacıyla hazırlandı. Konuyla ilgili bilgileri elde etmek için araştırmacı Nicel Araştırma yaklaşımını kullanmıştır. Bu araştırmadaki birincil veriler, Irak şirketlerinde çalışan 152 Bilgi Tekonoloji uzmanlarıyla anket yapılarak toplanmıştır. Bununla birlikte, ikincil veriler, Google E-Ögrenim ve EBSCOhost'a erişerek ilgili literatürlerden toplanmıştır. Toplanan veriler Açıklayıcı Analiz yöntemini kullanarak analiz edilmiştir. Araştırmalar Bulut Bilgileri işleminin yeşil BİT stratejisinin uygulanmasında büyük önem taşıdığını ortaya koymuştur; bununla birlikte, Irak'taki şirketlerin bulut benimsenmesini geliştirmek için çalışanlarının beceri ve uzmanlıklarının geliştirilmesine daha fazla odaklanmaları gerektiğini öne koymuştur.

Anahtar Kelimeler: B*ulut bilişim, Yeşil BİT stratejisi, Yeşil BİT Stratejisi, Heek'in Faktörü, EBSCOhost, Google Akademik, Google formu.*

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- CO2 Carbon Dioxide
- ICT Information And Computer Technology
- IT Information Technology
- NIST The National Institute Of Standards And Technology
- PaaS Platform as a Service
- TBL Triple Bottom Line

CHAPTER 1

INTRODUCTION

1.1. Introduction

The chapter incorporates information about the overall plan for conducting research on the impact of cloud computing in delivering sustainable business welfare as part of the green ICT strategy in developing countries. However, amid all of the developing countries, the main focus of the study would be in Iraq. In particular, the present study critically analyses whether adopting a cloud computing model, as part of the green ICT strategy, can help the businesses in achieving sustainability benefits while reducing cost and increasing operational efficiencies. The section includes the detailed background information about the selected topic of research. The purpose of carrying out this activity is to critically analyse the current situation and trends in the ICT industry. In addition to this, some of the other sections of the chapter include research problem, research aim and objectives, research questions, the significance of the research, as well as the research methodology that has been selected for accomplishing the research objectives.

1.2. Background

It is a fact that rapid development in the corporate sector has commendably contributed in the economic growth, but it has also resulted in degrading the natural environment. It is mainly due to the increased consumption of energy and overuse of natural resources. After considering the severity of the situation, the organisations have started to bring changes in their day-to-day practices, in terms of adopting

environment-friendly and sustainable practices. In other words, sustainable development has become one of the greatest priorities of the organisations. This situation has led the organisations towards the optimisation of their social, ecological, and economic objectives for ensuring lasting efficiency of organisational activities. It is significant to bring into the notice that these three aspects (i.e., social, ecological, and economical) are referred as TBL (Triple Bottom Line). TBL is found to be one of the greatest ways for the organisations to bring higher levels of sustainability in their day-to-day operations. It is observed that the adoption of the sustainable strategies do not only allow the businesses to minimise their environmental impact, but these strategies also result in increasing the overall competitiveness of the business (Rivera and Kurnia, 2016).

One of the most prominent initiatives that have been taken by the organisations to bring sustainability into their operations is the inclusion of ICT (information and computer technology). ICTs can be understood as networks, communication devices, software, hardware, etc. These elements help the organisations in sharing, manipulating, processing, and capturing organisational information in a more efficient and sustainable manner. Specifically, in the context of sustainability, ICT facilitates the organisations to utilise, monitor, analyse, capture, and standardise their information that ultimately leads them towards taking sustainable actions for the betterment of the planet, society, as well as for their business. ICT also assists the organisations in reducing their energy utilisation, simply by dematerialisation, like through the replacement of physical systems and data centres to virtual platforms (specifically cloud computing) (Rivera and Kurnia, 2016). In short, it can be said that ICT is greatly facilitating the businesses to minimise their environmental impacts, specifically through the adoption of sustainable tools/technologies.

The widespread benefits of ICT have played a critical role in increasing its adoption, both in private and corporate sector. This situation has ultimately resulted in speeding up the hardware production demands; thereby, impacting environmental sustainability due to the increased energy consumption. It is established from the research work of Wabwoba, Wanyembi, and Omuterema (2012) that increased energy consumption is the biggest contributor to poor climatic conditions, mainly due to the increased emission of sulphur, carbon dioxide, and other hazardous

pollutants that are produced during electricity generation. Besides that, the rapid technological evolution has also played a major role in minimising the lifecycle of ICT devices that accelerate obsolescence of the devices. Later on, these obsolescence devices are exported to the developing countries, which are reused and often discarded in the form of e-waste. This e-waste is found to be responsible for posing devastating impacts on the environment. The worsening situation has led the organisations and businesses towards considering green ICT to overcome such challenges.

According to Wabwoba, Wanyembi, and Omuterema (2012), green ICT has great relevance in minimising the environmental impact of disposing of, using, manufacturing, and designing servers, computers, and associated sub-systems. However, during the transition of conventional ICT into green or sustainable ICT, it is important for the ICT professionals fully understand the outcomes and benefits that can be achieved through the implementation of sustainable or green ICT (Wabwoba et al, 2013). Without the contribution of the ICT professionals, it is merely impossible to get benefited from green ICT. Kaleem, Jain, and Husain (2017) had discussed the need of green ICT while highlighting the contribution of ICT sector in impacting the environmental sustainability. According to the findings of the study, in the year 2007, 14 per cent of the ICT emissions were caused due to data centres. These included both, the internet data centres and corporate data centres that require excessive energy for cooling purposes as well as to provide power to the data centres. In order to overcome these challenges, the concept of cloud computing emerged that had played an ineviTable role in creating green ICT infrastructure. The concept of cloud computing has enabled the businesses and organisations to convert their conventional datacentres into “Greenfield”. This initiative had resulted in minimising the requirement of excessive power consumption, as the data is stored on virtual platforms. In more precise words, it can be affirmed that the emergence of cloud computing has played an ineviTable role in creating a green ICT infrastructure by means of reducing hazardous emissions by thirty to ninety per cent. Some of the other benefits that cloud computing offer to the businesses include business agility, higher efficiency, and reduced operational cost (Kaleem, Jain, and Husain, 2017).

1.3. Problem Statements

The emergence and continual evolution of information and communication technology have played a major role in permeating all sectors. This situation has ultimately resulted in increasing the adoption rate of the ICT technologies. Though it is a good sign for the growth and betterment of world's economy, but it has become the greatest threat to the eco-system (Wabwoba et al, 2013). The increased consumption of energy is severely impacting the environmental conditions, as the majority of the businesses are reliant on their data centres that need increased power for their operations (Gholamhosseinian and Khalifeh, 2012). In short, it can be stated that ICT has undeniably contributed to the economic growth of the world, but it has indirectly impacted the overall utilisation of energy and natural resources. The severity of the situation can be understood by considering the fact that ICT's total energy consumption cannot be estimated. Therefore, on the basis of these evidence it can be affirmed that ICT plays a dual role in today's world. On the one hand, information and communication technologies are enabling the government and non-government organisations to efficiently operate and provide their services in the best possible manner. On the other hand, it is causing severe harm to the environment by emitting greenhouse gases, specifically due to the increased utilisation of energy and natural resources (HMGovernment, 2011). ICT tools and technologies are operated on increased amounts of energy and it is continually increasing with the passage of time. Data centres have gained considerable attention in this regard because of consuming more power (electricity), as compared to other ICT tools (Houghton, 2010).

Therefore, on the basis of these evidence, it has been identified that it is now the greatest need of the time to take optimal initiatives to convert conventional ICT into green and sustainable ICT. In this regard, cloud computing has been emerged as the savour, in terms of enabling the organisations to continue delivering their services without consuming excessive energy; thereby, conserving environmental sustainability and saving overall operational cost (HMGovernment, 2011). However, there is an intense need to increase awareness about the benefits and contribution of cloud computing in delivering sustainable business welfare, as part of the green ICT strategy, especially in the developing countries. Specifically, in Iraq, the adoption of

cloud computing has greatly been affected by the unavailability of skilled staff, proper network infrastructure, and lack of knowledge (Wahsh and Dhillon, 2015).

1.4. Research Aim and Objectives

The aim of the present research work is to analyse the role of cloud computing, being a part of green ICT strategy, to deliver sustainable business welfare in developing countries, specifically in Iraq. In order to successfully accomplish this research aim, following objectives have been developed.

- To assess the energy consumption of ICT tools, like servers, call manager, video conference, network devices etc.;
- To analyse the role of cloud computing, (specifically cloud computing), in increasing end-user productivity and collaboration;
- To examine the role of cloud computing in improving business agility;
- To analyse the success factors of adopting cloud computing;
- To assess the role of cloud computing in providing sustainability benefits to the businesses, while reducing cost and increasing their operational efficiencies;
- To inspect the contribution of cloud computing to improving the continuity and reliability of business operations in Iraq;
- To recognise the ability of cloud computing services in improving service delivery models in Iraq;
- To understand the reasons behind low consumption of cloud computing services by Iraqi businesses;

1.5. Research Questions

The present study is intended to answer following research questions.

RQ1: How green ICT (specifically cloud computing) increases end-user productivity and collaboration when using cloud computing services?

RQ2: Can cloud computing improve continuity and reliability of business operations?

RQ3: How can cloud computing improve business agility?

RQ4: Can green ICT strategy motivate the businesses to transfer their operations from on-premise to cloud computing services in the developing countries?

RQ5: Can cloud computing service improve service delivery models in developing countries?

RQ6: What are the success factors of adopting cloud computing?

RQ7: Do cloud computing contribute in providing sustainability benefits to the businesses while reducing cost and increasing operational efficiencies.

1.6. Significance of the Research

In the contemporary era, ICT is playing a pivotal role in driving growth, productivity, and innovation within the organisations. ICT sector is continually growing and it is expected that it would comprise of 8.7 per cent of the global GDP by the end of 2020 (Ozturk et al, 2011). On one hand, ICT is significantly helping the businesses in increasing the efficiency and agility of their operations. On the other hand, it is causing severe problems to the eco-system. It is due to the fact that IT and computer infrastructure consume a significant amount of energy that exerts pressure on the grid stations to produce more electricity so as to fulfil the increasing energy needs. The situation ultimately results in impacting the integrity of the environment, in terms of increasing greenhouse gas emissions. Regardless of this, the disposal and production of the ICT hardware also impact the environmental conditions. Therefore, it can be stated that ICT is one of the biggest factors that are contributing to the environmental problems. To counter these issues, the concept of green ICT has emerged that is solely aimed at reducing the impacts of ICT tools on the environment, while improving the performance of the business sector. However, there are certain misconceptions about green ICT that restricts the organisations from its adoption. According to research work of Brooks, Wang, and Sarker (2010) green IT possesses a number of benefits, but there exist some issues that are important to be managed on priority. One of the biggest issues is associated with the wrong perception of the organisations towards green ICT.

The organisations consider sustainable ICT initiatives as overheads, instead of an opportunity. It is a fact that the green initiatives are attracting the businesses and organisations, but the IT departments, executives, and IT professionals are feeling burdened by the green philosophy (Murugesan, 2008). In this regard, Jenkin,

McShane, and Webster (2011) had contended that there are mainly four gaps that are restricting the IT professionals to replace traditional ICT systems to green systems. The four gaps, identified by the researcher included ‘knowledge-doing gap’, ‘opportunity gap’, ‘practice gap’, and ‘knowledge gap’. In terms of knowledge-doing gap, the IT professionals need to be learned enough to successfully implement green IT practices within the organisation. On the other hand, opportunity-gap signifies that the professionals have not realised and acknowledged the role of green ICT in contributing to the environmental sustainability, improved business operations, and reduced operational cost. However, practice gap signifies that the professionals do not know about the best practices of implementing green ICT. The knowledge gap indicates that the professionals are totally unaware of the sustainability and cost efficiency-related benefits of ICT (Jenkin, McShane, and Webster, 2011).

Cloud computing, which is considered as one of the greatest initiatives towards the implementation of green ICT strategy, has also been faced such obstacles in developing countries. Specifically, in the given case of Iraq that adoption rate of cloud computing is too low due to the lack of about the positive aspects of cloud and unavailability of resources (both infrastructure and skills) (Wahsh and Dhillon, 2015). Therefore, there is an intense need to highlight the benefits that cloud computing offers to the businesses, in terms of sustainability and cost-effectiveness. In this account, the present research work is expected to significantly contribute in highlighting the benefits of cloud computing, in terms of its role in enabling the organisations to gain sustainable business outcomes. It is also expected that the research would contribute to increasing the knowledge and understanding of Iraqi IT professions about the importance of adopting cloud computing as a part of green ICT strategy.

1.6. Research Methodology

The present research work has adopted quantitative research approach. In this account, both primary and secondary data have been collected. For collecting secondary data Google Scholar and EBSCOhost were accessed. Pertinent journal articles, textbooks, and related literature have played an ineviTable and indispensable role in providing ample amount of information regarding the contribution of cloud

computing in providing benefits to the businesses. However, the success factors of cloud computing adoption have been identified and assessed by using Heek's Factor Model. On the other hand, the primary data was collected by conducting the survey. The survey was carried out with 152 IT professionals, working in Iraqi companies. The collected data were statistically analysed, specifically through descriptive analysis.

1.7. Structure of the Thesis

Following structure has been followed during the drafting of the present thesis.

Chapter 1: Introduction – The section entails the detailed background information, relevant to ICT and its contribution in affecting the environmental sustainability. Moreover, the section has also discussed the emergence of cloud computing technologies and the ways in which it is handling the issue. On the basis of the background information, the aim and objectives have been formulated in this section so as to recognise current situation in Iraq, in terms of cloud computing adoption and its impacts in delivering business welfare in the country. The adopted methodology has also been briefly described in this section.

Chapter 2: Literature Review – The chapter include the review of the diverse literature, related to cloud computing and its role in bringing sustainable business welfare, being the component of green ICT strategy. This section holds undeniable importance in the collection of detailed descriptive information about the research topic.

Chapter 3: Research Methodology – The section elaborates the approaches and methods that were used for the collection of desired evidence.

Chapter 4: Analysis and Discussion – The section encapsulates the analysis and discussion of the findings, collected from primary and secondary sources.

Chapter 5: Conclusion and Recommendation – The section is comprised of the concluding remarks, specifically on the basis of the results that were drawn from the collected information. Required recommendations are also included in this section that would be effective for promoting the use of cloud computing in Iraq.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

The section incorporates the review of literature that is collected from the previous studies, related to green ICT and cloud computing adoption in developing countries. More specifically, the chapter incorporates the analysis of the impacts of cloud computing in delivering sustainable business welfare. In this account, the chapter analyses the energy consumption trends as well as the environmental impacts of ICT tools. Moreover, the chapter also includes the in-depth evaluation of green ICT strategy as well as the role and benefits of cloud computing in delivering sustainable business welfare, being a part of green ICT strategy. Mainly, the literature review section includes the in-depth analysis of the research questions that were developed in the previous chapter.

2.2. Energy Consumption Trends and Environmental Impacts of ICT Tools

According to Mattern, Staake, and Weiss (2010), ICT tools have become one of the most important features of the contemporary world. It does not only have an impact on private and professional users, but it also serves as the important driver of economic development and growth. However, it is also observed that along with its favourable impacts on the economic conditions of the world, it has also indirectly impacted the overall consumption of energy and natural resources; the overall energy consumption of ICT is difficult to calculate. However, it has been documented in the study of European Commission (2008) that the overall consumption of electricity by the ICT sector (except that of the consumer electronic items) was approximately 119TWh in the year 2005. The major part of the energy is consumed by the servers, call manager, video conference, network devices etc. The consumption Figures correspond to 0.6 per cent of the total consumption of energy and 4.3 per cent of the overall consumption of electricity. It is established such energy consumption trends

are alarming for the integrity and overall sustainability of the environment. While demonstrating the consumption of energy by ICT tools, Global Action Plan (2009) had stated that ICT tools use excessive amounts of energy and it is continually increasing over the time. In the UK, ICT tools consume around 10 per cent of the overall electricity consumption of the country. It is expected that the non-domestic energy consumption from these tools will grow up to 40 per cent by the year 2020. It is established that the rising energy needs are ultimately impacting the integrity of the environment and it is estimated that ICT equipment is responsible for around 2 per cent of global carbon dioxide emissions.

According to Schippl and Weinberger (2009), this 2 per cent can be easily controlled, but the continuously increasing ICT tools, i.e., server rooms, computers, PCs, etc. are complicating the situation. It is also claimed by the researcher that the increasing need for communication tools, data storage, and computation is playing a prominent role in the growth of the global emissions. In this account, it is also expected that the overall percentage of the emissions, caused due to these tools, will reach up to 3 per cent by the end of 2020 (Schippl and Weinberger, 2009). Houghton (2010) had examined the impacts of ICT on environmental conditions and had found that the rising utilisation of ICT is severely affecting the environment mainly due to the increased need of energy for data centre operations and cooling purposes, distribution and production of ICT hardware, and e-waste. While highlighting the positive aspects of ICT, Global Action Plan (2009) has claimed that information and communication technologies are capable enough to reduce 15 per cent of global carbon dioxide emissions by the year 2020, while saving the cost of carbon, energy, and fuel that is required normal ICT operations. However, this element can only be achieved when smart and environment-friendly practices are considered during the utilisation of ICT equipment. Referring to the Climate Group, Global Action Plan (2009) has predicted that by the end of 2020, the overall carbon footprint of the ICT industry will be increased by 75 per cent. This situation can be evaded through the adoption of environment-friendly practices and it is expected that these smart practices would not only benefit the ICT sector, but it would also help other sectors in reducing their carbon emissions (the carbon emissions of other sectors in five times greater than the ICT sector) (Global Action Plan, 2009).

2.3. Green ICT Strategy

According to Deng and Ji (2015), adverse environmental impacts of ICT equipment have played a substantial role in increasing the demands of green or sustainable ICT. It is observed that the organisations have started to consider green ICT, as an important strategic initiative, because it helps them in achieving high competitive advantages. In this account, a number of initiatives have been taken on the government level. The "Greening Government: ICT Strategy" documented in the research of HMGovernment (2011) is aimed at developing energy efficient and cost effective ICT estate. The vision of the green ICT strategy is to develop such estate that would enable the government entities to serve the public sector in a sustainable and more efficient manner. The strategy focuses on the greening of ICT tools, throughout their lifecycle, i.e., from designing and manufacturing to their disposal. ICT does not only impact the environmental conditions by consuming excessive energy, but its impacts span from procurement, manufacturing, and designing to its final disposal, recycling, and reuse. Taking all these aspects into the consideration, the government entities had designed green strategy that embeds green principles throughout the lifecycle of the ICT equipment.

According to RBKC (2008), the vision of the government behind green ICT is to completely control CO2 emissions and achieve carbon neutrality by the year 2020. In this account, certain objectives have been developed that include the minimisation of the energy consumption of ICT equipment. The findings have shown that a number of initiatives have been taken in this regard that includes the replacement of physical infrastructure to virtual servers, putting computer systems on low power modes, etc. (RBKC, 2008). In particular, it can be affirmed that the green ICT strategy is solely aimed at increasing the overall efficiency of operations while reducing the environmental impacts of ICT and reducing the operational cost of the businesses.

2.4. Green ICT Concept

While demonstrating the concept of green ICT, Molla (2009) had claimed that the term 'green ICT' is originated with IT itself and it is nothing more than the inclusion of sustainable practices, while using ICT equipment. In particular, green

ICT is the systematic application of environment-friendly principles to the disposal, usage, sourcing, production, as well as designing of the technical infrastructure of the ICT tools. Wabwoba, Wanyembi, and Omuterema (2012) has claimed that green ICT is associated with the adoption of environment-friendly practices within the technological, managerial, and human components of ICT infrastructure so as to minimise the excessive use of resources and hazardous emissions; thereby, ensuring economic and sustainable utilisation of the information and communication technology tools.

According to Philipson (2010), green ICT can be achieved through the cautious utilisation of software, hardware, and human personnel. Therefore, it can be affirmed that green ICT is associated with the identification of the processes that are involved from the production/mining of the ICT equipment to the final disposal. In addition to this, green ICT also involves the recognition of the ways in which ICT is utilised and implemented by the users. Wabwoba et al (2013) have established that increasing operational cost of the businesses, within the technological environment, has played an imperative role in creating pressure on the corporate world to adopt eco-friendly practices that could equally benefit them in ensuring sustainability and gaining higher cost efficiency. Therefore, it can be affirmed that green ICT is all about the attainment of sustainability. Mingay (2007) had defined green ICT as the optimal utilisation of the information and communication technologies so as to manage the environmental sustainability of the organisation, its resources and services, products, as well as its operations. On this basis of this evidence, it can be affirmed that green ICT is the process that is intended to ensure strategic deployment of ICT as well as the related operations to responsibly, sustainably, and dramatically align their business objectives with sustainability goals.

Elsaadmi (2015) had stated that ICT is one of the biggest causes of increased energy consumption of the world, e-waste, and carbon footprint. Moreover, the increased utilisation of internet is also contributing to increasing the consumption of energy that is posing devastating impacts on the environment. To control this situation, the green ICT practices have emerged that are intended to promote recyclable products, reducing carbon footprints, and increasing energy efficiency. Elsaadmi (2015) and De Zoysa and Wijayanayake (2013) have also stated that green

ICT minimises energy use, promotes green disposal of the computing products, and encourages green and environment-friendly disposal of the ICT items. In short, green ICT is all about the practice of using technological tools in an economic, effective, and efficient manner.

In the same context, Forrester (2009) had established that regardless of providing sustainability-related benefits, green ICT is also about gaining higher levels of cost efficiency. Currently, operational and cost efficiency aspects have become one of the biggest motivations for the businesses to adopt green ICT practices. This phenomenon is also reflected in the widespread adoption of green ICT equipment. Uddin et al (2012) had highlighted some of the ways in which organisations have integrated green ICT concept within their working environment. One of the most prominent ways includes the consolidation of the green data centres. These data centres help the organisations in reducing the emissions while enabling them to regain cooling and power capacity, dramatically reducing total ownership cost and energy costs, and recapturing resilience.

2.5. Cloud Computing – A Part of Green ICT Strategy

Mell and Grance (2011) have defined cloud computing in the perspective of the definition that was presented by NIST (The National Institute of Standards and Technology) that cloud computing is the model that facilitates on-demand, convenient, and ubiquitous accessibility to the shared pool of configurable computing devices. These computing resources include services, applications, storage, servers, and networks. It is important to note that cloud computing facilitates the provision of all of these resources in a feasible and cost-efficient manner, without having the need of service provider interaction. Hashim, Hassan, and Hashim (2015) have contended that cloud computing is nothing more than the way of providing measured services, rapid elasticity, resource pooling, broad network access, and on-demand self-service to the businesses.

Kiryakova, Angelova, and Yordanova (2015) had presented a unique approach according to which cloud computing is a new business model, instead of being the new technology. Cloud computing provides attractive opportunities for the management and acquisition of the advanced software platforms so as to fulfil the

varying needs of the contemporary world. While demonstrating the benefits of cloud computing Aljabre (2012) had claimed that cloud computing reduces the infrastructure cost of the business, because of being operated on the virtual platforms. This feature reduces hazardous emissions while enabling the businesses to reduce their operational cost. Therefore, on the basis of these evidence it can be affirmed that cloud computing fulfils the objective of green ICT strategy.

Regardless of this, cloud computing also enables multiple users to collaborate in a well-timed and efficient manner, regardless of their geographical location (Miller, 2008). The analysis of diverse research studies has presented an idea that is the important part of the green ICT strategy, cloud computing has completely changed the façade of organisational operations. Its exclusive features, including the prompt availability of resources, high scalability, and virtualisation has resulted in its widespread adoption on a corporate level (Armando, et al. 2009; Ryan, 2011; Astri, 2015; Mickoleit, 2010). Hashim and Hassan (2015) had affirmed that in the context of deployment, cloud computing technology can be categorised into four types, i.e., community, hybrid, private, and public clouds. It is observed that public cloud is easily accessible and cheap; however, they are not secured as compared to the private clouds. On the other hand, hybrid cloud is highly secured and is also affordable. Apart from that, the community cloud can be regarded as the integration amid the organisations to make use of the cloud technology (Lian, Yen, and Wang, 2014; Gustafsson and Orrgren, 2012).

2.6. Benefits of Green ICT and Cloud Computing to the Businesses

A number of researchers have acknowledged the benefits of cloud computing, in terms of bringing agility, reducing cost, increasing operational efficiency, increasing flexibility, achieving sustainability, reliability, continuity, increased end-user productivity, and improved collaboration within the organisation (Astri, 2015; Si Xue and Wee Xin, 2016; Kiryakova, Angelova, and Yordanova, 2015; Marston et al, 2011). Astri (2015) has claimed that the servers of cloud computing have the capability to perform multiple tasks at a time, without having the need of additional resources. Most importantly, the overall operations of the cloud are dependent on virtual platforms, rather than the physical or hardware-based systems. These aspects

ultimately result in reducing the operational cost of the businesses. Si Xue and Wee Xin (2016) have claimed that the main reason that is involved in motivating the organisations towards the adoption of cloud computing is the reduced cost. Smith, Bhogal, and Sharma (2014); Assante et al (2016) had also contended that because of having a subscription model, cloud computing significantly help the organisations in saving their operational cost. Cloud computing resources are deployed and installed in an efficient and cost-effective manner, as a service provider has to perform all of these activities. In short, the cloud services are upgraded, patched, and managed by the service providers; hence, enabling the organisations to control their expenditures.

While highlighting the requirements of today's competitive corporate environment, Si Xue and Wee Xin (2016) has stated that businesses need to be competitive to sustain their position in the market. In such circumstances, cloud computing plays a pivotal role in enabling the organisations to respond to their customer's need in a well-timed and efficient manner. The operations of cloud computing are based on virtual platforms and are operated on internet technology that facilitates the businesses to deliver their services in the shortest period of time (Jafar et al, 2013; Sean et al, 2011; Ta-Tao, Kazuo, and Thoma, 2015). On the other hand, Astri (2015) and Nabil (2010) had suggested that cloud computing brings higher levels of flexibility within the business processes. Cloud computing services support the businesses to store their information on virtual platforms that allow the employees to flexibly access their desired data, regardless of the geographical and time constraints.

IET (2012) has stated that cloud computing enables the IT personnel to demonstrate advanced levels of response to changing customer demands, market conditions, and business needs, specifically by the prompt availability of information. It becomes possible by the large pool of virtual devices and efficient servers that support the efficient management of information; thereby, bringing higher flexibility and agility in business operations. VMware had published a white paper in the year 2011 that shows that around 72 per cent of the IT firms, who have integrated cloud computing services within their day-to-day business operations, believe that cloud plays a central role in improving business agility. Additionally, approximately 65 per cent of the IT firms said that cloud enables the businesses to main higher levels of flexibility (VMware, 2011).

Devasena (2014) had underlined the benefits of cloud computing services, in terms of increased reliability of the business operations. According to the researcher, the cloud is more reliable because of the 24/7 availability of the network. Cloud computing eradicates the need for in-house IT staff to provide required information to the organisations. Data redundancy features are built-in in the cloud networks that ensure the reliable and uninterrupted availability of the files, despite the power failures, network downtime, etc. (Devaki, 2011). These aspects signify that cloud computing ensures the reliability of operations within the organisation. Astri (2015) said that cloud computing radically minimises site failures and network downtime incidents that result in providing redundancy to the network; thereby, ensuring network reliability. In the context of collaboration and information sharing, cloud computing services offer great opportunities to the organisations to collaborate in an efficient manner, both in the internal and external environment. Krell (2011) has asserted that with the proliferation of smartphones and social media tools, small companies and start-ups have greatly been benefited by the cloud service, specifically in terms of improving collaboration with their stakeholders and enhancing end-user productivity. File storage options of cloud technology enable the organisations to share data and information (via IM-instant messengers, shared web-links, and emails), retrieve and store information with their stakeholders (Devaki, 2011).

Custom Solution Centre (2012) concluded that cloud computing facilitates centralised storage of the information that supports well-timed sharing, management, and utilisation of data. The well-timed availability, increased collaboration, and improved file sharing activities eventually result in better visibility of the projects/business activities, increased competitiveness and innovation, improved alignment of upper management and employees, informed decision-making processes, and increased end-user productivity; thereby, leading the organisations towards higher profitability and increased operational efficiencies. Besides improved collaboration, cloud computing services also bring higher levels of scalability in business operations (Si Xue and Wee Xin, 2016). Buse (2011) established that cloud computing facilitates its users to make use of the available resources as per the varying needs of the business. It can be carried out by the expansion of the

computing resources, as the majority of the cloud computing services are flexible and user-friendly. Angela and Chen (2012) had compared cloud's features with the conventional IT solutions and had concluded that cloud offers better scalability to the organisation, as compared to the traditional solutions. All of these characteristic features ultimately lead the organisations towards achieving higher competitiveness and increased end-user productivity.

According to Mualla, Pender, Jenkins (2016), the dynamic and incomparable capability, provided by on-demand cloud service enables the organisations and businesses to save energy. Peltomäki (2009) has stated that cloud computing is the most influential investment that has been done for greening the ICT. Mualla, Pender, Jenkins (2016) has claimed that cloud computing services have the incredible potential of eradicating the need of plugged-in equipment. This feature ultimately reduces the associated management effort, space, and electricity consumption that eventually reduce the operational cost of the organisations. In accordance with the views of Mualla, Pender, Jenkins (2016) and López, Sissa, and Natvig (2011) cloud computing have the capability of running numerous operating systems on a single virtualised machine; thereby, resulting in reduced cost of operations, increased efficiency, and higher sustainability. Batchelor and Norrish (2003) have presented an idea that the server virtualisation, supported by cloud computing services, dramatically minimises the consumption of energy that eventually reduces hazardous e-waste, while lowering CO2 emissions. Therefore, it can be contended that cloud computing is the most efficient ways of integrating green ICT strategy; hence, achieving sustainable business welfare.

2.7. Service Delivery Models of Cloud Computing and their Role in Improving Business Operations

According to Savolainen (2012), there are mainly three service delivery models of cloud computing. These include SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service). On the other hand, Kavitha (2014) had stated that service delivery models of cloud computing are categorised into three archetypal models as well as numerous derivative combinations. However, the three most essential classifications are regarded as "SPI"

or “SPI Models”, i.e., Software, Platform, and Infrastructure (as a service). In accordance with Savolainen (2012), in SaaS model of cloud computing, the service provider licenses the required applications to be purchased and used on demand. It is significant to bring into the notice that the applications can be accessed through the network from diverse clients (i.e., mobile phone, web browser, etc.) by the users of the application. However, the application does not need the clients to install anything; only network connectivity, client devices, and browser are needed to use this cloud model.

However, Kavitha (2014) had presented an idea that this service delivery model facilitates multiple users by delivering single application, by the help of a browser. While describing the characteristics of SaaS Kavita (2014) had stated that the service delivery model offers centralised web-based access to the important information of the company; thereby, result in increasing the overall operational efficiency of the business. Most importantly, it completely eradicates the need of software patches and upgrades, as a service provider is responsible for performing all of these activities. Mathew (2012) has also highlighted some of the benefits of SaaS that include customisation of services, increased collaboration, maximisation of resources, capacity and scalability, and feasible mobile access to the desired applications.

Vijayalakshmi (2013) had the findings of Mathew (2012) by highlighting the characteristic features of SaaS that include ongoing updates and maintenance, low cost due to sharing of infrastructure, and improved collaboration. However, PaaS is one of those service delivery models that create such environment where the deployment and creation of the applications can be done by the developers, without knowing the need of processors and memory. In other words, it can be affirmed that PaaS is an integrated and abstracted cloud-based environment that has the ability to support the management, operations, and development of the applications. The services that are supported by PaaS include deployment and development services, operating systems, and middleware to provide support to the software delivery and development organisations (Savolainen, 2012; Vijayalakshmi, 2013). PaaS offers a range of benefits to the businesses that include failover, security, and load balancing capabilities, facilitating concurrent users because of having multi-tenant architectural

framework, provision of web-based user interface designing tools for the deployment, testing, modification, and creation of diverse user interface scenarios, increased flexibility to efficiently and quickly meet customer's needs, automatic scalability, and failure tolerance (Kavitha, 2014; Savolainen, 2012; Vijayalakshmi, 2013).

Another service delivery model of cloud is IaaS, i.e., infrastructure as a service. According to Savolainen (2012), IaaS has completely changed the ways in which developers used to handle the designing and deployment of applications. It is due to the fact that the IaaS users are empowered to directly utilise the components of the infrastructure (i.e., networks, firewalls, storage, and other computing resources) that are offered by the service provider. In short, it can be contended that virtualisation assists the organisations to carry out their operations in a more feasible, cost-effective, and efficient manner. According to Kavita (2014), IaaS offer considerable flexibility to the users, in terms of selecting their desired network, servers, and desktop resources. Moreover, IaaS also facilitate the customisation of their infrastructure package through the selection of storage space, CPU hours, bandwidth, etc. IaaS holds undeniable importance in minimising IT OPEX and CAPEX; thereby, allowing the organisation to carry out its day-to-day tasks in a cost-effective and more resilient manner. Vijayalakshmi (2013) has highlighted some of the prominent characteristics of IaaS model that remarkably contributes to the betterment of the organisations. The characteristics of IaaS include self-service capabilities, licensing (PAYG – Pay As You Go), renting, service levels, and dynamic scaling. Some of the other characteristics of IaaS, highlighted by Savolainen (2012) are the choice of virtualisation operating systems and platforms, instance capacity of the hardware, APIs for system accessibility, a wide choice of user interfaces, data centre's geographic distribution.

2.8. Success Factors of Adopting Cloud Computing Using Heek's Factor Model

Napitupulu and Sensuse (2014) said that critical success factors are nothing more than the areas that high-performance potential. The identification of these areas plays an ineviTable role in enabling the organisations to easily achieve their goals. According to Eid (2013), Heeks Factor Model is one of the most effective ways of identifying the success and failure factors of IT related projects. Heeks had proposed

factor model in the year 2003 for the sake of judging e-government failure and success. In particular, the model had identified ten key factors so as to determine the failure or success of the e-government projects. These factors included technological infrastructure, competencies, design, self / political interest, change management, project management, overall strategy, vision, etc. (Eid, 2013). In order to recognise the success factors of cloud computing, Heeks factor model was taken into the consideration. In this account, it was identified from the study of Abdollahzadegan et al (2013) that top management support plays a pivotal role in the successful deployment of cloud computing services within the organisation. Low, Chen and Wu (2011) had also supported this idea by claiming the top management significantly contributes to the implementation of cloud computing, i.e., through ensuring the provision of resources, by acknowledging the benefits of cloud computing, and by encouraging the employees to adopt change. However, Abdollahzadegan et al (2013) also claimed that the size of the firm also impacts the implementation of cloud computing. Large sized organisations have more flexibility, in terms of utilising resources (i.e., human, technical, and financial resources) that result in the successful deployment of cloud services.

According to Levenburg, Magal, and Kosalge (2006), biggest organisations have more expertise and more resources, as compared to small sized organisations. Oliveira and Martins (2010) had regarded technical readiness of the organisation as the biggest determinant of cloud computing's successful integration. Technical readiness includes both, IT human resource and technology infrastructure of the firm. Low, Chen and Wu (2011) had established that the organisations that have technical readiness are likely to successfully integrate cloud computing services within their working environment. De Zoysa and Wijayanayake (2013) had recognised the factors that influence the adoption of green IT in data centres while considering the case of Sri Lankan banks. During the investigation, it was identified that the factors that impact the success or failure of cloud computing services in the organisations can be categorised into three types. These include technological factors, organisational factors, as well as the environmental factors. On analysis, it is observed that these three factors are closely related to the ones that were defined by Heeks. The elements of technological infrastructure, competencies, design, presented

in the Heeks Factor model can be easily accommodated in the technological factors. However, self / political interest, change management, project management, overall strategy, and vision can be accommodated in organisational and environmental factors.

It has been established by De Zoysa and Wijayanayake (2013) that the technological factors can be understood as the pre-existing IT infrastructure as well as the readiness of an organisation to grasp new technologies. Garrison, Wakefield, and Kim (2015) had suggested that technological factors or technical capability of a firm are associated with the aspects or features of organisation's IT capabilities. Moreover, technological factors may also include the intangible characteristics of the firms, i.e., collaboration strategies of the business unit, problem-solving process, firms' technical knowledge, and technical knowledge and expertise of the employees. Garrison, Wakefield, and Kim (2015) had concluded that technical IT capability or technological factors are directly related to the successful implementation of cloud services. Besides that De Zoysa and Wijayanayake (2013) had also identified diverse organisational factors that contribute in the successful deployment of cloud computing in a firm. Some of the most prominent success factors that were recognised in this regard included staffs' skills, support from top-tier management or leadership, and communication practices.

These findings are aligned with the ones that were provided in the study of Eid (2013), regarding Heeks factor model. Garrison, Wakefield, and Kim (2015) had claimed that the managerial support and capabilities of handling technological changes play a pivotal role in the successful integration of cloud computing services. The managers must be capable enough to know the need of cloud adoption while motivating the employees to embrace the change. However, Oliveira and Martins (2011) had identified another aspect of an organisational factor that promises the successful cloud deployment. According to the researcher, green ICT adoption (specifically cloud computing adoption) is a lengthy and quite complex process that needs continual support from the top management. Without top management support, firms can never adopt cloud computing. De Zoysa and Wijayanayake (2013) had claimed that environmental factors (in the form of external pressures) also impact cloud deployment processes. It may come in the form of increasing demands of

environment-friendly practices and rising competition. The external and internal uncertainties and pressure could impact the performance of the firm while affecting the cloud deployment, but the adoption of effective strategies could lead the organisations towards gaining long-term competitive advantages (Garrison, Wakefield, and Kim, 2015).

2.9. Consumption of Cloud Computing Services in Iraq

Hashim and Hassan (2015) had stated that besides the tremendous benefits of cloud computing, considerably limited researches have been conducted on its deployment in developing countries, specifically in Iraq. Some of the researchers that have made their contribution in this regard include Mohan et al (2014); Hashim and Othman (2014); Mohammed et al (2016); and Al-Ani and Ibrahim (2012). Hashim and Hassan (2015) had affirmed that the adoption of cloud computing services is heavily influenced in Iraq, mainly due to two reasons. These reasons include the weak supply of electricity and weak technological infrastructure. In addition to this, lack of awareness and knowledge about the benefits and performance of cloud has also resulted in the low adoption of cloud in Iraq.

Wahsh and Dhillon (2006) had conducted a research regarding the deployment of e-government system that was based on cloud computing services. During the investigation, it was found that poor resource management, lack of financial resources, resistance to handle cloud services, lack of top management support, corruption, lack of IT knowledge, political influence, and infrastructure instability are the core factors that limit widespread deployment of cloud computing in Iraq. Mohammed et al (2016) had also highlighted the challenges that are responsible for the low adoption of cloud in Iraq. The prominent challenges included weak technical infrastructure, lack of devices/platforms, poor technical knowledge/awareness, interoperability, lack of economic resources, lack of support from top management and from government entities, and corruption.

Moreover, cloud deployment is also heavily influenced in Iraq due to the internet and computer illiteracy, incompatibility of the technical staff, resistance to new technology, and lack of government’s interest towards deploying advanced technological infrastructure (Mohammed et al, 2016).

2.10. Summary

The chapter has profoundly discussed the perspectives of different researchers that they have presented in their studies, specifically regarding green ICT. In this account, the chapter entails the detailed review and analysis of the green ICT strategy, while assessing the objective and prospects of this strategy. In addition to this, the chapter has also examined and demonstrated the ways in which cloud computing (being a part of green ICT) is facilitating the businesses, in terms of increasing their efficiency and performing their day-to-day activities in a sustainable manner. In this regard, the contribution of cloud service delivery models is specially considered as different service delivery models are distinctively facilitating the businesses, in the context of in gaining sustainable and cost efficiency. Moreover, the success factors of cloud adoption are also analysed, specifically by considering Heeks Factor model. The reasons of low consumption of cloud computing in Iraqi companies have also been identified that revealed that poor infrastructure, low support from government and top management, lack of financial resources, low expertise and knowledge, etc. are the main constraints.

CHAPTER 3

RESEARCH METHODOLOGY

3.1. Introduction

The chapter discusses the methodological approaches that have been adopted to successfully accomplish the research aim and objectives. According to Bryman (2015), the identification of the research methods plays an imperative role in the drawing reliable results that are aligned with the predefined research objectives. Therefore, to recognise the impact of cloud computing in delivering sustainable business welfare, as part of a green ICT strategy the research had used different approaches and methods that are discussed in the following sections of this chapter. The chapter encapsulates the elaboration of the research approach, research design, data sources, research participants, sampling strategy and size, research instruction, variable description, and data analysis techniques that were used during the investigation**.**

3.2. Research Approach

Flick (2015) has defined research approach as the strategy of gathering, interpreting, and evaluating the data, needed for achieving research aim and objectives. It is found that research approach is mainly of three types, i.e., quantitative, qualitative, and mixed research approach. The qualitative research approach is usually based on people's thoughts, views, and concerns and allows the researcher to use qualitative aspects of the available information, with higher levels of flexibility. However, the quantitative research approach is associated with the investigation of the relationship between the variables (Creswell, 2013). The quantitative data allows the researcher to easily measure the relationship between the variables through statistical techniques. On the other hand, the third research approach, i.e., a mixed approach is the combination of both qualitative and quantitative approaches.

The current research has made use of the quantitative approach to assess the impact of cloud computing in delivering sustainable business welfare. It is important to note that the findings of the primary data are supported by the findings that are collected from the secondary sources (previous literature); thereby, fulfilling the purpose of adopting this quantitative research approach, i.e., reliability, objectivity, and integrity of the final results.

3.3 Research Design

The research design is a way of representing the entire research strategy that is adopted for investigating research objectives. In more precise words, research design is nothing more than the framework or process that is adopted for inquiring research aim, in a more structured and appropriate manner. Extensively used research designs include correlational, semi-experimental, review-based, descriptive, and experimental designs (Jackson, 2015). It is observed that the successful completion of the research work is heavily dependent on the selected research design. Therefore, it is considered as one of the foremost responsibilities of the researcher to cautiously choose the research design (Bryman and Bell, 2015; Neuman and Robson, 2012).

The present research work has selected multiple research designs to draw reliable results. In particular, correlation, description, and review-based research designs have been selected in this study. The review-based design has enabled the researcher to develop a profound understanding of the respective area of research. In addition to this, the descriptive research design had contributed in gathering relevant information through survey questionnaire that was conducted with 152 IT professionals, working in Iraq. Moreover, correlational research design had allowed the researcher to analyse the impacts of cloud computing on business welfare.

3.4 Sources of Data

After the selection of research approach and research design, the researcher has the responsibility to selected data sources for the collection of pertinent data. Data sources have undeniable significance in drawing cohesive conclusions, as it enables the researcher to establish a profound understanding about the research topic.

Data sources are of two types, i.e., secondary data sources and primary data sources. Primary data sources are the ones that are associated with the direct and first-hand data collection. On the other hand, secondary data sources signify the indirect data that is collected from previous studies or literature. However, it is important for the researcher to cautiously act while collecting data from both of these sources, i.e., by adhering to the integrity, authenticity, credibility, and relevance of the data (Bryman, 2015).

In the present study, the researcher had made use of both primary and secondary data sources to draw relevant conclusions. In this account, the primary data was collected by carrying out survey questionnaire with the 152 IT professionals, working in Iraqi companies. On the other hand, secondary data was gathered by accessing the previous literature using Google Scholar and EBSCOhost. For the sake of filtering the desired peer-review articles, different Boolean operations (i.e., OR/ AND) were also used. The combination of primary and secondary data has remarkably contributed in letting the researcher get fruitful outcomes about the impacts of cloud computing in delivering sustainable business welfare.

3.5 Research Participants

The integrity of the primary data is heavily dependent on the participants that are selected by the researcher for the collection of evidence (Bryman, 2015). Therefore, in order to ensure the credibility of the current study, the researcher had selected the IT professionals, working in Iraqi companies. The main objective of making the selection of these participants was to gain close insight about their perception about cloud technology and to identify the role of cloud computing that it is playing in delivering sustainable business welfare in Iraq. IT professionals have more knowledge about the technological platforms, as compared to the citizens; this aspect was also considered while making the selection of the research participant. The researcher was also intended to recognise the success factors of cloud deployment in Iraq; hence, IT professionals were selected as they can better understand the current ICT situation in Iraq.

3.6 Sampling Strategy

Since it is impossible for the researcher to collect required data from the entire population; therefore, a small segment is usually selected to gather the required evidence. This small segment is usually referred as ‘sample’. A researcher holds the responsibility to carefully select the sample, as the entire reliability of the results is dependent on it. There are mainly two types of sampling strategies that are being sued for making the selection of research samples (Flick, 2015). These include non-probability sampling and probability sampling. In the current study, the researcher has made use of the non-probability sampling because it facilitates the researcher to do random participant selection. However, probability sampling requires the researcher to consider unique skills and capabilities to choose the participants. Therefore, to avoid this complexity the non-probability sampling strategy was selected that had made the researcher to gather data from the IT professionals, working in the Iraqi companies, regardless of considering any specific organisation/sector.

3.7 Sampling Size

The selection of the size is important to ensure the generalizability of the results. In this account, a sample size of the present study is based in 152 sample participants, working as IT professionals in Iraqi companies.

3.8 Research Instrument

In the current study, the research instrument that has been used to collect pertinent information from the participants is ‘Survey Questionnaire’. The questionnaire was designed to five-point Likert scale and incorporated close-ended questions.

3.9 Description of Variables

The variables, used in the present research work are illustrated in the below-mentioned Table 1.

Table 1 Variable Description

DEPENDENT VARIABLES	INDEPENDENT VARIABLES
• End-user productivity • Collaboration • Business agility • Operational cost • Sustainability • Operational efficiency • Continuity and reliability of operations • Improved service delivery	• Cloud Computing

3.10 Data Analysis Techniques

Data analysis is the last stage and the most important stage of the research, as it leads the researcher to draw final results. In the present research work, a number of statistical techniques were used to analyse the collected data. In particular, descriptive statistics, regression analysis, and correlation analysis were used. Descriptive statistics (based on percentages and frequencies) had enabled the researcher to recognise the perceptions of the IT professionals towards the contribution of cloud computing in delivering sustainable business welfare. Besides that, correlation analysis technique was also used to identifying the relationship between the variables. It is established that correlation helps in recognising the strength of relationship amid the variables on the basis of the correlational coefficient.

The range of the coefficient is from -1 to +1. If the acquired correlational coefficient value is >0.75 then it is said to be highly correlated. However, the degree of correlation is low when this value lies amid 0.25-0.50; when the value is <0.25, it shows that no correlation exists amid the variables (Jackson, 2015). On the other hand, regression analysis was used to assess the potential impacts of the established relationships of the defined variables. In particular, regression analysis had helped the researcher in the analysis of the causal relationship amid the variables. Besides all of these analysis techniques, the variable of Heeks Factor Model was also used to identify the success factors of cloud computing adoption in Iraq, while recognising the reasons of low cloud adoption in the country.

3.11 Ethical Consideration

Researchers have the responsibility to adhere to the ethical practices while carrying out research work so as to ensure the integrity and reliability of the study (Bryman and Bell, 2015). In this account, the researcher had followed ethical practices during the entire tenure of the study. In particular, the objective and purpose of the research were clearly told to the participants and proper consent was taken from them. Participant's right-to-privacy was especially ensured and protected by the researcher. To ensure the anonymity of the participants, their names and identities were kept confidential. The participants had the freedom to quit participating in the research, at any time. Most importantly, the responses of the participants were interpreted with caution to avoid bias and subjectivity.

3.12 Summary

Table 2 The summary of the chapter is provided in below-mentioned

RESEARCH ACTIVITIES	METHODOLOGICAL APPROACHES
Research Approach	Quantitative research approach
Research Design	Correlational design, descriptive design, and review based design (i.e., literature review based)
Data Sources	Secondary and primary data sources
Participants	IT professionals, working in Iraqi companies
Sampling Strategy	Non-probability sampling strategy
Sample Size	152
Research Instrument	Survey questionnaire, based on Likert scale
Data Analysis Techniques	Regression, correlational, and descriptive statistical analysis.

CHAPTER 4

RESULTS AND ANALYSIS

4.1. Demographics

The study was carried out with total 152 numbers of participants of which 63.8% were males and 36.2 % were females as shown in the Table below. The pie chart is also presented to specify the gender of the participants, involved in the study.

Table 3 Gender participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	97	63.8	63.8	63.8
	Female	55	36.2	36.2	100.0
	Total	152	100.0	100.0	

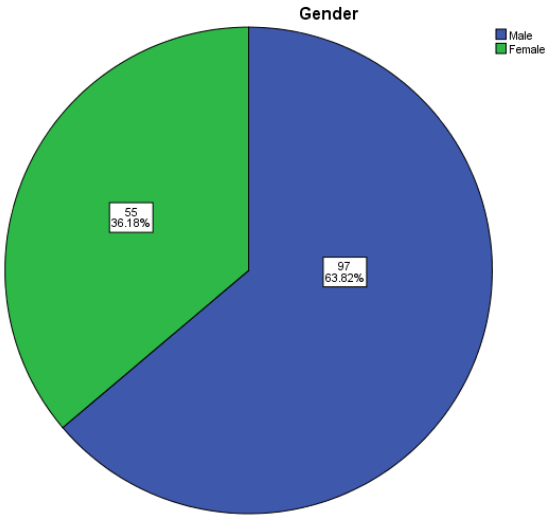


Figure 1 Gender of the Participants

The categorisation of the participants on the basis of their education level revealed that out of a total number of participants, 54.6% had bachelor degree; 1.3 %

were from high schools and 10.5 were affiliated to higher diploma program. In addition, 25% reported that they had done Masters and 0.7% of the participants were not educated. 7.9% had done PhD. The results are also shown in Table 4 and Figure 2.

Table 4 Participant Education Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelor	83	54.6	54.6	54.6
	High School	2	1.3	1.3	55.9
	Higher Diploma	16	10.5	10.5	66.4
	Master	38	25.0	25.0	91.4
	Not educated	1	.7	.7	92.1
	Ph.D.	12	7.9	7.9	100.0
	Total	152	100.0	100.0	

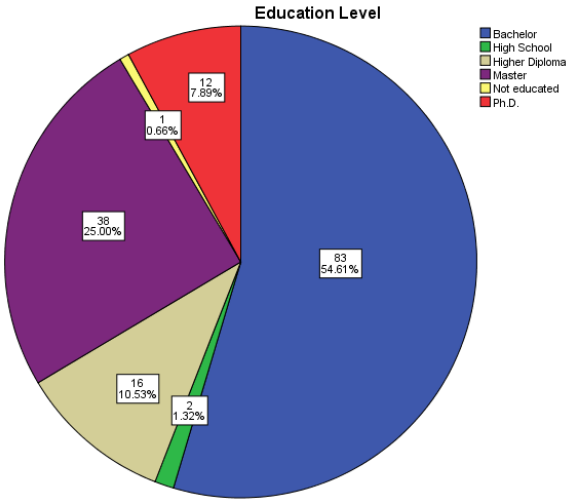


Figure 2 Education Level of the Participants.

The division of the participants on the basis of age group provided us with a result tabulated below in Table 5, according to which the participants, having age of 18-25 years were 28.9% in total. On the other hand, the major part of the participants belonged to the age range of 25-45 with 59.5% and the remaining the participants who were 45 or more were 11.2%. The results are also shown in Table 5 and Figure 3 below.

Table 5 Age Group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 25	44	28.9	28.9	28.9
	25 - 45	91	59.9	59.9	88.8
	45 or more	17	11.2	11.2	100.0
	Total	152	100.0	100.0	

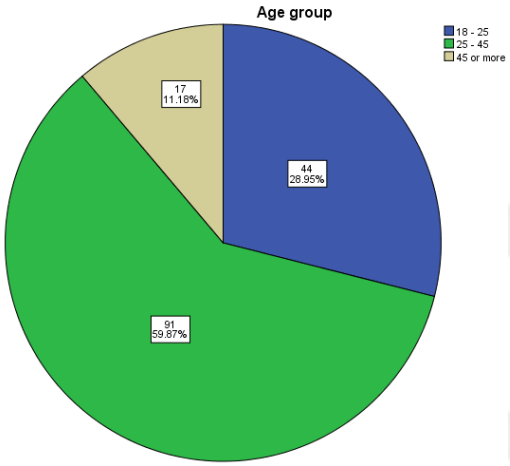


Figure 3 Age Group of the Participants

The experience of the participants in ICT showed that 12.5% had less than 1-year experience, 27.6% had more than 1 year but less than 3 years, 25% reported more than 3 years but less than 5 years of experience, 21.1% showed more than 5 years but less than 10 years of experience. Whereas, 10.5% participants were with more than 10 years of experience and 3.3% were with no experience. These results are presented in Table 6 and Figure 4 below.

Table 6 Experience in ICT Service Field

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 year	19	12.5	12.5	12.5
	More than 1 year and less than 3 years	42	27.6	27.6	40.1
	More than 10 years	16	10.5	10.5	50.7
	More than 3 years and less than 5 years	38	25.0	25.0	75.7
	More than 5 years and less than 10 years	32	21.1	21.1	96.7
	No Experience	5	3.3	3.3	100.0
	Total	152	100.0	100.0	

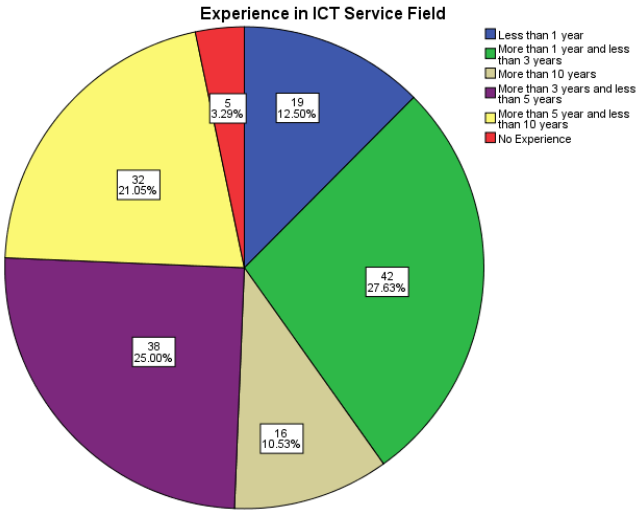


Figure 4 Experience in ICT Service Field

When the participants were asked about their experience with cloud computing technology, 44.1% participants said that they have 1-3 years of experience, 15.1% had 3-5 years, 30.9% had less than 1 year, and 1.3% had more than 5 years of experience. On the other hand, 8.6% participants reported that they have not used cloud computing. This analysis can be seen in Table 7 and Figure 5.

Table 7 Participants Experience in Cloud computing Service Field

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-3 years	67	44.1	44.1	44.1
	3-5 years	23	15.1	15.1	59.2
	Have not used a Cloud Computing	13	8.6	8.6	67.8
	Less than a year	47	30.9	30.9	98.7
	More than 5 years	2	1.3	1.3	100.0
	Total	152	100.0	100.0	

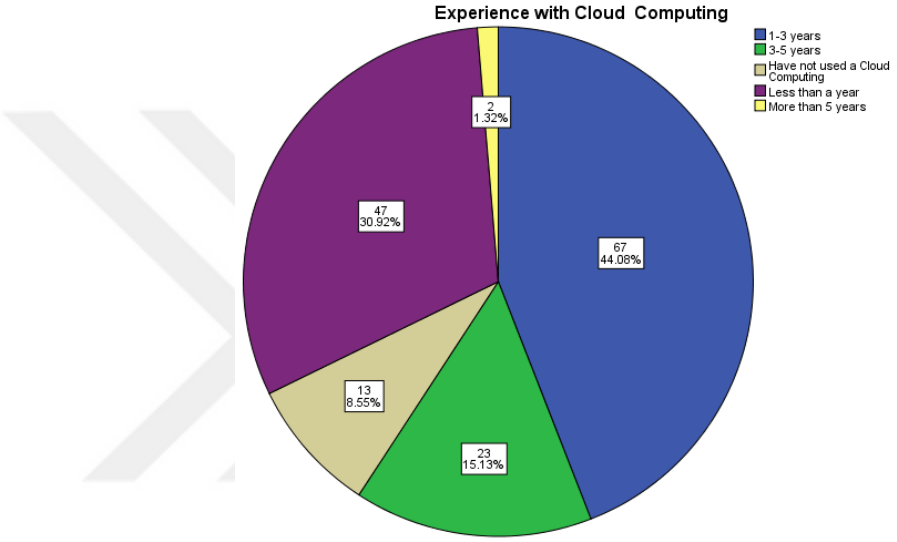


Figure 5 Experience with Cloud Computing

When the participants were asked if they are ready to voluntarily work in the ICT service field and cloud computing, 39.5% participants said that they would go for it if there would be suiTable opportunities. On the other hand, 23.7% and 36.8% participants clearly said no and yes respectively. The discussed results are also shown in Table 8 and Figure 6 below.

Table 8 Voluntariness work in ICT Service Field and Cloud Computing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I would do it if there was a suiTable opportunity to do so	60	39.5	39.5	39.5
	No	36	23.7	23.7	63.2
	Yes	56	36.8	36.8	100.0
	Total	152	100.0	100.0	

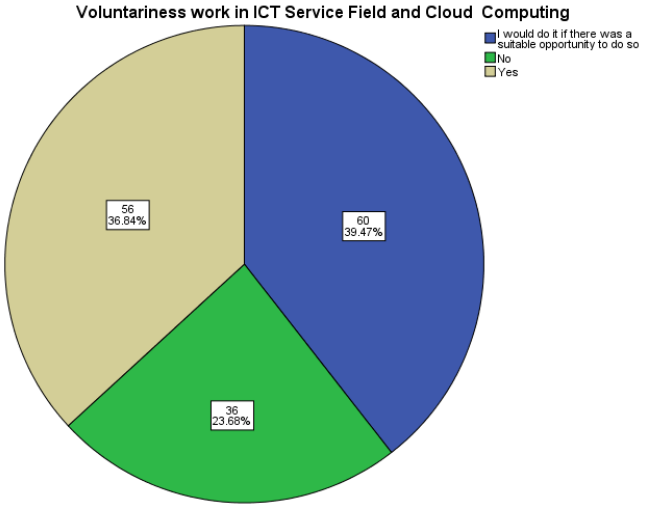


Figure 6 Voluntariness work in ICT Service Field and Cloud Computing

4.2 Collaboration and End-User Productivity

Cloud computing has played an ineviTable role in enabling the organisations to share ideas and information with their managers, regardless of their geographical location. When the relevance of this idea was asked by the participants, 59.9% of the participants said that they are agreed with the statement. Only 3.9% of the participants said that they disagree with the statement. These results show that cloud computing has minimised geographical constraints that the organisations had to face in the previous era, specifically for sharing information with different units of the organisations or to collaborate with their managers, working in different units. The results are also shown in the below-provided Table (9) and Figure (7). The results are aligned with the study, which was presented by Miller in the year 2008.

Table 9 Cloud computing has enabled the employees to share their views and Ideas with their managers regardless of their geographical location

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	2.6	2.7	2.7
	Disagree	6	3.9	4.1	6.8
	Neutral	30	19.7	20.3	27.0
	Agree	91	59.9	61.5	88.5
	Strongly Agree	17	11.2	11.5	100.0
	Total	148	97.4	100.0	
Missing	System	4	2.6		
Total		152	100.0		

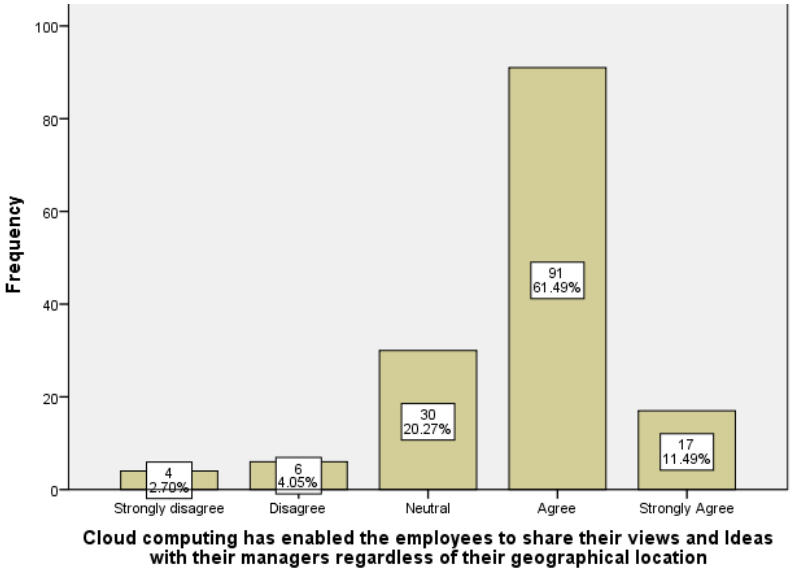


Figure 7 Cloud Computing and Sharing of Ideas

It is the most convenient feature of cloud computing that it offers flexible access to the desired data regardless of the time constraint (Astri, 2015). When the participants were asked about this feature, 30.3% were agreed with the statement whereas, 4.6% reported that they disagreed with the statement. These results are presented in Table 10 and Figure 8 given below.

Table 10 Cloud computing allows the users to access their desired information in a real-time manner Instead of waiting for the In-house IT staff

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	2.6	2.6	2.6
	Disagree	7	4.6	4.6	7.3
	Neutral	55	36.2	36.4	43.7
	Agree	46	30.3	30.5	74.2
	Strongly Agree	39	25.7	25.8	100.0
	Total	151	99.3	100.0	
Missing	System	1	.7		
Total		152	100.0		

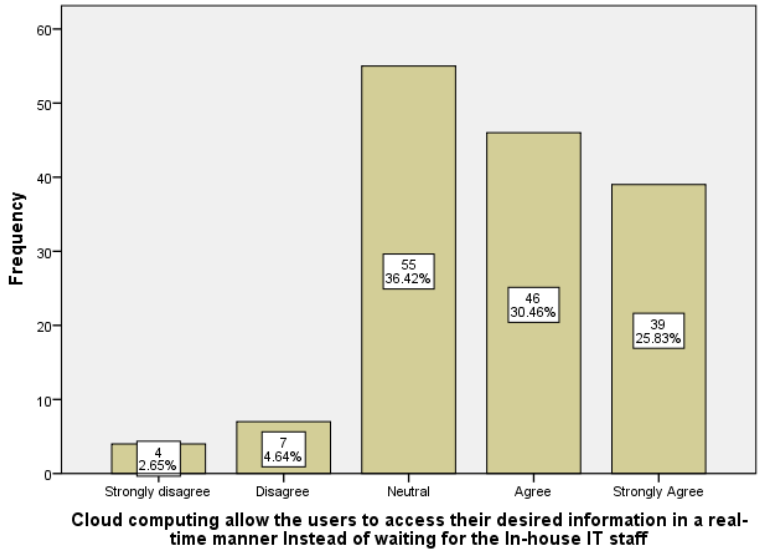


Figure 8 Cloud Computing and easy access to the information

When the participants were asked about the relevance of the idea that cloud computing and availability of information helps in improving end-user productivity, 42.8% participants agreed with the statement and 3.3% disagree with the idea. The statement was also supported by Marston et al (2011). The discussed results are also shown in Table 11 and Figure 9 below.

Table 11 (24/7) availability of information ultimately improves end-user productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.7	.7	.7
	Disagree	5	3.3	3.4	4.0
	Neutral	22	14.5	14.8	18.8
	Agree	65	42.8	43.6	62.4
	Strongly Agree	56	36.8	37.6	100.0
	Total	149	98.0	100.0	
Missing	System	3	2.0		
Total		152	100.0		

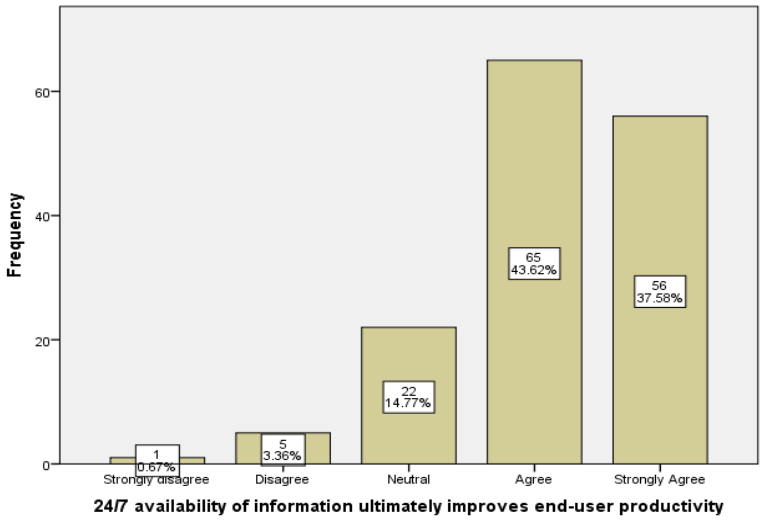


Figure 9 Figure Cloud computing and end-user productivity

Out of various useful features, cloud computing enables the firms to share the progress of internal operations with the stakeholders. Moreover, it also contributes to improving collaboration between them (Astri, 2015). The participants responded to this statement which is presented in the Table 12 and Figure 10 which shows that 40.1% participants agreed and 4.6% participants disagreed with it.

Table 12 By using cloud services, businesses can easily share the progress of the projects with their stakeholders that Improve collaboration among them

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.3	1.3	1.3
	Disagree	7	4.6	4.7	6.0
	Neutral	48	31.6	32.2	38.3
	Agree	61	40.1	40.9	79.2
	Strongly Agree	31	20.4	20.8	100.0
	Total	149	98.0	100.0	
Missing	System	3	2.0		
Total		152	100.0		

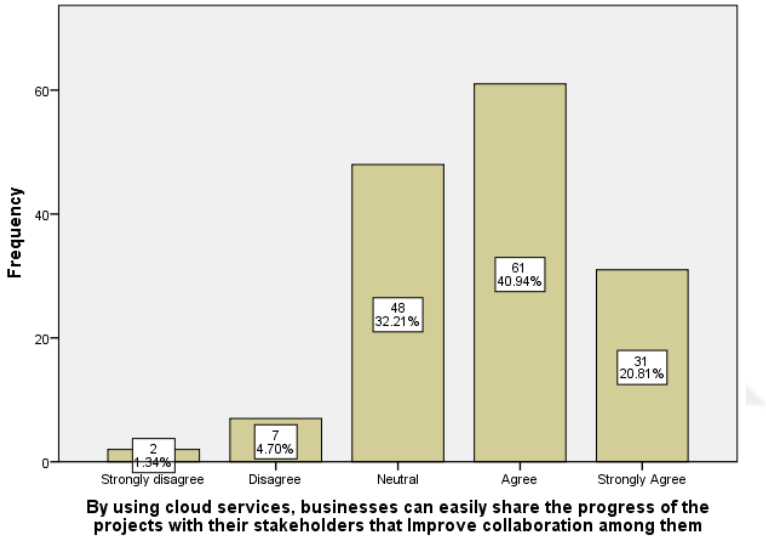


Figure 10 Cloud Computing and Collaboration with Stakeholders

4.3 Operational Efficiency and Business Agility

Cloud computing further enables the individuals to increase business operations by identifying market conditions and frequently changing customer demand and by providing an appropriate piece of information by a single touch (IET, 2012). The result of the participant responding to this statement revealed that 52.6% agreed and 6.6% disagreed with this idea. Results are also shown in Table 13 and Figure 11 below.

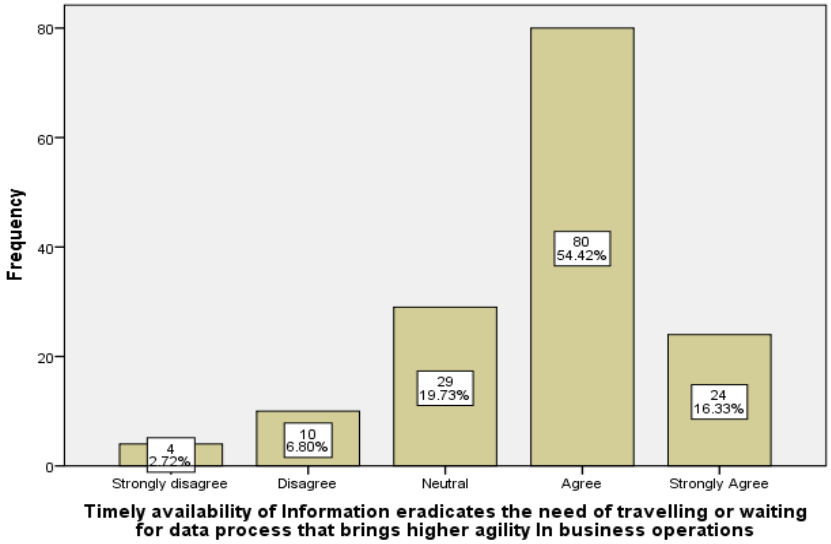


Figure 11 Cloud Computing and Agility in Business Operations

Table 13 Timely availability of Information eradicates the need of travelling or waiting for data process that brings higher agility in business operations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	2.6	2.7	2.7
	Disagree	10	6.6	6.8	9.5
	Neutral	29	19.1	19.7	29.3
	Agree	80	52.6	54.4	83.7
	Strongly Agree	24	15.8	16.3	100.0
	Total	147	96.7	100.0	
Missing	System	5	3.3		
Total		152	100.0		

Along with multiple benefits, cloud computing also offers the feature of on-demand service availability (Kavita, 2014). When the authenticity of this statement was inquired from the participants, it was found out that 40.1% participants agreed whereas 4.6% disagreed with the idea as shown in the Table 14 and Figure 12 below.

Table 14 The on-demand availability of services, supported by cloud, help the businesses to carry out their tasks without any delay

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.3	1.3	1.3
	Disagree	7	4.6	4.6	6.0
	Neutral	50	32.9	33.1	39.1
	Agree	61	40.1	40.4	79.5
	Strongly Agree	31	20.4	20.5	100.0
	Total	151	99.3	100.0	
Missing	System	1	.7		
Total		152	100.0		

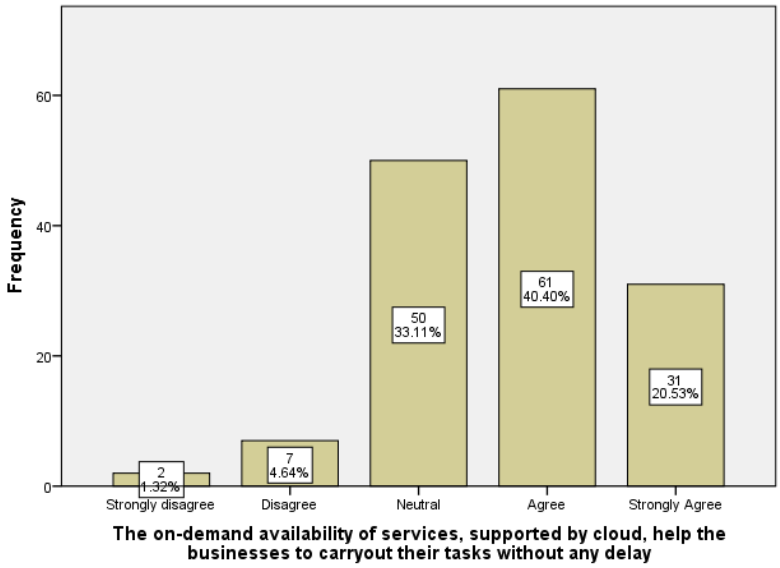


Figure 12 Cloud computing and on-demand service availability

IET (2012) proclaimed that flexibility and high business agility can be generated by cloud computing and a large pool of virtual devices. The respondents answered this question which revealed that 46.1% agreed with the statement whereas 4.6% of them disagreed with it. The tabular and graphic representation of the results is given below in Table 15 and Figure 13.

Table 15 The large pool of virtual devices and efficient services supports data management that Increases business agility

Frequency		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	3.3	3.4	3.4
	Disagree	7	4.6	4.7	8.1
	Neutral	43	28.3	28.9	36.9
	Agree	70	46.1	47.0	83.9
	Strongly Agree	24	15.8	16.1	100.0
	Total	149	98.0	100.0	
Missing	System	3	2.0		
Total		152	100.0		

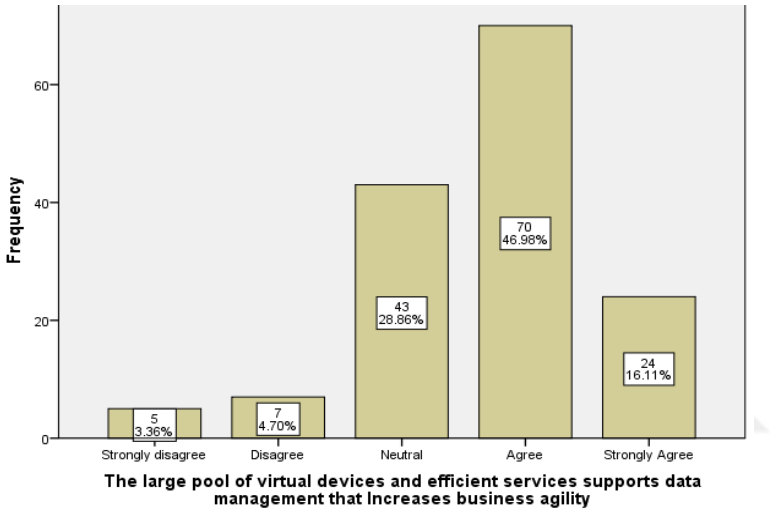


Figure 13 Cloud Computing and Increased Business Agility

4.4 Operational Cost

The services of cloud computing assists in reducing the consumption of electricity that eventually minimise the operational cost. The idea was supported by Mualla (2016). When the relevance of this statement was asked by the participants, 81% of the participants said that they are agreed with the statement and only 6% disagreed with it. The results are presented in the Table 16 and Figure 14.

Table 16 Cloud computing reduces operational cost of the organisations due to minimal need of electricity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	3.3	3.4	3.4
	Disagree	6	3.9	4.1	7.5
	Neutral	32	21.1	21.9	29.5
	Agree	81	53.3	55.5	84.9
	Strongly Agree	22	14.5	15.1	100.0
	Total	146	96.1	100.0	
Missing	System	6	3.9		
Total		152	100.0		

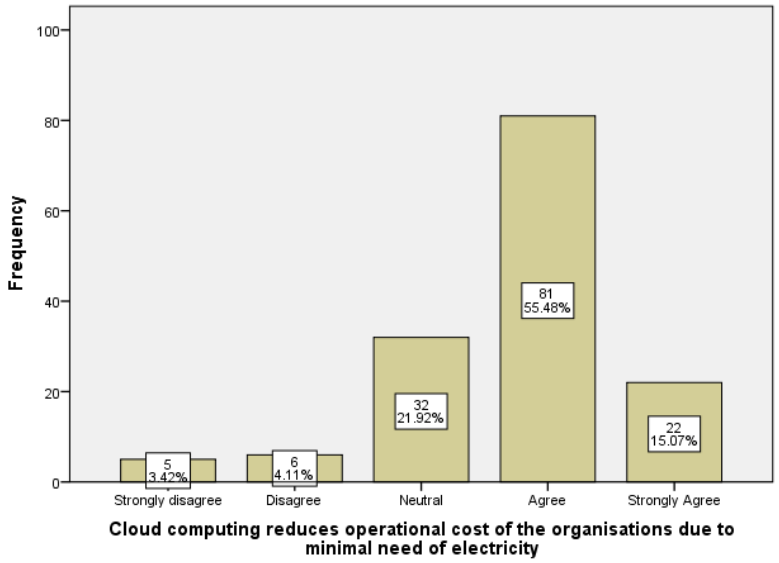


Figure 14 Cloud Computing and Reduced Operational Cost

Batchelor (2003) presented the idea which says that the technology of cloud computing supports virtualisation which reduces energy consumption which increases cost efficiency and sustainability in the organisation. 36.8% participants agreed with the idea whereas, 5.9% disagreed with it as shown in Table 17 and Figure 15.

Table 17 Virtualisation, supported by cloud computing technology, brings both sustainability and cost efficiency in an organisation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.0	2.0	2.0
	Disagree	9	5.9	6.0	8.1
	Neutral	46	30.3	30.9	38.9
	Agree	56	36.8	37.6	76.5
	Strongly Agree	35	23.0	23.5	100.0
	Total	149	98.0	100.0	
Missing	System	3	2.0		
Total		152	100.0		

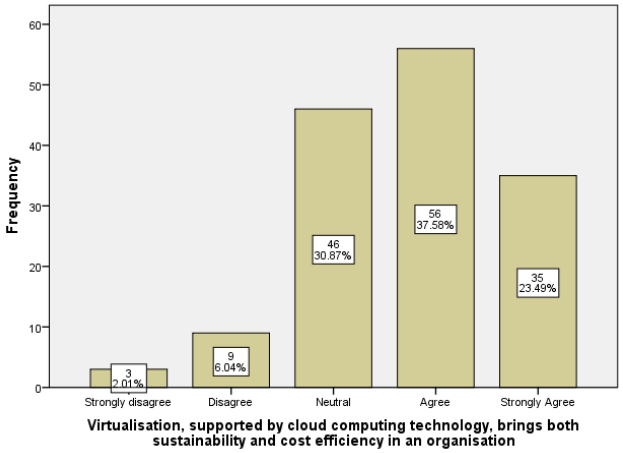


Figure 15 Virtualisation and Cloud Computing

Cloud computing also offers a reduction in ownership and energy cost by the integration of green ICT concepts in the working environment of an organisation (Uddin et al, 2012). 48% participants agreed with the statement and 5.9% disagreed with it. These results can be seen in Table 18 and Figure 16 given below

Table 18 Cloud computing has reduced total ownership cost and energy costs, as cloud is not dependent on electricity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.0	2.0	2.0
	Disagree	9	5.9	6.0	8.0
	Neutral	40	26.3	26.7	34.7
	Agree	73	48.0	48.7	83.3
	Strongly Agree	25	16.4	16.7	100.0
	Total	150	98.7	100.0	
Missing	System	2	1.3		
Total		152	100.0		

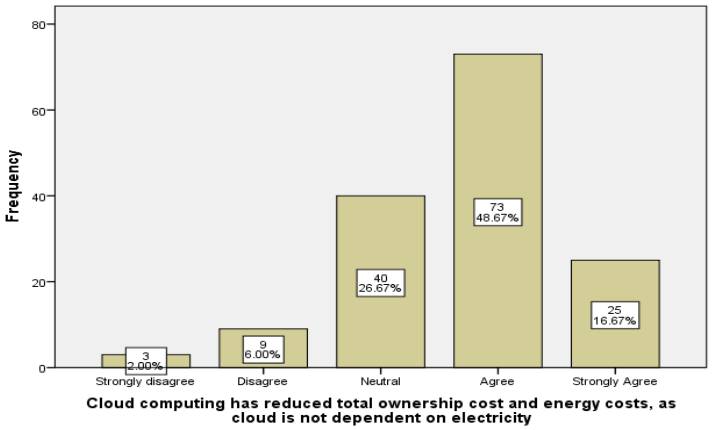


Figure 16 Reduced ownership and energy cost via cloud computing

Minimal dependency on the physical hardware devices would help businesses reducing their emissions and excessive expenditures that are usually required for the production or transportation of hardware (Astri, 2015). 46.1% participants agreed with the idea whereas, 6.6% disagreed with it as shown in the Table 19 and Figure 17.

Table 19 Minimal dependency on the physical hardware devices would help businesses reducing their emissions and excessive expenditures (that are usually required for the production or transportation of hardware)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.0	2.0	2.0
	Disagree	10	6.6	6.6	8.6
	Neutral	45	29.6	29.8	38.4
	Agree	70	46.1	46.4	84.8
	Strongly Agree	23	15.1	15.2	100.0
	Total	151	99.3	100.0	
Missing	System	1	.7		
	Total	152	100.0		

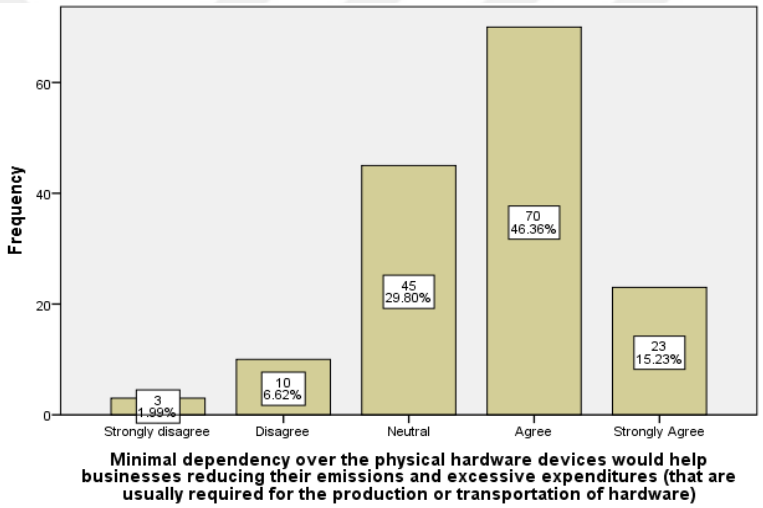


Figure 17 Cloud Computing and Minimal Hardware Dependency

4.5 Continuity and Reliability of Operations

In Iraq, the services of cloud computing have significantly reduced the dependency on IT staff for the required piece of information (Devasena, 2014). When the authenticity of this statement was inquired by the participants, it was found out that, 59.2% participants agreed with the statement whereas, 7.2% participants disagreed with it. Detailed results are tabulated in Table 20 and Figure 18.

Table 20 Cloud computing has empowered businesses, not to be dependent on the IT staff for making the required information available

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.3	1.3	1.3
	Disagree	11	7.2	7.3	8.7
	Neutral	24	15.8	16.0	24.7
	Agree	90	59.2	60.0	84.7
	Strongly Agree	23	15.1	15.3	100.0
	Total	150	98.7	100.0	
Missing	System	2	1.3		
Total		152	100.0		

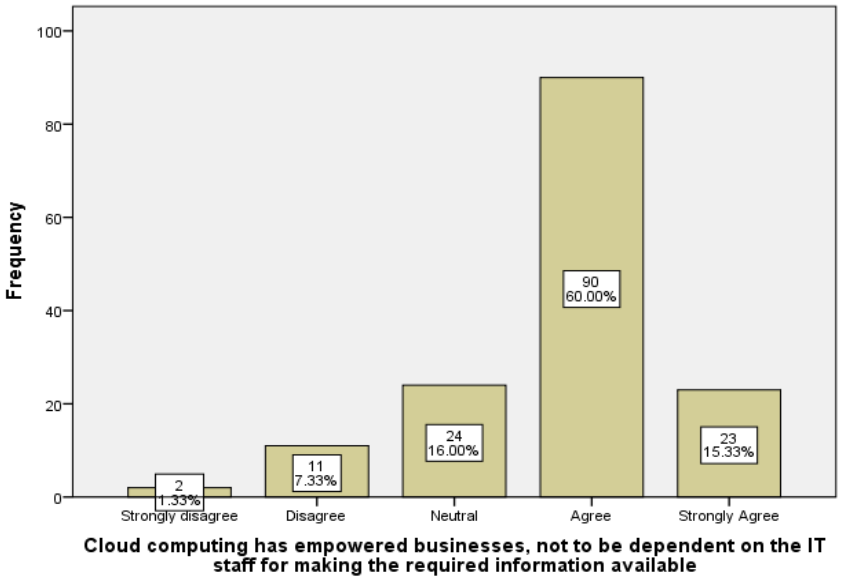


Figure 18 Reduce dependency on IT staff via cloud computing

Astri (2015) emphasises that cloud services ensure the network reliability by minimising site failure and incidents of network downtime. When the statement was shared with the participants, 36.2% of them agreed and 3.9% disagreed with it. Table 21 and Figure 19 gives details of the results.

Table 21 Cloud services offer unbeaTable tolerance to the organisational network against power failures, network downtime, etc

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	2.6	2.7	2.7
	Disagree	6	3.9	4.0	6.7
	Neutral	54	35.5	36.2	43.0
	Agree	55	36.2	36.9	79.9
	Strongly Agree	30	19.7	20.1	100.0
	Total	149	98.0	100.0	
Missing	System	3	2.0		
Total		152	100.0		

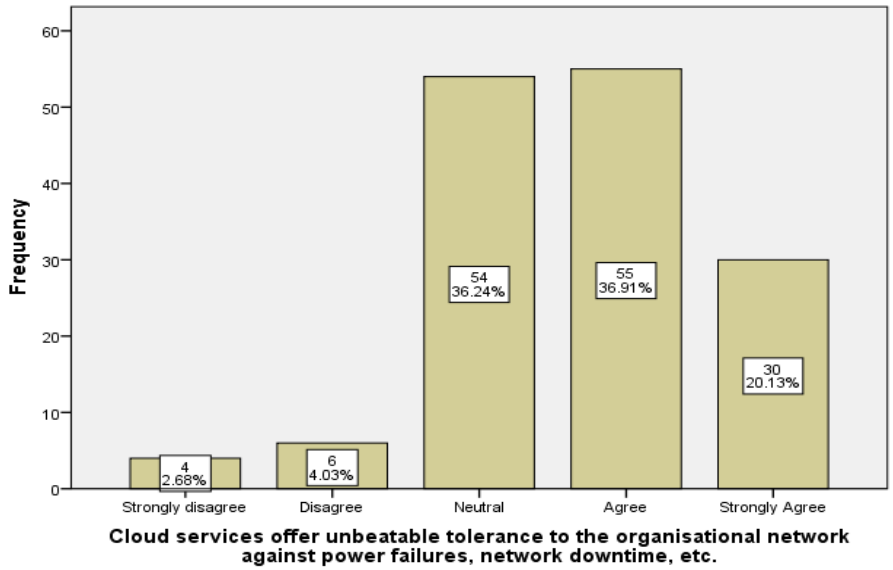


Figure 19 Cloud services and unbeaTable tolerance

The presented idea was supported by Astri (2015) that cloud services significantly minimised network failure and provides reliable business operations. 51.3% participants agreed with the statement, on the other hand, 5.9 disagreed with it. The Table and graph of the results are given below in Table 22 and Figure 20.

Table 22 Radical minimisation in network failure incidents result in continued and reliable business operations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.0	2.0	2.0
	Disagree	9	5.9	6.0	7.9
	Neutral	39	25.7	25.8	33.8
	Agree	78	51.3	51.7	85.4
	Strongly Agree	22	14.5	14.6	100.0
	Total	151	99.3	100.0	
Missing	System	1	.7		
Total		152	100.0		

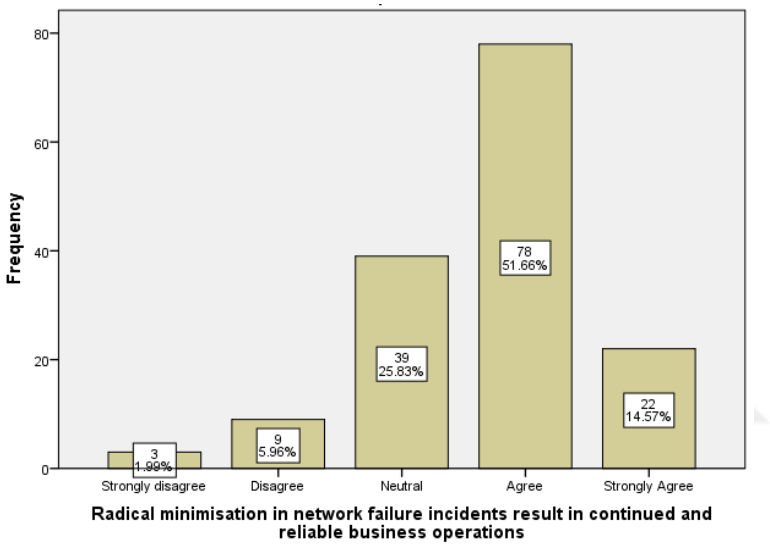


Figure 20 Cloud Services and Reduced Network Failure

4.6 Improved Service Delivery

The unique feature of cloud services i.e. web-based information access increases the operational efficiency of the business (Kavita, 2014). When the statement was asked of the participants, 55.9% of them agreed with it and 8.6% disagreed. These results are presented in Table 23 and Figure 21 in detail.

Table 23 Centralised web-based access to the information improve overall service delivery of the businesses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.0	2.1	2.1
	Disagree	13	8.6	8.9	11.0
	Neutral	29	19.1	19.9	30.8
	Agree	85	55.9	58.2	89.0
	Strongly Agree	16	10.5	11.0	100.0
	Total	146	96.1	100.0	
Missing	System	6	3.9		
Total		152	100.0		

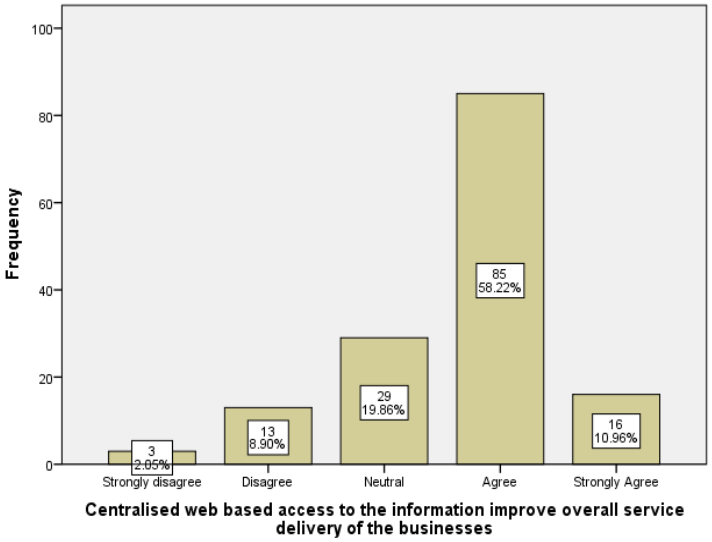


Figure 21 Web-Based Information Access and Improved Business Delivery

Another unique feature of cloud services is that it eradicates the need for software patching and upgrading which improves business services (Kavita, 2014). On this statement, 33.6 participants agreed and 5.3% disagreed. Table 24 and Figure 22 gives details of the results.

Table 24 Businesses no longer have to be worried about the patching and updating of software. The feature has enabled them to solely focus on the betterment of their services

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.0	2.1	2.1
	Disagree	8	5.3	5.6	7.6
	Neutral	54	35.5	37.5	45.1
	Agree	51	33.6	35.4	80.6
	Strongly Agree	28	18.4	19.4	100.0
	Total	144	94.7	100.0	
Missing	System	8	5.3		
Total		152	100.0		

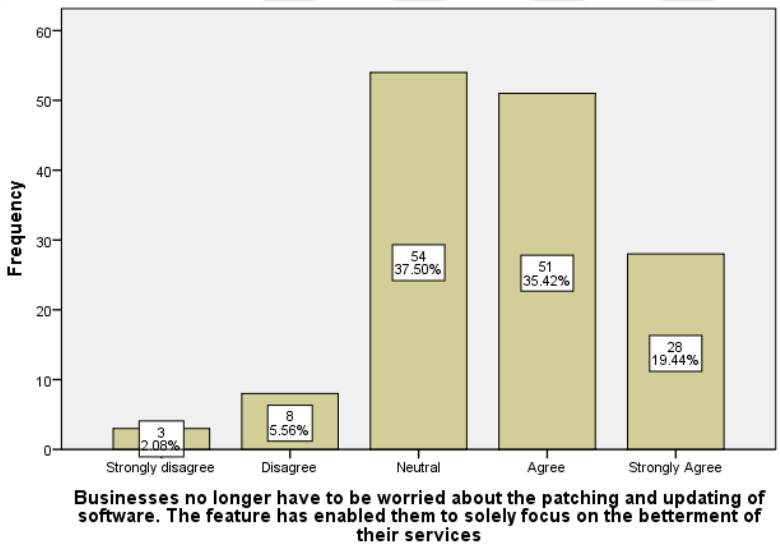


Figure 22 Cloud Services and Patching and Updating of Software

Savolainen (2012) highlighted the benefits of cloud services by claiming that its feature of virtualisation assists the organisations to access the information regardless of time and geographical factors. 42.8% participants agreed with the statement and 6.6% disagreed with it. Table 25 and Figure 23 are the details of the results.

Table 25 Virtualisation and data centre's geographic distribution have greatly benefited the organisations to access or share desired files/information, regardless of the geographical and time constraints

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	2.6	2.7	2.7
	Disagree	10	6.6	6.7	9.3
	Neutral	46	30.3	30.7	40.0
	Agree	65	42.8	43.3	83.3
	Strongly Agree	25	16.4	16.7	100.0
	Total	150	98.7	100.0	
Missing	System	2	1.3		
Total		152	100.0		

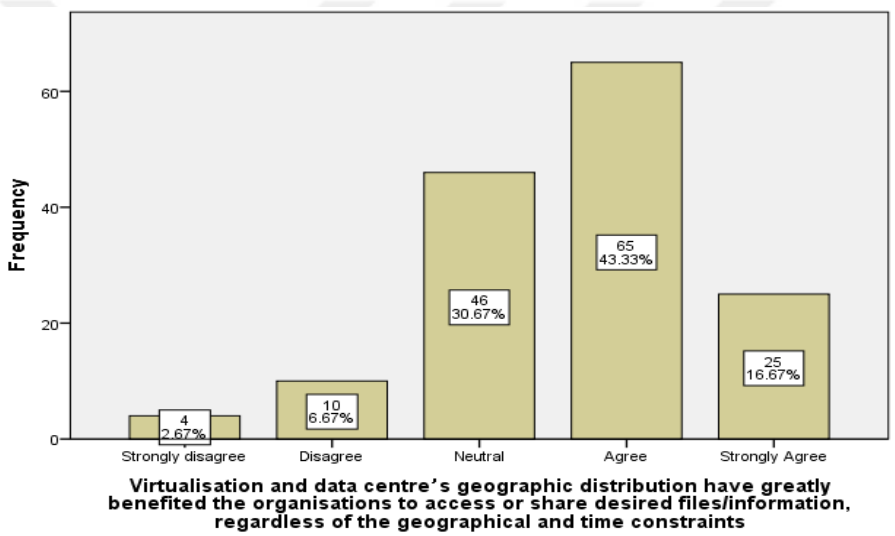


Figure 23 Virtualisation and Access to Desired Information

4.7 Sustainability

The benefits of cloud services also highlighted that it significantly reduces carbon footprints by managing physical resources (Elsaadmi, 2015). On this statement, 53.9% participants agreed and 7.2% disagreed. These results are shown in the Table 26 and Figure 24 in detail.

Table 26 Cloud computing services eradicates the need for production, transportation, and management of physical resources that results in reduced carbon footprints

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	3.3	3.4	3.4
	Disagree	11	7.2	7.5	10.9
	Neutral	31	20.4	21.1	32.0
	Agree	82	53.9	55.8	87.8
	Strongly Agree	18	11.8	12.2	100.0
	Total	147	96.7	100.0	
Missing	System	5	3.3		
Total		152	100.0		

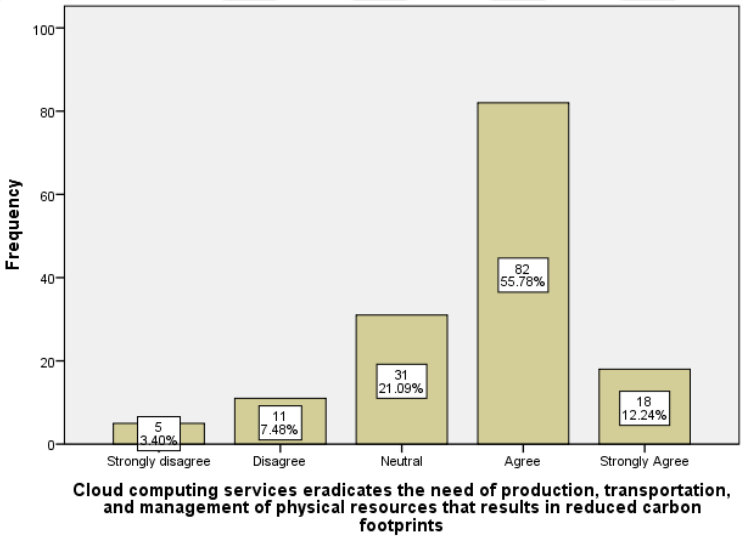


Figure 24 Cloud Computing and Reduced Carbon Footprints

Batchelor and Norrish (2003) argued that cloud services are beneficial for reducing the risks of e-waste as it is not dependent on physical hardware. Upon asking the relevance of this statement, 31.6% participants agreed with it whereas, 4.6% disagreed. Table 27 and Figure 25 show the results in detail.

Table 27 Since cloud is not dependent on physical hardware, it completely eliminates the risk of e-waste or unsustainable disposal activities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	3.3	3.3	3.3
	Disagree	7	4.6	4.6	7.9
	Neutral	59	38.8	39.1	47.0
	Agree	48	31.6	31.8	78.8
	Strongly Agree	32	21.1	21.2	100.0
	Total	151	99.3	100.0	
Missing	System	1	.7		
Total		152	100.0		

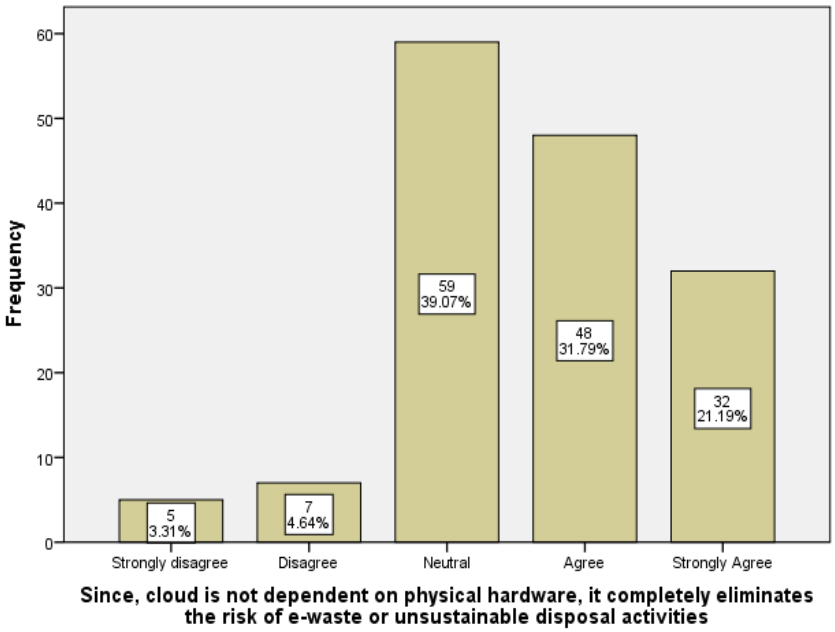


Figure 25 Cloud Services and Elimination of E-waste Risks

Excessive electricity demand can be reduced by one of the features of cloud services i.ie green data centres (Uddin et al, 2012). When asked this from the participants, 47.4% agreed with the statement whereas, 7.2% disagreed with it. These results are further elaborated in the Table 28 and Figure 26.

Table 28 Consolidation of green data centres have minimised excessive demands of electricity that is needed for cooling, in conventional systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.3	1.3	1.3
	Disagree	11	7.2	7.2	8.6
	Neutral	51	33.6	33.6	42.1
	Agree	72	47.4	47.4	89.5
	Strongly Agree	16	10.5	10.5	100.0
	Total	152	100.0	100.0	

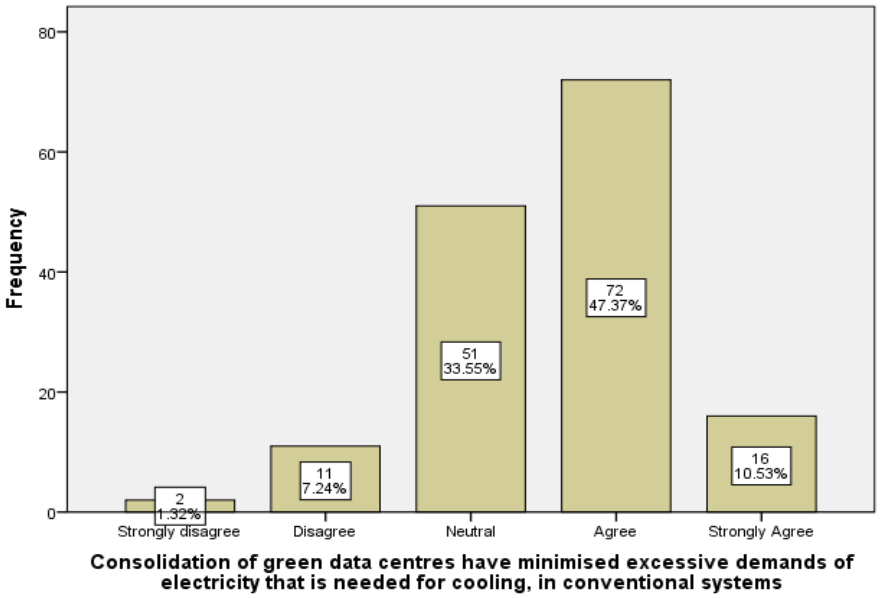


Figure 26 Green Data Centres and Reduced Electricity Demands

4.8 Reliability and Security

Easy access to information via computing may result in privacy-related issues as the user has less control over information (Mathew, 2012). When the statement was shared with the participants, 52.3% participants agreed with the statement and 5.9% disagreed with it as shown in the Table 29 and Figure 27.

Table 29 In a cloud computing environment, users have minimal control over the information that often results in privacy-related issues

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.0	2.0	2.0
	Disagree	9	5.9	6.1	8.1
	Neutral	36	23.7	24.3	32.4
	Agree	78	51.3	52.7	85.1
	Strongly Agree	22	14.5	14.9	100.0
	Total	148	97.4	100.0	
Missing	System	4	2.6		
Total		152	100.0		

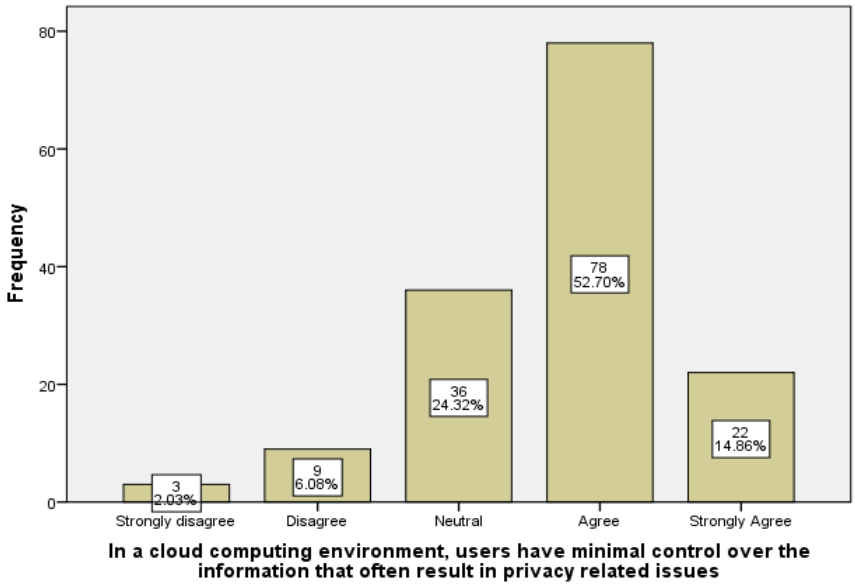


Figure 27 Cloud Computing and Control Over Information

Besides benefits, cloud computing may cause difficulty in information security due to increase virtualisation (Mathew, 2012). 37.5% participants agreed with this point whereas, 3.9% of them disagreed with it. Table 30 and Figure 28 elaborated the results clearly.

Table 30 Due to Increased Virtualisation, it is often difficult to ensure information security in cloud computing environment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.7	.7	.7
	Disagree	6	3.9	4.1	4.7
	Neutral	49	32.2	33.1	37.8
	Agree	57	37.5	38.5	76.4
	Strongly Agree	35	23.0	23.6	100.0
	Total	148	97.4	100.0	
Missing	System	4	2.6		
Total		152	100.0		

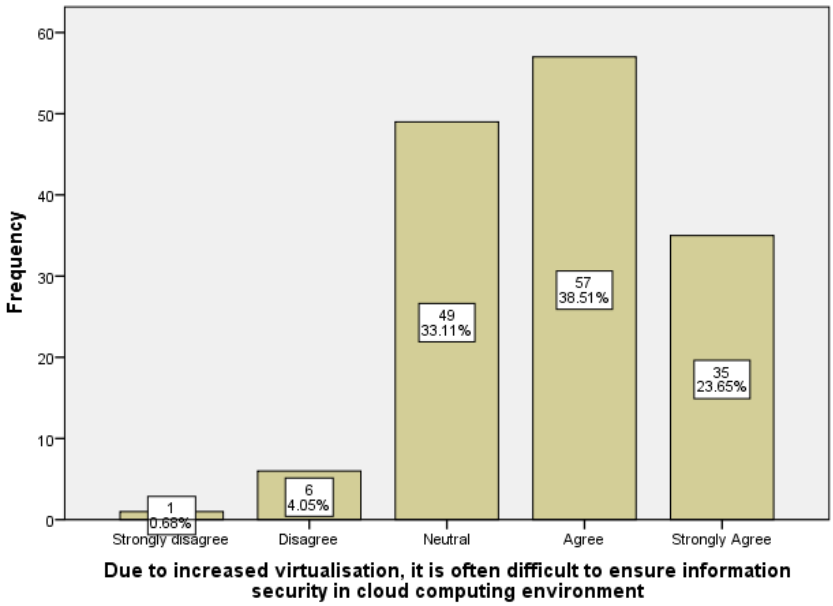


Figure 28 Cloud Computing and Difficult Information Security

In Iraq, by adopting access control measures including authorisation and authentication is likely to help in resolving privacy issues (Mathew, 2012). 63% participants agreed with it and 9.2% disagreed with it as shown in the Table 31 and Figure 29.

Table 31 Access control measures, i.e., authorisation and authentication could help in avoiding security and privacy-related issues that are occurred in cloud computing environment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.7	.7	.7
	Disagree	14	9.2	9.5	10.1
	Neutral	48	31.6	32.4	42.6
	Agree	63	41.4	42.6	85.1
	Strongly Agree	22	14.5	14.9	100.0
	Total	148	97.4	100.0	
Missing	System	4	2.6		
Total		152	100.0		

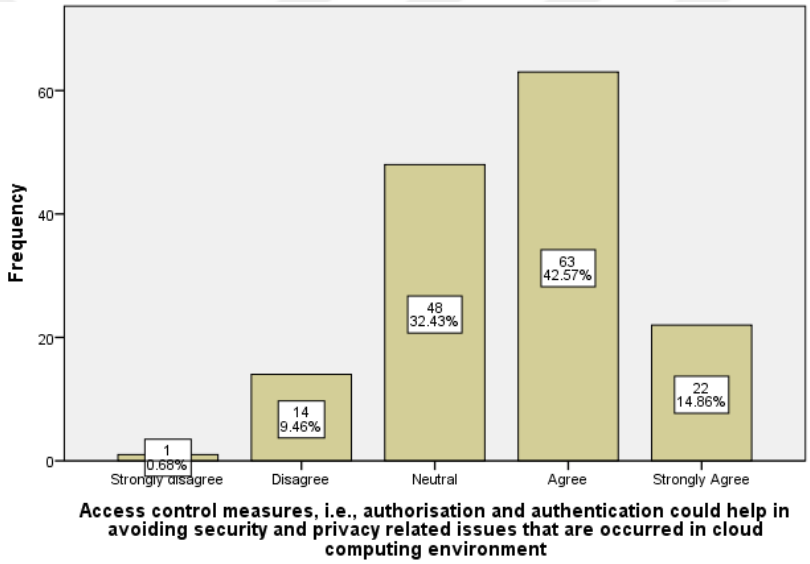


Figure 29 Cloud Computing and Access Control Measures

4.9 Low Consumption of Cloud In Iraq –Using Heek's Factor Model

In Iraq, a weak technical structure results in low cloud consumption (Mohammed et al, 2016). The participants responded to this point in such a way that 46.7% participants agreed with it whereas, 9.2% of them disagreed with it. These results are further elaborated in Table 32 and Figure 30.

Table 32 Low consumption of cloud in Iraq is mainly due to weak technical infrastructure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	2.6	2.8	2.8
	Disagree	14	9.2	9.8	12.6
	Neutral	31	20.4	21.7	34.3
	Agree	71	46.7	49.7	83.9
	Strongly Agree	23	15.1	16.1	100.0
	Total	143	94.1	100.0	
Missing	System	9	5.9		
Total		152	100.0		

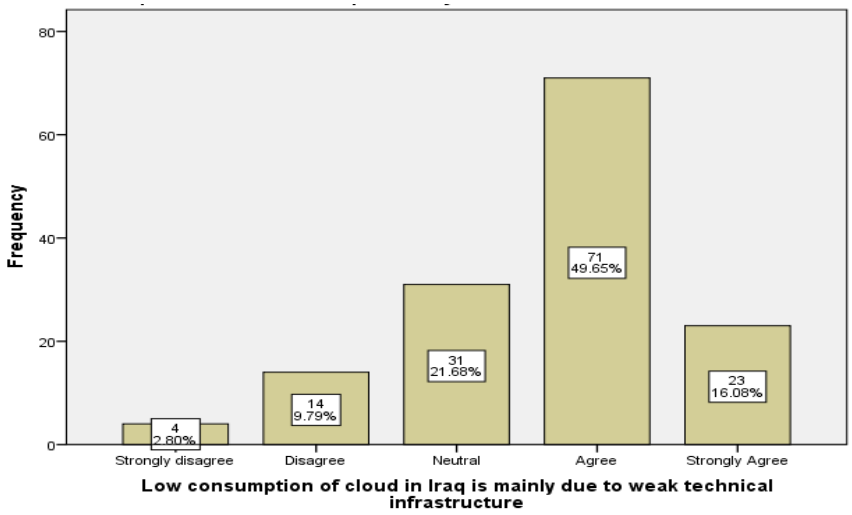


Figure 30 Weak Technical Infrastructure in Iraq

Mohammed et al (2016) argued that poor technical knowledge and lack of awareness affects the adoption of cloud in the region of Iraq. By investigating this point among participants, 34.9% agreed with it and 4.6% disagreed with it as shown in the Table 33 and Figure 31.

Table 33 Lack of technical knowledge and awareness is also affecting cloud adoption in Iraq

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.0	2.1	2.1
	Disagree	7	4.6	4.8	6.8
	Neutral	59	38.8	40.4	47.3
	Agree	53	34.9	36.3	83.6
	Strongly Agree	24	15.8	16.4	100.0
	Total	146	96.1	100.0	
Missing	System	6	3.9		
Total		152	100.0		

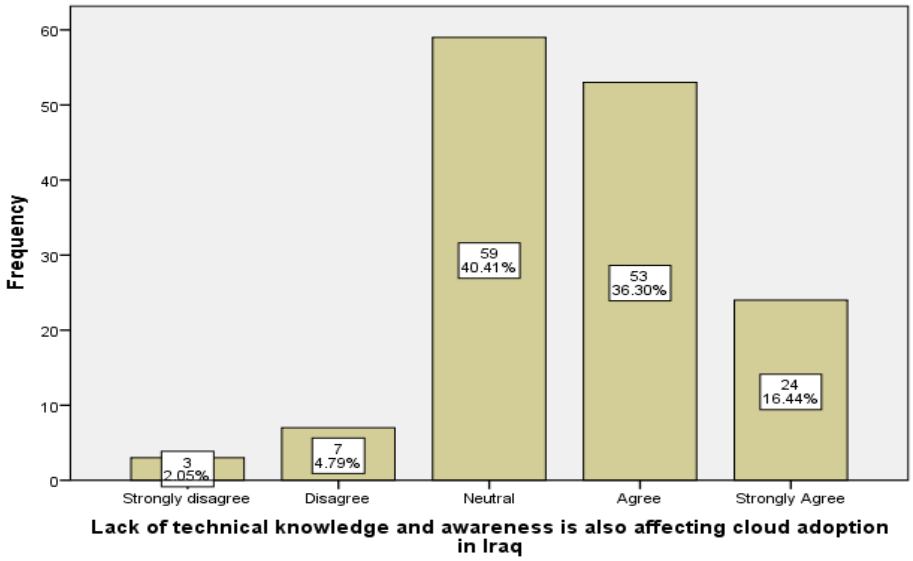


Figure 31 Lack of Technical Knowledge in Iraq

It was found out that, in Iraq, the management and government do not support the transition of cloud services (Wahsh, 2006). During the survey, 44.1% participants agreed with the statement whereas, 8.6% disagreed with it. Table 34 and Figure 32 elaborated the results in detail.

Table 34 Top management do not support the transition of operations from on-premise to cloud

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.3	1.4	1.4
	Disagree	13	8.6	8.9	10.3
	Neutral	44	28.9	30.1	40.4
	Agree	67	44.1	45.9	86.3
	Strongly Agree	20	13.2	13.7	100.0
	Total	146	96.1	100.0	
Missing	System	6	3.9		
Total		152	100.0		

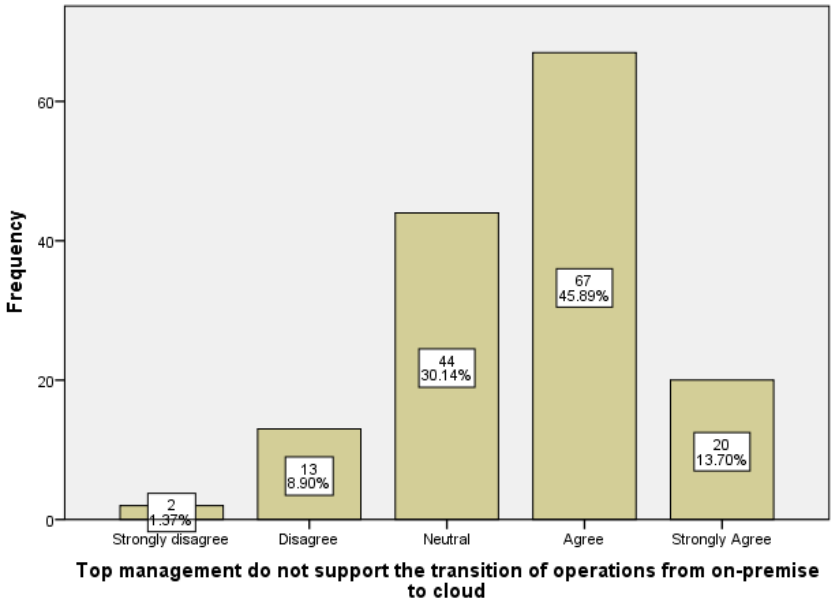


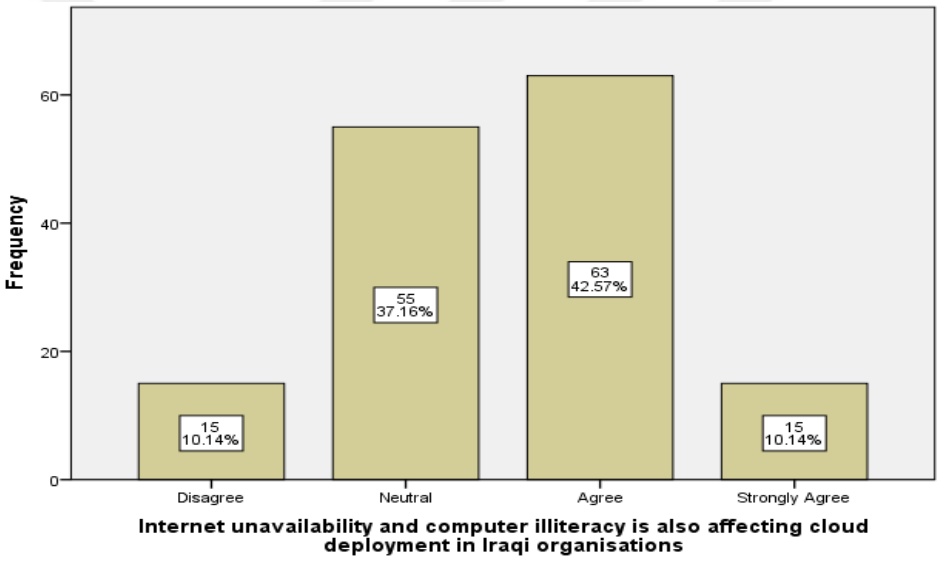
Figure 32 Transition of operation

Out of various factors, computer illiteracy is another factor that affects cloud deployment in Iraq (Mohammed et al, 2016). 41.4% participants agreed with the statement, on the other hand, 9.9% of them disagreed with it as shown in the Table 35 and Figure 33.

Table 35 Internet unavailability and computer illiteracy is also affecting cloud deployment in Iraqi organisations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	15	9.9	10.1	10.1
	Neutral	55	36.2	37.2	47.3
	Agree	63	41.4	42.6	89.9
	Strongly Agree	15	9.9	10.1	100.0
	Total	148	97.4	100.0	
Missing	System	4	2.6		
Total		152	100.0		

Figure 33 Cloud Deployment in Iraq



Lack of government support, corruption, and minimal interest towards technological advancement is also a reason behind constrained cloud adoption in Iraq (Wahsh, 2006). This idea was supported by 48% participants as they agreed with it whereas, 7.2% of them disagreed with it as shown in the Table 36 and Figure 34.

Table 36 Lack of government support, corruption, and minimal interest towards technological advancement is also a reason behind constrained cloud adoption in Iraq

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	3.3	3.4	3.4
	Disagree	11	7.2	7.5	11.0
	Neutral	46	30.3	31.5	42.5
	Agree	73	48.0	50.0	92.5
	Strongly Agree	11	7.2	7.5	100.0
	Total	146	96.1	100.0	
Missing	System	6	3.9		
Total		152	100.0		

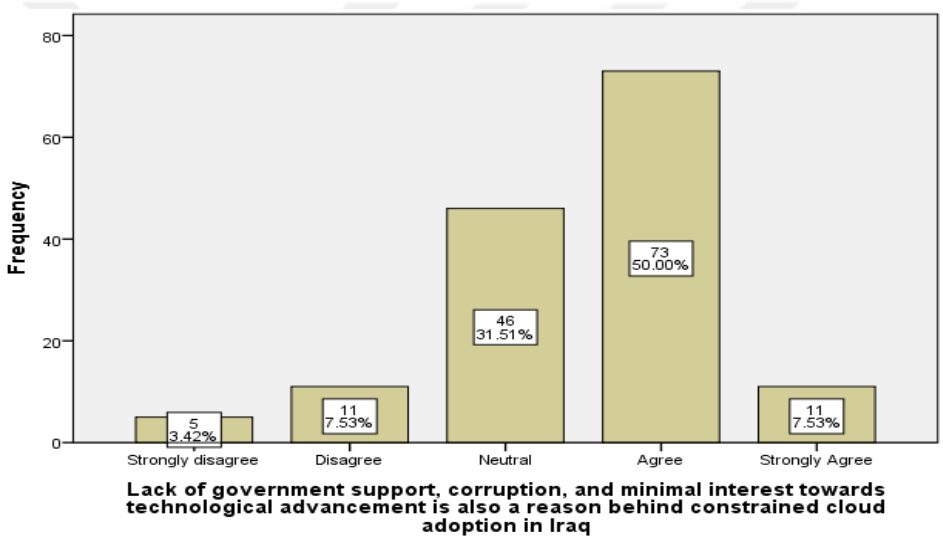


Figure 34 Lack of Government Support in Iraq

In Iraq, lack of resources and unsTable economic condition restricts the organisations to adopt cloud services (Mohammed et al, 2016). 41.4% participants agreed with the fact whereas, 6.6% disagreed with it. Table 37 and Figure 35 further elaborate the results.

Table 37 Fragile economic conditions of the country is also restricting the organisations to adopt cloud computing services

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	2.6	2.7	2.7
	Disagree	10	6.6	6.8	9.5
	Neutral	58	38.2	39.2	48.6
	Agree	63	41.4	42.6	91.2
	Strongly Agree	13	8.6	8.8	100.0
	Total	148	97.4	100.0	
Missing	System	4	2.6		
Total		152	100.0		

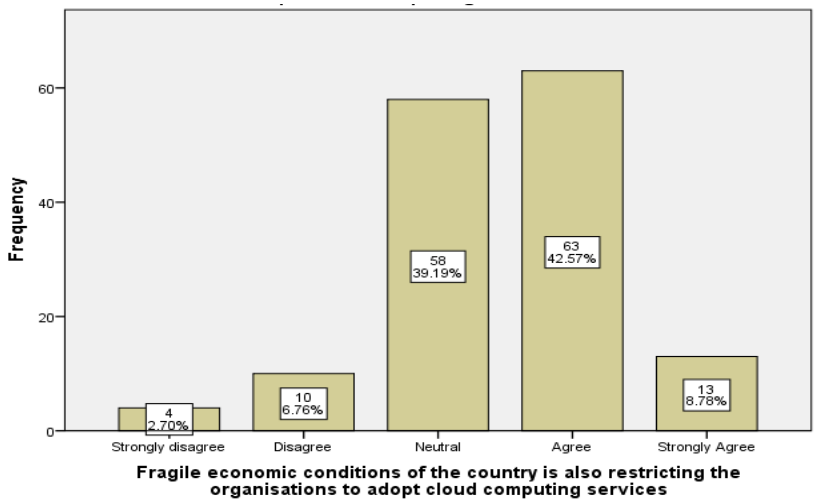


Figure 35 Fragile Economic Condition in Iraq

In Iraq, lack of experts and technical staff restricts the organisations to adopt cloud services (Wahsh, 2015). 50% participants agreed with this statement whereas, 7.2% of them disagreed with it. Further details are given in Table 38 and Figure 36.

Table 38 Lack of experts and incompatibility of the technical staff with the recent innovations is also restricting Iraqi organisations to adopt cloud services

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	7	4.6	4.7	4.7
	Disagree	11	7.2	7.3	12.0
	Neutral	38	25.0	25.3	37.3
	Agree	76	50.0	50.7	88.0
	Strongly Agree	18	11.8	12.0	100.0
	Total	150	98.7	100.0	
Missing	System	2	1.3		
Total		152	100.0		

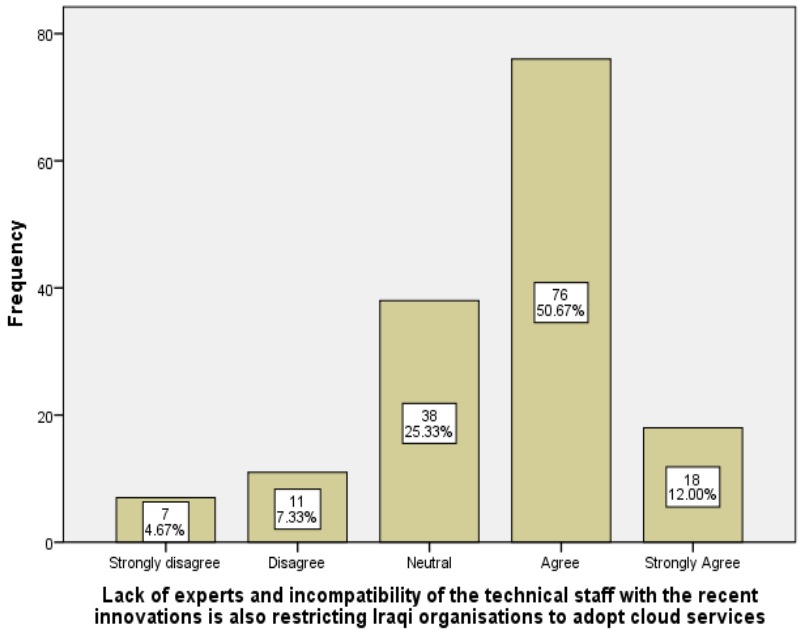


Figure 36 Lack of Technical Staff in Iraq.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion and recommendations

Technological advancements have played an ineviTable role in changing the day-to-day operations of the organisations. Primarily, ICT systems have enabled the organisations and businesses to carry out their activities, in a more efficient manner. However, due to the increased need for energy (required for operating ICT systems), the integrity of the environment has greatly been influenced. In such circumstances, the adoption of cloud technology can be considered as one of the greatest initiatives towards protecting the integrity of the environment. The operations of cloud technology are based on virtual environment, which minimises the need of excessive energy, which is usually needed for the operation of technological systems. However, it is established that the organisations are not fully aware of the benefits and challenges that are associated with cloud technology. Especially in developing countries, lack of awareness, lack of knowledge, lack of proper infrastructure, and unavailability of skilled staff are the core factors that are hindering the adoption of cloud computing technology.

For gaining in-depth insight, the present research work had developed an aim of analysing *the role of cloud computing, being a part of green ICT strategy, to deliver sustainable business welfare in developing countries, specifically in Iraq*. For ensuring the successful accomplishment of this research aim, several objectives were also formulated. The first objective was based on the assessment of the energy consumption of the ICT tools, like network devices, video conferencing tools, call manager, servers, etc. This objective was accomplished by accessing and analysing the related literature. Additionally, the second objective was associated with the analysis of the role of cloud computing in enhancing collaboration and increasing end-user productivity. The third objective was related to the examination of the role of cloud computing in improving the agility of the business. The fourth objective was

to carry out an analysis of the success factors of adopting cloud computing. The fifth objective was based on the analysis of the success factors of adopting cloud computing technology. The sixth objective was to assess the role of cloud computing in the provision of the sustainability benefits to the businesses while minimising the cost and increasing the overall efficiency of their operations. The seventh objective was associated with the inspection of the contribution of the cloud computing in improving the continuity and reliability of the business operations in Iraq. The second last objective was to recognise the ability of the cloud computing services in bringing improvements to the service delivery models in Iraq. The last objective was to understand and analyse the reasons that are involved in the low consumption of cloud computing services by Iraq businesses.

For the sake of ensuring successful accomplishment of the mentioned research objective, the researcher had selected *"Quantitative Research Approach"*. The data sources that were used in this regard include both, 'primary' and 'secondary' data sources. The primary data was collected by conducting a survey with 152 Iraqi professionals, working in the local companies. On the other hand, the secondary data was gathered by accessing the pertinent and up-to-dated literature, related to the research topic. The collected data has played an ineviTable and indispensable role in providing in-depth insight into cloud computing adoption in Iraq. It is significant to bring into the notice that the gathered data was analysed by using the statistical tool, specifically through descriptive analysis.

On the basis of data analysis, it has been recognised that the core factor that is primarily hindering the adoption of cloud computing technology in Iraq is lack of knowledge and lack of required skills and expertise. Iraqi professionals are interested in adopting this technology, as they find it favourable for both, environment as well as the economy of the country. The inclination of the Iraqi professionals towards cloud technology can be observed from the survey responses in which approximately 39.5% of the participants were agreed to voluntarily work in ICT service filed and cloud computing. IT professionals, working in Iraq do acknowledge the importance of cloud computing technology in improving business agility, end-user productivity, overall business efficiency, collaboration among different units of the business, increased flexibility, and 24/7 availability of the information. However, there are

certain factors that need attention to ensure widespread adoption of cloud technology in Iraq. These include end-user training, improvement of employee's skills to make full use of cloud technology. Concentrating on all of these factors would undeniably improve the performance of the Iraqi firms and would help them in contributing to the implementation of the green ICT strategy.

Therefore, in this account, it is recommended to the concerned authorities of Iraq to focus on the training and development of the employees, in terms of improving their technical skills and expertise. In addition to this, it is also recommended to the governmental bodies of the country to pay attention towards investing capital in the deployment and improvement of the high-tech infrastructure so that the organisations and businesses can easily align themselves with the technological evolution. It is anticipated that the deployment of all of these recommendations would surely change the facade of the corporate sector of Iraq and would help the companies to get the full benefit of the cloud technology. It is due to the fact that cloud technology does play a pivotal role in delivering sustainable business welfare as a part of the green ICT strategy.

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CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: SALIH, Bawar
Date and Place of Birth: 19 November 1988
Marital Status: Married
Phone: +964 (0)750 315 5418
Email: B_programmer@ymail.com

EDUCATION

Degree	Institution	Year of Graduation
M.Sc.	Çankaya Univ., Computer engineering	2018
B.Sc.	Cihan Univ., Computer science	2013
High School	Hewa High School	2008

WORK EXPERIENCE

Year	Place	Enrollment
2017 June - Present	UNOPS	QA Specialist
2016 June - June 2017	Gateway (VFS global) Turkey visa application center.	Supervisor
2015 September – 2016June	Qala and Mnara Institute for Computer science	Lecturer
2015 September – 2016June	Gasha Institute for Computer science	Lecturer
2013 July – 2014 January	Korek telecommunication	Technical programming specialist engineer

LANGUAGES

	Speaking	Reading	Writing
1. Kurdish	Native	Native	Native
2. Arabil	Fluent	Fluent	Fluent
3. English	Fluent	Fluent	Fluent
4. Turkish	Elementary	Elementary	Elementary