# ADOPTION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN TEACHING AND LEARNING ENVIRONMENT IN JORDANIAN HIGHER EDUCATION INSTITUTIONS

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# Abstrak

Teknologi Maklumat dan Komunikasi (ICT) memainkan peranan penting dalam institusi moden dengan meningkatkan dan memudahkan proses pengajaran dan pembelajaran selari dengan zaman teknologi maklumat. Jordan, sebagai negara membangun, amat menghargai kepentingan Institusi Pengajian Tinggi (IPT) dan peranannya dalam usaha mencapai kemakmuran ekonomi menerusi pembangunan sumber manusia. Namun, penerimaan dan penggunaan ICT dalam pengajaran dan pembelajaran dalam kalangan kakitangan akademik di IPT awam di Jordan adalah agak rendah. Tujuan utama kajian ini adalah untuk mengkaji faktor yang mungkin penting dalam mempengaruhi penerimaan dan penggunaan ICT dalam kalangan ahli akademik Jordan. Kajian ini menjelaskan penggunaan ICT dengan menggunakan Teori Difusi Inovasi, *Theory of Planned Behavior,* dan *Decomposed Theory of Planned Behavior.* Satu tinjauan telah dijalankan ke atas 500 kakitangan akademik yang dipilih daripada IPT awam di Jordan. Sejumlah 415 peserta (83%) telah memberi maklumbalas kepada soalselidik tersebut. Dapatan kajian menunjukkan bahawa norma-norma subjektif dan persepsi terhadap tingkah laku pengawalan telah secara positif mempengaruhi keinginan bertingkahlaku untuk menggunakan ICT di IPT di kalangan ahli akademik. Kajian ini memberi cadangan kepada pengurusan pendidikan tinggi dan penggubal dasar ke arah peningkatan penggunaan dan penyebaran teknologi pada masa akan datang. Selain itu, kajian ini juga menghuraikan dengan jelas penerimaan ICT dalam bidang teknologi pendidikan dalam konteks negara membangun amnya, dan negara Arab khususnya.



**Kata Kunci**: Teori Difusi Inovasi, *Theory of Planned Behavior*, *Decomposed Theory of Planned Behavior*, Penerimaan, Teknologi pembelajaran

# Abstract

Information and Communication Technology (ICT) plays an important role in modern institutions by facilitating and improving the teaching and learning process to be in line with the information technology age. Jordan, as one of the developing countries, highly values the importance of Higher Education Institutions (HEIs) and their role in achieving an economic prosperity through the development of human resources. Unfortunately, the adoption and usage of ICT in teaching and learning process is quite low among the academic staff in the public HEIs in Jordan. The main purpose of this study is to examine the potential prominent factors related to the adoption and usage of ICT in Jordanian HEIs among the academicians. The study provides an understanding on the ICT usage by applying the Diffusion of Innovation theory, Theory of Planned Behavior and the Decomposed Theory of Planned Behavior. A self-administered survey was conducted on 500 academic staff selected from public HEIs in Jordan. A total of 415 participants (83%) responded to the questionnaires. The findings showed that subjective norms, attitude towards technology, and perceived behavioral control positively affected the behavioral intention to use ICT in HEIs among academicians. The study provides recommendations to the higher education leaders and policy makers towards promoting a successful adoption and diffusion of technologies in the future. Besides, it offers a clear description about the adoption in the field of educational technologies in the context of developing countries and the Arab world in particular.



**Keywords**: Diffusion of Innovation, Theory of Planned Behavior, Decomposed Theory of Planned Behavior, Adoption, Educational technology

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# List of Abbreviations

| | |
|---|---|
| **ANOVA** | Analysis Of Variance |
| **ASMO** | Arab Standards and Metrology Organization |
| **ATT** | Attitude Toward Technology |
| **BI** | Behavioral Intention |
| **CBL** | Computer Based Learning |
| **CIA** | U.S Central Intelligence Agency |
| **COMPT** | Compatibility |
| **COMPX** | Complexity |
| **CSE** | Computer Self Efficacy |
| **DF** | Degree of Freedom |
| **DOI** | Diffusion Of Innovation |
| **DTPB** | Decomposed Theory of Reasoned Action |
| **DV** | Dependant Variable |
| **EFA** | Exploratory Factor Analysis |
| **EFL** | English as a Foreign Language |
| **ERFKE** | Education Reform For Knowledge Economy |
| **FA** | Factor Analysis |
| **GFC** | Government Facilitating Condition |
| **HEI** | Higher Education Institutions |
| **$H_I$** | Hypothesis i |
| **HKJ** | Hashemite Kingdom of Jordan |
| **HM** | His Majesty |
| **ICT** | Information and Communication Technology |

| | |
|---|---|
| **IDPM** | Innovation–Decision Process Model |
| **INTAJ** | Information Technology Association |
| **IS** | Information System |
| **IT** | Information Technology |
| **IV** | Independent Variable |
| **JEI** | Jordan Education Initiative |
| **JUST** | Jordan University of Science and Technology |
| **KMO** | Kaiser-Meyer-Olkin |
| **LRA** | Linear Regression Analysis |
| **MBL** | Mobile Based Learning |
| **MENA** | Middle East and North Africa |
| **MIS** | Management Information System |
| **MMC** | Mass Media Channel |
| **MOHESR** | Ministry of Higher Education and Scientific Research |
| **MOICT** | Ministry of Information and Communication Technology |
| **MTC** | Mobile Telecommunication Company |
| **MVA** | Missing Value Analysis |
| **OBSERV** | Observability |
| **PBC** | Perceived Behavioral Control |
| **PC** | Personal Computer |
| **PCA** | Principal Component Analysis |
| **PDA** | Personal Digital Assistant |
| **PEOU** | Perceived Ease of Use |
| **PFA** | Principal-Axis Factoring Analysis |

| | |
|---|---|
| **PTTB** | Telephone and Telegraph Bureau |
| **PU** | Perceived Usefulness |
| **RA** | Relative Advantage |
| **RFC** | Resource Facilitating Condition |
| **RO** | Research Objective |
| **RQ** | Research Question |
| **SD** | Standard Deviation |
| **SE** | Self Efficacy |
| **SN** | Subjective Norms |
| **SN-WOM** | Subjective Norms with Word of Mouth |
| **SPSS** | Statistical Package for the Social Sciences |
| **TAM** | Technology Acceptance Model |
| **TAM2** | Extension Technology Acceptance Model |
| **TDM** | Total Design Method |
| **TFC** | Technology Facilitating Condition |
| **TPB** | Theory of Planned Behavior |
| **TRA** | Theory of Reasoned Action |
| **TRIAL** | Trialability |
| **TRC** | Telecommunications Regulatory Commission |
| **UAE** | United Arab of Emirates |
| **UK** | United Kingdom |
| **UNDP** | United Nations Development Program |
| **UPM** | Universiti Putra Malaysia |
| **USA** | United States of America |

| | |
|---|---|
| **UTAUT** | Unified Theory of Acceptance and Use of Technology |
| **UUM** | Universiti Utara Malaysia |
| **VIF** | Variance Inflation Factor |
| **W_O_M** | Word of Mouth |
| **WAP** | Wireless Application Protocol |
| **WEBCT** | Web Course Tools |
| **WEF** | World Economic Forum |
| **ZU** | Zayed University |

CHAPTER One

# INTRODUCTION

## 1.1 Introduction

Information and Communication Technology (ICT) plays an important role in modern institutions by facilitating and improving the teaching and learning process to accompany the information age. Developing nations have more at stake in the diffusion of ICT in supporting higher education than do the developed nations. As this technology diffusion process is often the economic lever upon which national competitive advantage will reside, technology education provides the manpower to achieve this high technology advantage.

In striving towards a competitive institution, a university or any higher education institutions must enhance teaching and training process related to the advancement of ICT and the innovations technologies (Wood, 1995; Duggan, Hess, Morgan, Kim, and Wilson, 2001). Hence, universities in developing countries as well as in developed countries attempt to move in parallel with the rapid advancements of ICT by increasing the adoption of ICT as tools to develop and improve the teaching and learning process and to become more flexible by reducing some difficulties in the education process.

In relation, the Jordanian government represented by the Ministry of Higher Education and Scientific Research (MoHESR) emphasizes to adopt the Royal Message in the Higher Education Development Forum (HEDF), which was convened in 2007 at the Dead Sea, Jordan. One of the forum’s main objectives is the information technology, which aimed to utilize ICT by the academic staff in teaching and learning process in the higher education institutions. On the other hand, the former prime minister of Jordan, Marouf Bakhit (2007) has emphasized that there is a need to discover solutions to develop the higher education in meeting the challenges in the world with lack of resources. Therefore, improving the quality of the teaching and learning process in these institutions is the main goal of the leadership of higher education in the Arab world (Abdulhaq, 2007).

The higher education sector in Jordan is considered as one of the most influential sectors that develop the country. It encourages the government and private sectors to develop new universities and institutions to achieve economic prosperity by developing the human resources which is considered the main resources in the country. According to MoHESR there are twenty six (26) educational institutions available until 2010 in Jordan (10 public universities, and 16 private universities). They were served by 8038 academic staff, in which 5308 of them are in the public universities and 2730 are in the private institutions (MoHESR, 2010). ICT has been recognized as a new way of improving the value of educational system (Virkus and Wood, 2004). A successful adoption of ICT among lecturers and management in universities is considered very critical in ensuring an effective teaching and learning process to students. With these concerns, and the importance of ICT in Jordanian higher education sector, this study intends to focus on the adoption of ICT in Jordanian public universities among the teaching staff with the focus on the factors influencing the adoption of ICT in their teaching and learning process.

## 1.2 Background of the Study

The new and rapid growth of technologies has changed the face of the world. ICT has become the main influential determinant in economic, social, and human development (Dertouzos, 1997). It is being considered the umbrella for the communication and networking devices and software with applications (Jain, 2006). In fact, the development of ICT strategy is vital for the growth of the knowledge economy in developing countries. The idea of the knowledge society and the associated "information economy" has become popular as a policy idea among developing nations in the last decade.

With a fully one-half of the world represented by developing nations (Sahay and Avgerou, 2002), the significance of national technology initiatives in the developing world and the technology education programs that support them is high. Consequently, the less developed countries could observe the development of a knowledge society via the development of associated information technology as the way toward economic prosperity (Beerkens, 2008). Yet, it has long been known that the development and diffusion of ICT represents a means of national advantage in the developing world (Kulchitsky, 2004). Though technology patterns vary across underdeveloped nations, the eventual success depends heavily on an educated workforce (Mistry, 2005). A successful diffusion of technology in such poor resource-based developing countries requires the establishment of a group of educated managers and technicians who can implement emerging technologies, which implies a critical role for technology education in the process of national economic improvement (Hall, 1999; Deichmann, Eshghi, Haughton, Masnghetti, Sayek, and Topi, 2006). In conjunction, Jordan, as one of the developing countries faces many challenges such as limited natural resources like water, oil, and gas which affect the economic capabilities. This limitation has driven the country to explore new ways in the higher educational system with supports of ICT to improve and supply the existing natural resources to be more efficient and to increase the economic prosperity.

### 1.3 ICT Development in Jordan

The Hashemite Kingdom of Jordan (HKJ) is one of the highly developed Arab countries in the Middle East. The King and the government have sponsored many initiatives to encourage the diffusion of technologies in the country that not only possessing geographical advantage, but also often seeking to develop technological workforces to increase the standard of living and economic productivity (Al-Jaghoub and Westrup, 2003). Jordan focuses on the higher education sector and universities significantly in regards to the development of human resources in the country. Upon accession to the throne, King Abdullah II has launched concerted initiatives emphasizing on the importance of the higher education for the future of the country. According to King Abdullah II, "*The development of human resources is the first priority in this stage because the Jordanian people are the wealth to the country. So the government will focus on human resource investment among the comprehensive of knowledge economy within rehabilitation teachers, curriculums development, and* *promotion of scientific research and higher education levels to move to the Information age*".

Governmentally, the educational strategies began in 2000 that aims at adopting and using ICT in the educational system to attain the objectives of the e-government (MoICT, 2010). Even though Jordan is a poor country in terms of the natural resources such as water, oil, and gas, the country gives a high priority to the development of human resources as the main resource to expand the national economy (Straub, Loch, and Hill, 2001). The challenges for the country therefore are to increase the quality of education in universities and to support the scientific research to face the lacking of resources for the development of the national economy. Developing nations in similar circumstance have successfully leveraged ICT for national competitive advantage (Harris, 2002). Besides, the Jordanians have great enthusiasm for the adoption and use of ICT (Stafford, Turan, and Khasawneh, 2006). On the other hand, in spite of being recorded as the lowest users in the Middle East compared to all other regions in the world except that in Africa (Ali, 2004), the Kingdom of Jordan is a shining example of technology diffusion (Al-Jaghoub and Westrup, 2003).

Telecommunications Regulatory Commission (TRC) shows that the number of users who use ICT services such as mobile devices and Internet is increasing from year to year. As an illustration, Internet users in 2005 were 720,000 with a diffusion rate of 13.2%, which increased in 2010 to 2,324,000, with a diffusion rate of 38%.

Consequently, mobile phone users in 2005 were 3,138,000 with the diffusion rate of 57%, while in 2010 it increased to 6,620,000 with a diffusion rate of 108% (TRC, 2010). The young King, H.M. Abdullah II, has made technology diffusion in general and the Internet specifically, the articles of faith among the population. Also, inroads are made in adapting technology for the purposes of economic development in Jordan.

### 1.4 Transformation in Higher Education

ICT plays major roles in every aspect of our life and it's required in every sector and industry, including the educational sector. This sector has been going through some evolution and changes with the influence and supports of ICT to improve the quality and the efficiency of the teaching and learning process (Westera, 2004). These include the innovation of e-learning or online learning, emails, multimedia-based teaching materials, and also application systems, and databases. The adoption and diffusion of educational technologies that leverage ICT and the Internet have provided an unprecedented opportunity for improving higher education around the world (Davis and Wong, 2007). Therefore, the educational technologies must become more popular among developing nations which seek economic improvement (Khasawneh, Khasawneh, Bsoul, Idwan, and Turan, 2011). In fact, the educational technology is becoming more universal at an increasing rate as most firms recognize the needs to prepare the IT professionals for the global environment (Margavio, Hignite, Moses, and Margavio, 2005).

In an effort to transform and realign universities into 'Information Age', a major restructuring of computer centers and IT division and establishing division of e-learning activities has been initiated to maintain and increase the use of ICT in the universities teaching and learning practice. One of the main goals of these divisions is to upgrade the teaching skills and practice amongst the teaching staff. The introduction of such centers has assisted and helped university management, staff, and students in maximizing the value of information technology and further delivering the leading-edge information technology products, services, supports, trainings and education for staff and students.

Apart from this, the globalization of the learning process is paralleled with the dramatic increase in the utilization of the Internet as an educational support tool (Van Raaij and Schepers, 2008). Meanwhile, the developing nations are always one step behind the Western world in terms of the adoption of important information technology innovations (Hall, 1999), and it seems equally unquestioned that the West can provide important guidance and supports to the educational technology initiatives of the developing world, as part of the assistance in the implementation of technology-based economic development models (Watson, 1994). In general, ICT is seemed as critical to the development process upon which economic prosperity depends, but it is also an integral part of the education systems, fundamentally changing the nature of the educational process (Kenny, 2001).

Actually, the higher education sector is in the midst of a pedagogical paradigm shift worldwide and the utilization of ICT in the educational system. Hence, this study focuses on the success characteristics of lecturers, particularly in their various technological contexts and settings, as opposed to continuing in the comparative study of the technologies (Clouse and Evans, 2003; Davis and Wong 2007).

### 1.5 Problem Background

In the last two decades, many studies have been conducted on the adoption of innovation of ICT all over the world especially in the industrialized and developed nations, such as the United States of America (USA), United Kingdom (UK), and Australia. Each of these studies focused on the adoption of different types of technologies such as computers (DeLone, 1988; Davis, Bagozzi, and Warshaw, 1989; Oyediran and Odusami, 2005), E-commerce (Bhattacherjee, 2000; Sahawneh, 2002; Al-Qirim, 2007), mobile commerce (Siau, Lim, and Shen, 2001; Khalifa and Cheng, 2002; Pedersen and Ling, 2002), and Internet banking (Tan and Teo, 2000; Al-Ashban and Burney, 2001; Pikkarainen, Pikkarainen, Karjaluoto, and Pahnila, 2004).

Consequently, there are differences between developed and developing nations in how they use ICT that can be traced through cultural differences (Sagi, Carayannis, Dasgupta, and Thomas, 2004). In conjunction, using the available benchmarks from developed nations for studying ICT adoption in developing nations is unreliable and ill-advised (Rolland and Montiero, 2002; Sahay and Avgerou, 2002; Sundqvist, Frank, and Puumalainen, 2005). However, there are certain benchmarks found in the developed world that would serve as useful methods if they could be used reliably in the developing world. Accordingly, the next sub sections attempt to explain the problem background from developing countries perspective, Jordan in particular, and determining the factors that mostly used in the adoption theories that influencing on the adoption decision to the academic staff in their teaching and learning process.

### 1.5.1 ICT in Jordanian Higher Education Institutions

Jordan believes that the use of ICT affects the increase of knowledge among the society. As a response, MoHESR has highlighted in its strategies and vision about the adoption and utilization of ICT in its academic institutions. Also, the Jordanian National ICT Agenda emphasizes the adoption of ICT in the higher education institutions including public and private universities. In March 2002, the National ICT Agenda in higher education strategy was ratified in a national conference, and was approved by the council of the Higher Education in Jordan. The strategy aims at empowering students in employing ICT and improving their skills and knowledge, improving the ICT skills and knowledge of faculty members especially academicians, employing ICT in educational system, and adopting e-learning (Al-Jarrah and Yassen, 2007).

In the matter of fact, the higher education sector in Jordan plays a critical role in the growth of the national economy because the individuals have strong needs and interests in education to develop their knowledge and skills to become competitive and knowledge workers in the global markets. Recently, there are many initiatives and strategies from His Majesty the King, the government, and the leaderships of the higher education in Jordan such as the higher education strategies 2007-2012, to state the adoption and utilization of ICT in teaching and learning process on the move. In line with the national agenda in ICT development in the higher education sector, universities must provide sufficient infrastructures and resources to support the teaching staff in utilizing ICT. The Jordanian governments have worked hard to introduce appropriate technologies to enhance and improve the quality of educational system in Jordan.

In fact, the country has invested a large amount of money to adopt and integrate technologies into the education system by providing teaching staff with good opportunities to develop their knowledge, skills, and experience related to the use of these technologies (Al-Zaidiyeen, Mei, and Fook, 2010). This suggests that the government and the higher education leaderships in developing countries have responsibilities not only to provide computers and ICT tools to the universities but also to foster a culture to utilize ICT among the teaching staff in universities.

On the other hand, universities in Jordan have a few challenges in investing ICT in the teaching and learning process to achieve the economic prosperity to the country. The plans should include the pedagogical strategy and the focus is not only driven by the ICT but also on how the academic staff can and will use the tools. Perhaps the lack of models for integrating ICT into the university curriculums and the limitation of dedicated and committed leadership have contributed to the perceived lack of effective institutional planning such as training centers and training programs. Additionally, the different cultures and languages between western countries and the Arab countries may be considered as one of the most important challenges faced by the universities in adopting and using ICT in their teaching and learning process (Cortese, 2003; Uhomoibh, 2006).

Nevertheless, Jordan struggles to join the western countries especially in using technologies in teaching and learning process in higher education institutions. For instance, UK is considered as one of the best developed countries in the use of ICT in the higher education system (James and Hopkinson, 2009). They present in a report for the Joint Information Services Committee (JISC) that there are 1.470.000 computers, 250.000 printers, and 240.000 servers. In contrast, there are very few empirical studies being conducted to measure the adoption of ICT in the educational institutions in developing countries, especially in the Arab countries (Wee and Abu Bakar, 2006; Al-Mobaideen, 2009). More information is needed to improve the understanding of applying ICT in order to enhance the adoption of ICT in higher education institutions in Jordan.

The study concludes from the previous literatures that until now there is a lack of ICT usage among the universities' academic staff in Jordanian higher educational institutions (Al-Mobaideen, 2009). The adoption and usage of ICT in universities in teaching and learning process are still limited among the academicians (Patnaik, 2001). In which they have lack of knowledge, skills, motivations, and interests in using ICT in facilitating their works (Jawarneh, El-Hersh, and Khazaleh, 2007; Qudais, Al-Adhaileh, and Al-Omari, 2010). A comparative study was conducted between two Arab universities, which are Jordan University of Science and Technology in Jordan (JUST) and Zayed University (ZU) in United Arab of Emirates (UAE). As a result, ZU has a significant better of technology infrastructures and resources than JUST, which will be increased the motivations and skills to adopt ICT in the educational system (Tubaishat, Bhatti, and El-Qawasmeh, 2006).

Other issue regarding the adoption and usage of ICT in Jordanian universities is the lack of guidelines that specify the roles and responsibilities of training centers and training programs that support universities' faculty members to use ICT in teaching and learning process (MoHESR, 2010). According to a report issued by the United Nations Development Program (UNDP), there is a limitation of ICT utilization in higher education institutions in Jordan and this is due to the lack of technical infrastructure and training program (AlFarawati, 2001). In addition, Baylor and Ritchie (2002) state, "*regardless for the amount of technology and its sophistication, technology will not be used unless faculty members have the skill, knowledge and attitude necessary to infuse it in to curriculum*". In response to this issue, it is necessary for a university to establish training centers and programs to the staff with availability of sufficient technologies to help them develop their skills in using ICT in the educational purposes.

### 1.5.2 Factors Influencing ICT Adoption

With regards to discussions in the previous paragraphs, the literature reviews of information system (IS) field have shown several factors which influence the adoption and acceptance of information technologies. Among the factors that are widely being studied are attitude towards technology (ATT), subjective norms (SN), and perceived behavioral control (PBC) (Park, Lee, and Cheong, 2008; Dixon and Siragusa, 2009; Park, 2009; Karaali, Gumussoy, and Calisir, 2010; Macharia and Nyakwende, 2010; Qudais et al., 2010). In relation to these factors, behavioral intention (BI) is the ultimate destinations that bring to the adoption of one technology. The study, therefore, applies three adoption theories to develop a model to answer the research questions and achieve its objectives. Meanwhile, it looks at the ICT adoption from a holistic perspective; technological perspective by using the Diffusion of Innovation (DOI) (Rogers, 1995), psychological perspective by using Theory of Planned Behavior (TPB) (Ajzen, 1991), and management factors by using the Decomposed Theory of Planned Behavior (DTPB) (Taylor and Todd, 1995). Besides, there are four main factors which were used to developed the model: (i) the BI to use or reject the technologies among the academic staff in Jordanian higher education institutions, (ii) the ATT in the teaching and learning process, (iii) SN that influences them to use or reject these technological facilities, and (iv) PBC that influences them to use or reject ICT in their teaching and learning process.

Behavioral Intention

BI refers to a person’s subjective probability in performing certain behavior (Fishbein and Ajzen, 1975). It decides if the academic staff wants to accept and use the technologies in the educational system or rejects it. Park et al. (2008) argued that the BI is very important factor that affects the academic staff to use the Internet-Based Course Management System (IBCMS). In relation, SaadÃ, Tan, and Nebebe (2008) and Macharia and Nyakwende (2010) confirm the importance of measuring BI in the using and adoption of ICT in the higher educational institutions. BI, however, is considered a very important factor to the study because its ultimate station to accept or reject the technologies in the educational system among academicians.

Attitude towards Technology

Attitude refers to a person’s perception or general feeling of favorableness or unfavorableness towards using technologies in the higher educational system (Ajzen and Fishbein, 1980; Tan and Teo, 2000; Rogers, 2003). Park (2009) mentions that it is necessary to conduct studies that deal more intensively with learners’ perceptions of, attitude towards, and intention to use educational technologies. Karaali et al. (2010) also argued the importance of the attitude factor to measure the BI to use the technologies in the teaching and training system. Consequently, the relationship between the ATT and the BI to use it implies that, other factors being equal, people tend to perform behaviors toward which they have positive attitudes.

Several researches have proven the importance of the relationship between the ATT and the BI to use it such as Wu and Chen (2005), Chen, Fan, and Farn (2007), Lin (2007), Chang and Wang (2008); Liu, Liao, and Pratt (2009). In Jordan, a recent study by Qudais et al., (2010) found that the relationship between both factors is significantly important. The ATT, however, plays a critical role to success this study because it measures the BI to accept or reject educational technologies among academic staff in Jordanian institutions.

### Subjective Norms

SN refers to a person's perception that most referents who are important to them desire the performance or non-performance of using ICT in the teaching system and their motivation to comply with the views and wishes of referents (Ajzen and Fishbein, 1980; Warshaw, 1980). It is considered as one of the factors that influences the adoption and the acceptance of technologies. It appears in many adoption theories such as Theory of Reasoned Action (TRA) and TPB. Hsieh, Rai, and Keil, (2008) found that there are positive relationships between SN including social influences and BI to use technologies. Macharia and Nyakwende (2010) agree upon the importance of SN in adoption of educational technologies in the higher educational institution. In the Jordanian case, the social influence is very important in affecting the academic staff in accepting or rejecting the new technologies in the educational system. Particularly, Qudais et al. (2010) found that the socially and culturally sensitive issues are considered as one of the problems faced by the academic staff to adopt or reject the technologies in the educational system.

Perceived Behavioral Control

PBC is also considered as an important factor in the adoption of ICT in the educational system among academic staff. It refers to "*person's perception of the ease or difficulty of performing ICT, as well as the beliefs about having the necessary resources and opportunities to adopt educational technologies*" (Ajzen, 1991; Pavlou, 2002). Hsien et al. (2008) found a significant relationship between individual's PBC such as the facilitation that supports the use technologies and their BI to use these technologies.

On the other hand, Dixon and Siragusa (2009) and Bidin, Shamsudin, Sharif, and Hashim (2010) found the importance of PBC on behavioral interaction to accept and use ICT in the educational system. However, the Jordanian higher education institutions consider the PBC as a very important factor to increase the adoption rate of using ICT in the educational system. In fact, the MoHESR presents the facilitating conditions such as technological, resources, and governmental support to the universities to increase the ICT usage in the educational system (MoHESR, 2010). So, the study focuses on PBC factor to measure the Jordanian academicians' BI to adopt and use of ICT in teaching and learning process.

Hence, this research is conducted to study the adoption and utilization of ICT technologies with a focus on discovering the factors that affect the adoption of ICT among teaching staff (academicians) in Jordanian public universities. However, adoption of ICT technologies will be influence to improve the educational system.

Also, the study attempts to build an appropriate research model that will be help the leaderships of higher education institutions to support and encourage the usage of ICT among academic staff in the educational system.

### 1.5.3 Problem Statement

From the above sections and reviewing the literatures in the adoption of technologies in the information system field, educational technologies in particular, the study determine the problem statement as the limitation of ICT adoption and usage in the Jordanian higher education institutions among academic staff in their teaching and learning process. In order to solve the problem, the study measures the academic staffs' perception of the educational technologies from several perspective such as technological, psychological, and management perspectives by studying their perception of ATT, SN, and PBC that affect on academicians' BI to adopt or reject the educational technologies.

## 1.6 Research Questions

With the issues and problems discussed in the previous sections, the following are the research questions developed to drive a specific study in understanding the adoption of ICT among academic staff in public higher education institutions in Jordan.

RQ1: What are the differences related to the demographic characteristics that could affect the university's teaching staff in predicting ICT adoption in the educational system?

RQ2: What are the prominent predictors of ICT adoption in higher educational system that could affect academic staffs' BI?

RQ3: What is the status of utilizing ICT in Jordanian public universities by academic staff in the educational system?

### 1.7 Research Objectives

The study aims at achieving the following objectives:

RO1: To determine the relationships between the academic staffs' demographic characteristics with the use of common technologies that affects them to adopt ICT in teaching and learning process.

RO2: To determine the prominent predictors that influences the successful adoption of educational technologies by academicians in Jordanian public universities.

RO3: To develop an ICT adoption model to promote the adoption and usage of ICT in teaching and learning process by universities academic staff.

RO4: To explore the current status of ICT adoption in the teaching and learning process among universities academic staff.

## 1.8 Research Scope

The scopes of the study are as follows;

1. The research focuses on the adoption of technologies in the developing countries in general, Jordan and Arab world in particular.

2. The research environment is the higher education institutions in Jordan, with focusing on the public higher education universities.

3. The research is concerned with the improvement of teaching and learning process through the adoption of ICT among academic staff in the Jordanian public universities.

4. The research is focused on developing a conceptual model of factors that influence academicians to use ICT in their teaching and learning process.

5. The model is tested through a quantitative approach by distributing questionnaires to the academic staff in Jordanian public universities.

6. The findings of the research model testing are used to design the strategies to guide the planning and management of the adoption of ICT in teaching and learning process among academicians in higher education institutions.

### 1.9 Significance of the Study

The literature shows that adoption of ICT in educational systems has been examined in several countries, such as the USA, UK, Australia, and Canada. However, there is insufficient empirical research that focuses on adoption of ICT in educational sector spotlight on academicians in Jordanian public universities. Filling this gap is one of the reasons of conducting this research. Jordan as a nation at the heart of the Middle East region represents very different cultural, politico-legal and socio-economic realities. The level of economic, technological, and industrial development is significantly different than the developed countries. Jordan is a close-knit country that appears technically and culturally different from those of the western societies.

Higher education and universities are the most important organizations in the country. The increase trend to higher education by individuals with the increase number of the universities whether public or private demands the observation and development of the quality of educational systems to entering the information age. This study concerns the factors which influence the adoption of ICT among lecturers in Jordanian public universities. Also, this study makes an attempt in bridging the digital divide between developed and developing countries in the use of ICT in the education and learning process through Jordanian higher education institutions. The optimum use of ICT by academic staff in the universities will develop the quality of alumnus and improve the teaching and learning process in creating new generation who are capable and competitive in the global market. Hence, the study will be the authority to all universities that want to adopt and utilize ICT in their education and learning process in Jordan and all Arab countries.

In conjunction, the study gives benefits to the higher education system and the universities in Jordan to develop and improve the teaching and learning process by using ICT services in the teaching system. On the other hand, the study also attempts to give the higher education leaders a full image about the current status of ICT usage in the teaching system. Moreover, it determines the influential and non-influential factors on the academic staffs' BI to use ICT in their teaching and learning process. The importance of these factors is to help the decision and policy makers to determine which factors need support and which need treatment to encourage the academicians to adopt ICT in the teaching system.

### 1.10 Contribution to the Knowledge

In the Middle East, very few works beyond the explanatory level has been done to understand the dynamicity of technology adoption and diffusion. Particularly, the diffusion theories have been found to be a good and relevant indicator of diffusion propensity in technology adoption research, and appears to span the bodies of research that consider consumer interest and acceptance of new ICT.

On the other hand, the factors which will have effects in Jordan and the Arab world may not possibly be the same as the western countries. Additionally, there are differences between developed and developing countries in how they use the ICT that can be traced through cultural differences (Sagi, Carayannis, Dasgupta, and Thomas, 2004). Using the available benchmarks from developed nations for studying ICT adoption in developing nations is unreliable and ill-advised (Rolland and Montiero, 2002; Sahay and Avgerou, 2002; Sundqvist, Frank, and Puumalainen, 2005). There are certain benchmarks found in the developed world that would serve as useful methods if they could be used reliably in the developing world. However, the approach in this study is not just to apply an existing theory of adoption, as it may not be able to handle the differences between the industrialized nations and developing countries or the different technical and cultural settings. As a result, appropriate modifications of technology adoption theories are made to address the Jordanian environment.

This study lights up the assessment of the factors which are influencing the developing countries culture in general, Arab culture in specific and of their relative significance. The study looks through the current theories of IS adoption and intends to extend the related theories with additional factors. The findings of this research have contributed in both the practical and theoretical implications of ICT adoption in Jordanian higher education institutions.

Practically, it benefits the higher education system and the universities in Jordan to developing the teaching and learning process by utilizing ICT services in the teaching system. The study also gives the higher education leaders a full image about the current status of ICT usage in the teaching system. Additionally, it determines the influential and non-influential factors on the academic staffs' BI to use ICT in their teaching and learning process. The importance of these factors is to help the decision and policy makers determining which factors need support and which need treatment to encourage the academicians to adopt ICT in the teaching system.

In term of the contribution from the literatures perspective, this study offers a clear description about the adoption in the field of educational technologies in the context of developing countries and the Arab world in particular. This study addresses the gap found in the literature between developing countries and developed countries. It is a significant contribution to ease and elaborate further the understanding of ICT adoption in the higher educational system among one of the developing countries.

Theoretically, the study contributes by integrating the models of DOI (Rogers, 1995), TPB (Ajzen, 1991), and DTPB (Taylor and Todd, 1995). In the light of the works that have already been done, there is a reason to expect that these three theories might behave reliably in the context of developing the nations of the Middle East. In the meantime, the study looks at the ICT adoption from a holistic perspective; technological perspective by using the DOI factors, psychological perspective by using SN in the TPB, and management factors by using PBC from the DTPB.

As a summary, understanding the behavioral aspects of adoption is important to both researchers and industry players. The findings of the current research contribute to theoretical modelling by modifying the IS adoption theories in relation to a new application area that may give new insights into the theory. It is also proposed that this study improves a successful adoption of the particular services (ICT) that are supported by new technologies by deepening the knowledge about factors which inhibit or facilitate the adoption among the developing nation and the Arab countries in particular, as these countries share similar culture, religion and speak the same language.

### 1.11 Research Motivation and Justification

The motivations and justification for carrying-out this study include:

a) The higher education and universities in Jordan are the most important sectors in the country. In relation, this study receives special encouragements from the leaderships of higher education as well as the King and the governments in Jordan.

b) The significance of using technologies in the educational systems around the world and the increasing competition among the higher education institutions creates the needs to find solutions to increase the adoption of ICT in universities to improve the quality of the educational system.

c) Adoption of ICT among universities in teaching and learning process is a sufficient topic and the fact that there are conflicting evidences about the variables relating to adoption of ICT among teaching staff in the context of developing countries.

d) The limitations of previous studies in developing countries in explaining the ICT adoption behavior in the Arab and Muslim nations such as Jordan, up to the researcher knowledge there is a lack of empirical research in the Arab world.

e) The expected contribution of this study from two levels. (i) Theoretical level which means the study attempts to extend the theory from previous adoption theories. (ii) Practical level which implicates that the successful practice of the study will be published to all public universities in Jordan.

**1.12 Theoretical Framework**

The study intends to explore the factors that affect the BI of academic staff in Jordanian public universities to adopt and use of ICT in their teaching and learning process. To achieve the main objectives, this study has applied adoption theories to build a model relevant to the study's environment. These theories are DOI by Rogers (1995), TPB by Ajzen (1991), DTPB by Taylor and Todd (1995).

Consequently, building the model has driven the study to indicate several factors that represent three aspects of the study; (i) technological aspects in which the factors are devised from DOI theory such as relative advantage, compatibility, complexity, trialability, and observability, (ii) psychological aspects, which is composed of the factors from TPB such as SN including personal norms and media channels, and (iii) management aspect that contains factors from DTPB such as self efficacy (SE), and facilitating conditions (FC) including technology, resources and government support. The study is also interested in additional factors that play roles in the BI to adopt and use the ICT services among academic staff such as demographic factors which include gender, age, higher educational degree, major, the place of obtaining the higher educational degree, and experience of teaching.

Eventually, the proposed research model will be the authority for all universities to encourage the adoption and utilization of ICT in the education and learning process in Jordan and the Arab countries because this study is considered as a novel study in the Arab region. The proposed model could assist the decision and policy makers determining the most influential factors that affect the academicians' BI to use ICT in the educational system and try to support it.

Based on the results of the reviews on literatures regarding adoption theories and the literature, the study starts building the model, which includes the critical factors to be considered while describing the adoption and utilization of ICT in educational sector in Jordan. Consequently, there are some difficulties encountered in expressing the meaning of the associations among the factors such as the differences of the culture, language, and human skills between developed and developing countries. The study tries to build the research model in a way that the factors and the relationship between them are supported by material gathered from literatures and real-work example, such as web sites of selected universities.

Initially, the study starts to generate the model from the literature review and then decides to conduct interviews with experience people i.e. key informants to revise the model. The steps taken to build the research model are summarized in Figure 1.1. It explains that the theoretical framework of the research can be summarized into three parts. The first part is the study and survey of the information systems literature, which explores the adoption theories and the related literatures. In the second part, the scopes are reshaped to study the elements (factors) that make academicians utilize and use ICT from primary sources. For this part, the research adopts an explanatory study.

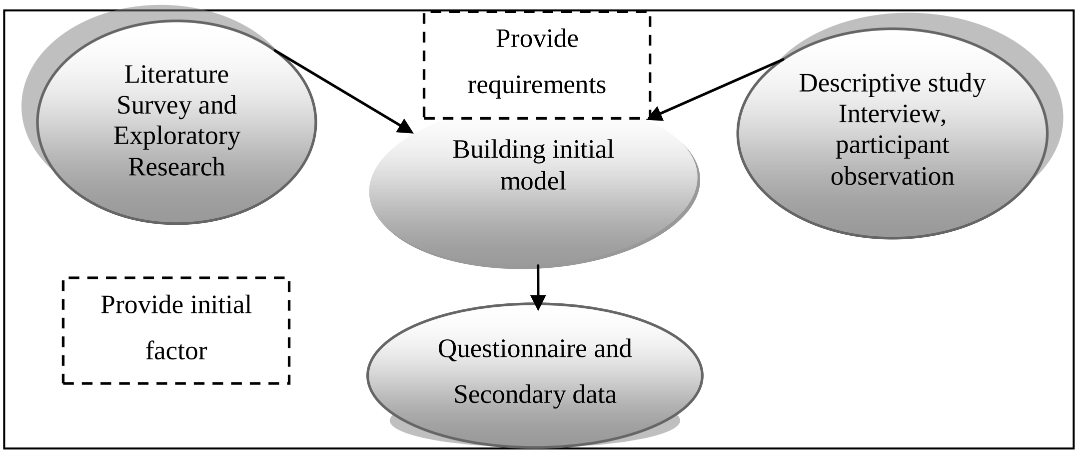



*Figure 1.1: Stream of Research that Guides this Study*

In the third part, the study outlines an initial model including factors that can affect the adoption and utilization of ICT in the educational system, followed with the technique used to test the model and data collection to validate the model. The research model was developed to investigate the factors that might have influenced the adoption of ICT in teaching and learning process among the academicians in public universities in Jordan. Within this realm, the scope of ICT has traditionally included hardware, software, and telecommunications components (Green, 1999). Also, it includes IS, products, and technologies (Fowler, 1994).

## 1.13 Research Framework

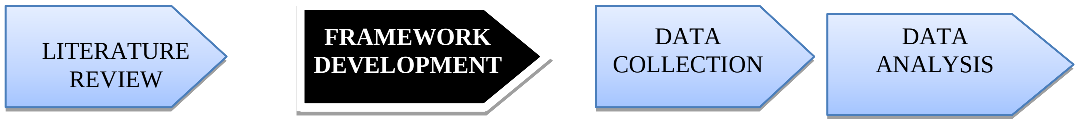
A research is defined as a way people carry out activities in order to fulfil their needs, like solving existing problems, assessing and discovering new strategies, and producing new products or services and other things (Saunders, Lewis, and Thornhill, 2003). In every research, there is a part or section discussing about how the researcher carry out the research methodology, and explaining the methods that the researcher used in collecting and gathering data, and analyzing the collected data, together with implications that the researcher face, besides other processes.

In conjunction, the approach used in this study is a model-based development. The approach involves four major phases (i) literature review, (ii) framework development, (iii) data collection and (iv) data analysis. The first phase involves a review on the previous studies in ICT adoption in general and in educational technologies in particular. The purpose is to identify gaps or limitations from the previous studies that lead to a new study. In the second phase (framework development), the research uses the adoption theories to build a model related to the adoption of ICT in the educational system in Jordanian universities. The third phase involves data collection from the academic staff in Jordanian higher education institutions. The purpose is to determine factors that affect academicians' BI to use ICT in their teaching and learning process. The last phase is the data analysis that produces the findings of the study and presents the relevant model to achieve the research objectives. The details of each phase with the key inputs, tools, activities and deliverables of each stage are given in Figure 1.2, 1.3, 1.4, and 1.5.

**LITERATURE REVIEW** → FRAMEWORK DEVELOPMENT → DATA COLLECTION → DATA ANALYSIS

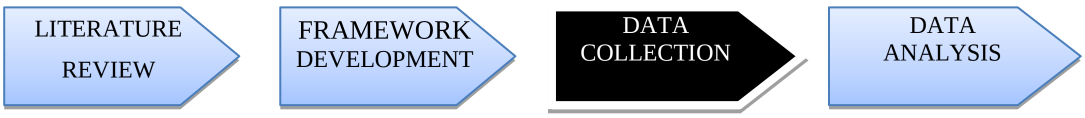
| OBJECTIVES, KEY INPUTS AND TOOLS | KEY ACTIVITIES | DELIVERABLES |
|---|---|---|
| Review Books, Periodical Journals, Proceedings, Published and Unpublished Papers, Online Documentations, Online Journals, and Online Proceedings.<br><br>Explore Web sites of Jordanian Universities, Ministry of Higher Education and Scientific Research, and other related sites. | Review of the existing books, journals and proceedings- on issues, models, frameworks, factors related to the adoption of ICT in general, ICT in higher education in particular.<br>Meet key informants and experts in the adoption of technology and in the Jordanian higher educational institutions.<br>Identify limitations/gaps in past literatures of adoption of ICT in general, Higher education institutions in particular.<br>Identify suitable concepts from the adoption theories to fill in the gap in the adoption of new technologies in developing countries. | Issues and problems in adoption of ICT, in particular higher educational institutions are determined.<br><br>The research questions, objectives, and scopes are identified.<br><br>Theories, approaches, and framework used in understanding ICT adoption. |

*Figure 1.2: Inputs, Activities, and Deliverables of Literature Review Phase.*



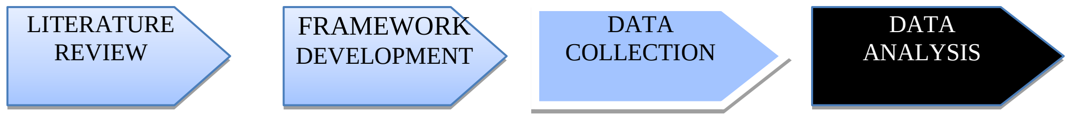

| OBJECTIVES, KEY INPUTS AND TOOLS | KEY ACTIVITIES | DELIVERABLES |
|---|---|---|
| Issues and problems in adoption of ICT, in particular higher educational institutions.<br>Research questions, objectives, and scopes.<br>Theories, approaches, and framework used in understanding ICT adoption.<br>Limitation in the previous studies | Specifying the theories which will be used in the proposed model<br>Specify the independent and dependent factors which are influencing the adoption of ICT in the Jordanian higher educational institutions.<br>Meeting key informants and experts in the adoption of technology and in the Jordanian higher educational institutions. | The framework of the study is proposed.<br>Research hypotheses are determined.<br>Research methods are specified.<br>Research population and sample are determined.<br>The questionnaire is built. |

*Figure 1.3: Inputs, Activities and Deliverables of Framework Development Phase.*




| OBJECTIVES, KEY INPUTS AND TOOLS | KEY ACTIVITIES | DELIVERABLES |
|---|---|---|
| Proposed framework of the study.<br>Research hypotheses.<br>Research methods<br>Research population and sample.<br>Questionnaire. | Test the research model.<br>Ensure the validity and reliability of the research methods through pilot study.<br>Modify questionnaires questions. | Universities are determined as the case study of the research.<br>Data collection approaches.<br>Data are fully collected using data collection approaches.<br>Data analysis software is determined. |

*Figure 1.4: Inputs, Activities, and Deliverables of Data Collection Phase.*




| OBJECTIVES, KEY INPUTS AND TOOLS | KEY ACTIVITIESKEY ACTIVITIES | DELIVERABLES |
|---|---|---|
| Universities as the case study of the research. | Determine the best approaches to test the proposed model. | The findings of the research are outlined. |
| Data collection approaches. | Determine the best approaches to test the research hypotheses in the proposed model. | Specify the factors that affect the adoption of ICT in the teaching system in Jordanian public universities. |
| The gathered data. | | The research model is considered as a new theory in the adoption of ICT in the educational system in Jordan higher education institution. |
| Data analysis software. | | |

*Figure 1.5: Inputs, Activities, and Deliverables of the Data Analysis Phase.*

## 1.14 Structure of the Thesis

**Chapter One: - Introduction,** this chapter is an introduction of the study which contains background, ICT in Jordan as the context of the study, summaries of higher education and the utilization of technologies in it. The major parts of chapter one includes the research problem, research questions, research objectives, and research scopes. Also, the chapter outlines the significance of the study and the motivation and justification, theoretical framework, with the contribution of the study. At the end, the chapter outlined the proposed methodology to conduct the research.

**Chapter Two: - ICT and Educational System in Jordan,** the chapter discusses Jordan in many perspectives such as the utilization of ICT in general and in higher education in specific. It continues with description of the initiatives from Jordanian government in improving the utilization of ICT in the education system in the country. The chapter also presents the status of ICT utilization in the Arab world in general.

**Chapter Three: - ICT Adoption Theories**, this chapter focuses on the literature review on the adoption theories particularly DOI, TRA, TPB, and DTPB in relation to ICT. Driven by these descriptions, the chapter describes the relationship between the factors which will be used in the proposed model specifically technological innovativeness, ATT, SN, PBC, and technological and demographic characteristics. At the end, the chapter reviews the issues of adoption of ICT in the educational institutions system from the previous studies.

**Chapter Four: - Conceptual Model Formulation and Research Methodology,** this chapter concerns about the research methodology and the proposed model of the study. The research framework is discussed stage by stage; continue with the hypotheses of the study. Additionally, the chapter explains the approach of the data collection and data analysis methods.

**Chapter Five: - Assessing the Reliability and Validity of Measurement,** the chapter discusses issues related to data preparation for the preliminary analysis of the study. The main objective of the chapter is to focus on assessing the reliability and validity of the measures in the study. Mainly, it determines the internal consistency using Cronbach's alpha and factorial validity through deploying factor analysis techniques. Then, it examines the multivariate assumptions related to the study.

**Chapter Six: - Findings and Discussion,** the chapter provides descriptive analyses of the study such as the relationships between demographics factors and the level of readiness to use ICT with the BI to use ICT in the educational system. In addition, it provides regression analyses for testing the hypotheses and maps with the objectives of the study. This chapter also discusses the study's model development and presents empirical findings of the study.

**Chapter Seven: - Conclusion,** the final chapter concludes the research by summarizing the researcher's works and findings. It also provides suggestions and directions for future research. As the main theme, this chapter presents the findings related to the research hypotheses as well as the major findings answering the research questions. Figure 1.5 shows the structure of the thesis as described in this section.

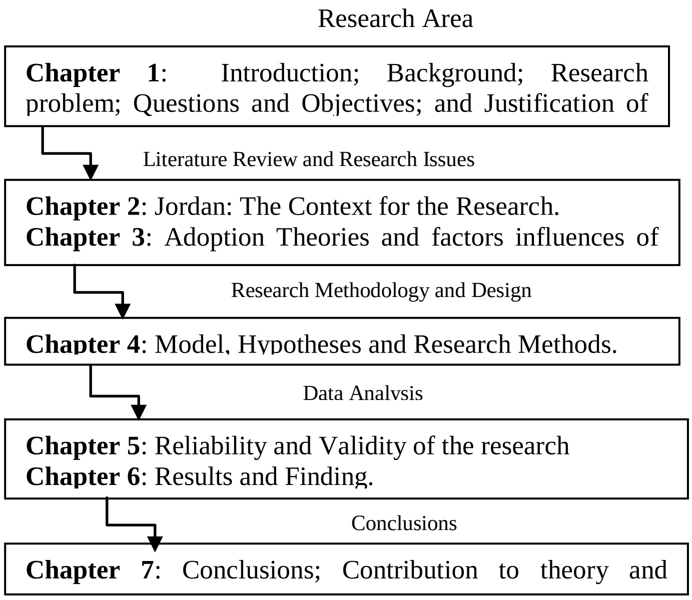



*Figure 1.6: Research Content*

## 1.15 Concluding Comments

This chapter presents the introduction of the study in terms of ICT adoption in higher education institutions in developing countries especially in Jordan in the teaching and learning process. More importantly, the chapter presents the problem statements which specify the main issues in the study and identify the gap of ICT utilization in Jordanian higher education institutions among academicians in their teaching and learning process. In addition, the chapter clarifies the research questions, research objectives, which attempt to answer and achieve it by determining the factors influence academic staff to adopt ICT tools in the educational system. The chapter outlines the significance of the study and its contributions to the body of knowledge in terms of theoretical, literature review, and practical perspectives. Also, the chapter explores the motivations and justification of the research, followed with the theoretical framework by integration adoption theories to build ICT adoption model suitable to the Jordanian higher educational system environment. Finally, the chapter concludes the research framework and the structure of the whole thesis. Consequently, the information about the context of the study is presented in the next chapter "ICT and the Educational System in Jordan".

CHAPTER Two

# ICT AND EDUCATIONAL SYSTEM IN JORDAN

## 2.1 Introduction

The main purpose of the chapter is to shed light on the environment being investigated in this study in relation to ICT adoption in Jordan. It starts by describing the current state of ICT utilization in the developing countries, followed by the introduction of Jordan in terms of historical view, geographical location, and general economic status. The chapter continues with a discussion on the state of ICT in Jordan and the Arab countries, in general, and in higher education in particular. Eventually, the chapter also discusses on the adoption of ICT technologies by Jordanian higher education institutions, of particular relevance to this study**.**

## 2.2 ICT Climate in Developing Nations

Effective ICT utilization is hindered by the digital divide between the advanced nations and the less advantaged, which points to the needs for more ICT related research dealing with less developed countries to bridge the gap (Ali, 2004). ICT diffusion patterns in the developing world tend to reinforce the digital divide rather than immediately ameliorating it, suggesting that simply implementing technology in a developing nation is not the entire solution (Müller, Sancho Gil, Hern 'ndez, Giro', and Bosco, 2007).

Learners in developing areas struggle both with tight budgets for technology and with the cultural context to convert the ICT use into something useful for them (Aduwa-Ogiegbaen and Iyamu, 2005). Even though ICT deployment provides stimulus for economic growth, this outcome is depending on the role of the educational sector in producing educated and technologically-trained workforces (Mistry, 2005).

However, the developing countries face many difficulties to adopt and accept the new technologies in the educational system. In Malaysian universities, Wee and Abu Bakar (2006) found that the rapid growth of technologies without spending sufficient time and effort being spent to understand the technologies is considered as one of the obstacles of the new technologies. They also found that the lack of network connectivity and lack of management support and encouragement for the academic staff to use the technologies in their teaching and learning process hinder the adoption and integration of technologies in the educational system.

The diffusion of the Internet in developing economies is naturally depending not only on the telecommunication infrastructure, but also on the educational development (Deichmann et al., 2006). However, the educational-based digital divide is doubly problematic, since the cost for technology-supported educational systems, and the training are considered as the critical challenges for them to be competitive in the global society (Fei Yang, 2006). Moreover, the adoption of educational technology in the developing nations does not always result in directly proportional increases in student learning outcomes, so it is important to understand the critical success factors in order to optimize outcomes (Fei Yang, 2006; Müller et al., 2007). Hence, the ICT in educational programs must be developed to boost the national economic productivity in order to generate the economic well-being necessity to support technology diffusion in the wider population.

## 2.3 ICT in the Arab World

The Arab world consists of twenty two countries, with all of them under the league of Arab states. ICT was introduced in the Arab world in the early 1960. In that era, the efforts of Arab countries were focused on utilization of IS tools and translating them into the Arabic language. This encourages the information technology companies to produce Arabic software product. The result of this effort created an Arabic computer standardized code, which was founded in 1985 by the Arab Standards and Metrology Organization (ASMO), and Arabization coordination bureau specialized organizations under the Arab league (Goodman and Green, 1992).

The ICT becomes a major factor in the world that drives social, economic and human development. The rapidly growing use of ICT and the Internet by the government, non-government, and individuals in the Arab world has changed many things from the traditional to the digital world. Hence, the development of an ICT strategy is vital for the growth of the knowledge economy in developing countries. In the past three decades, the ICT industry has grown to be a driving force behind the world economy and gaining the attention of the national leaders (Reach, 2004; Intaj, 2007). In relation, Jordan as one of the developing countries tries to become a leader in the Arab world by using ICT in all sectors, particularly in education and higher education sectors, in which, Jordan is considered to have one of the best systems in the Arab world (Al-Zaidiyeen et al., 2010).

Many ICT adoption studies have been widely done in the industrialized world, yet there is insufficient knowledge regarding ICT adoption in the less developed countries and in the Arab regions particularly. The adoption of technologies in the Arab regions in comparison to other countries in North America, Europe, and other developing countries is still at its very early stages (Ali, 2004; Azab, 2005; Rasmy, Tharwat, and Ashraf, 2005; Khasawneh and Stafford, 2008). Adoption and usage of ICT in the Arab regions at this stage has not been fully researched by practitioners or academia in the region. Many countries in these regions are still lagging far behind the developed countries in terms of the acceptance of technologies, and many organizations in these regions are not yet ready to accept the ICT. The lack of basic infrastructure, senior management support, sufficient funds, enthusiasm about ICT adoption, level of education and skills, expertise in the field, and the resistance to anything which is new, unclear, and uncertain all impede the adoption of the new technologies (Twati and Gammack, 2006).

On the other hand, new generations are more enthusiastic about adopting and accepting of the new technologies. The early introduction of the Internet and new education systems in the Arab Gulf region made it easier for organizations in the region to adapt and change as expected in the technological culture. There is also a shift to an electronic government in many countries in the Arab Gulf region, for example the UAE, Qatar, Jordan and Tunisia, in which most of the services are done on-line.

In the last world economic forum in Indonesia, 2011, the Global Information Technology Report presents that the UAE continues to be the highest-ranked in the Arab world and ranked 24th over the world in terms of utilizing ICT. The second rank in the Arab world is Qatar (25th), followed by Bahrain at (30th) and Saudi Arabia (33rd). Jordan has also been ranked the 50th in the world, which is considered a good rank in the report. The performance of the Arab countries is uncertain, but some governments have clearly put the ICT development at the heart of their competitiveness agenda (Dutta and Mia, 2011).

## 2.4 Jordan: The Context of the Research

Jordan as one of the developing countries in the Arab world is centrally located within the Middle East. It is a small country, which has an area of about 92,300 square kilometers with a relatively small population (Ein-Dor, Godman, and Wolcott, 1999). It is the heart of the Middle East in the Arab world, and is a constitutional monarchy with a bicameral parliament and representative government. Arabic is the official language, while English is considered as the first foreign language which is widely used, spoken, and understood at every level through the country. One third of the population live in the capital city called Amman, the biggest governorates, and its suburbs. As a result, the population of Jordan is geographically concentrated, which may impact on the diffusion of technology. Major cities include the capital Amman in the northwest, Irbid and Zarqa, both in the north, Karak and Aqaba in the south. According to the U.S Central Intelligence Agency (CIA, 2008), the estimated population in Jordan in 2008 was more than 6,198,677 millions (see appendix A).

Jordan is bordered by Syria to the north, Iraq to the north-east, Palestine to the west, and Saudi Arabia to the east and south. It shares the coastlines of the Dead Sea, and the Gulf of Aqaba with Palestine, Saudi Arabia, and Egypt. The Hashemite Kingdom of Jordan is a majority Muslim country with 92% of the population following Sunni Islam while a small minority of around 2% follows Shia Islam. Jordan also has a significant Christian minority, making up around 6% of the population, mainly Greek Orthodox, Catholic, or Coptic. Jordan's economy is relatively limited in natural resources such as water, oil, and gas and economic capabilities, with a per-capita form Gross Domestic Product of $4,500 yearly (Intaj, 2007). The country is currently exploring ways to expand its limited water supply and use its existing water resources more efficiently, including through regional cooperation. It also depends on external sources for the majority of its energy requirements. However, it has significant political, cultural, and economic influences due to its strategic location. Jordan has always been a crossroad between the east and west and its centrality has given it a strategic and economic importance by making it a vital trading and communication center.

In spite of the HKJ is a small country and has limited resources. The country is still considered a modern country in the Arab world and developing countries. Jordanian is one of the best educated and academically qualified commonly in the Arab world with the literacy rate at 91.3% (Intaj, 2007). Literacy in Jordan is one of the highest in the Arab World with nearly one-third of the populations are students. In response to the need for educational reform, officials in the Jordanian government, including H.M. the King himself, have started to call for a reorientation of educational policy to meet the ambitions of the country and the need of the people and to cope with the new world of information and information technology. On this basis, the main resource towards economic prosperity in Jordan is the human resource which brings to the need of the development in educational sector in general, and in higher education in particular. In relation with these conditions, Jordan needs to improve the education policies and to reform the education system to agree with the information age. Officially, King Abdullah II, and the government have begun in procedures to develop and reform the educational system to meet the ambitions of the country and enter with the world in information age. One of the initiatives taken by the Jordanian government is the formation of Jordan Education Initiative (JEI) with the main goal to develop and reform the educational system by encouraging the use of ICT in schools and universities.

## 2.5 ICT in Jordan

Since 1970s, many governments across the world have realized how important the ICT is in various fields of human endeavor. In conjunction, Jordan, first faced serious problems with the ICT in terms of both financial and technical reasons (El-Hersh, Ghazzawi, and Yamin, 2003), but later has been very much part of the world growth phenomenon and is witnessing rapid modernization of trade and ICT. The country, as the heart of the Arab world tries to be the hub of ICT and exports the manpower to all Arab countries and the entire world.

Among the neighboring countries, with its strategic place, Jordan has good, convenient, and high quality telecommunication facilities. In addition, the government encourages high investment in the development and application of the latest technologies in telephone and Internet services. It is worth mentioning that Jordan is showing high concerns towards the application of e-commerce, e-governments, and m-commerce. According to the Jordan Telecom (2008), telecommunications history in Jordan can be traced back to early 1921, when the telegraph was introduced. Since that date, the telecommunications sector in Jordan has significantly expanded and improved.

A number of government initiatives have been launched throughout the region to integrate the ICT into different fields of both public and private sectors. Both sectors in Jordan have acknowledged the vital and important role of ICT in different services and sectors. So far, public communications and broadcasting facilities are government-controlled. However, there is some privatization, especially in the telecommunications sector. Eventually, postal, telephone, and Internet infrastructure have been greatly expanded and improved in the last decade.

In support of that, the government of Jordan and King Abdullah II himself have clearly identified ICT investment as a means of economic development and national advantage (Al-Jaghoub and Westrup, 2003; Kulchitsky, 2004; Intaj, 2007). As a monarchy, Jordan has a pyramidal social structure that concentrates on wealth and privilege, and highlights disparities between the rich and the poor when it comes to technology access (Hill, Loch, Straub, and El-Sheshai, 1998). In fact, privatization of the government Post, Telephone, and Telegraph Bureau (PTTB) is a key to telecommunications liberalization in a developing country. The telephone service is reasonably sophisticated in Jordan (Sahawneh, 2002), with increasing usage of digital switching gear seen in recent years. In short, Jordan has shown quick developments in modernization, liberalization of industry, trade and ICT; however, there are anxieties about its capability to exploit this technology.

There is no doubt that the Jordan telecom sector is rapidly growing and penetrates the most dynamic and competitive market in the world. The telecom sector has reached full liberalization at the end of 2004 when the fixed line monopoly was ended. Therefore, the dynamic and competitive environment in ICT sector has led to heightened investor interest to invest in this field. However, Jordan keeps boasting as one of the most developed country in developing world. In fact, Jordan’s ICT industry is flourishing and has become a major contributor to the economy. About 93 percent of Jordanian people have access to telecommunication tools via fixed or mobile lines (MoICT, 2008). Jordan ICT industry has attracted many of the international ICT companies such as Microsoft, Intel, Cisco System, France Telecom, and Mobile Telecommunication Company (MTC). In fact, Jordan has prepared for huge investments from local and international companies. According to Jordan Investment Board (2008), the government of Jordan has been offering many facilities to encourage the investment of ICT such as:

- Modern and Liberal economy.
- Commitment by the government under the leadership of HM King Abdullah II to encourage the investment in the field and put all facilitations to them.
- Growing ICT market and open it to all neighboring countries, Jordan is the ideal way to the Middle East and North Africa (MENA) countries.
- On-going reform of ICT field with fair, transparent, and regulated independent laws.
- Modern, Reliable, and recognized communication infrastructure.
- Commitment to support technical skills and workforce capable to work in the information age.

Therefore, with the increase of ICT investments and adoption of ICT by individuals and organizations, Jordan is in the way to becoming an ICT hub in the region and to becoming the forerunner of the ideal implementation of the latest technologies.

Jordan's Motivation towards ICT

Jordan depends on its human resources to improve its economy. Therefore, the development of education sector particularly the higher education will improve the national economy in the country; especially Jordan has been one of the notable examples in which researches have documented some of the advances of ICT technologies (Goodman and Davis, 1992). It is an excellent case of a developing nation that has selected ICT sector for the emergent competitive advantage in the business in the region (Ein-Dor et al., 1999). The diffusion of ICT in Jordan and Middle East, however, is still lagging behind the rest of the world (Checchi, Hsieh, and Straub, 2003), though markets are evolving there (Rose and Straub, 1998; Straub et al., 2001), probably because Jordan implements the monarchy system, which has less effective governmental bureaus (Ein-Dor et al., 1999; Kulchitsky, 2004). The expectation that the technology will diffuse more readily in a rule-following and structured political environment leads to the expectation that technology will be more integrated and prevalent into the population. Thus, a strong government bureau exists to aid and support in the diffusion of the essential underlying telecommunication infrastructure necessary for mobile Internet use and other online activity. Upon accession to the throne, King Abdullah II has launched an initiative emphasizing on the importance of ICT for the future of the economy of the country.

The King has considerable influenced on the activities of the nation, and he has also been an active campaigner and the key player for the diffusion of ICT as a force for economic expansion in Jordan. The Initiatives of the Jordanian government as described above, with full support of the royal family, such as REACH and PC at every home (Ein-Dor et al., 1999; Intaj, 2007) have ensured that the king and the governments support the usage of ICT in every aspect in the country and in educational system in particular.

## 2.6 Education in Jordan

The educational system in Jordan starts with the state through the ministry of education. To date, the government supports the development of education system by using technology. The education in Jordan consists of school education level, higher education level, and vocational education level. School education contains two parts, the first part is the basic education which lasts for ten years, and is compulsory. The second part is the secondary education which lasts for two years, which is not compulsory. To access to the higher education institutions, students must hold a General Secondary Education Certificate (Tawjehi). The Higher education level consists of two stages; (1) undergraduate level which contains diploma and bachelor degree, and (2) postgraduate level which contains master and doctorate degree. Non-university and vocational education level are offered in community colleges. To be admitted to these community colleges, students must hold any type of general secondary education certificates.

Statistically, there are 10 public universities and 16 private universities, which contain about 225,602 students in bachelor degrees, and about 19,695 students in postgraduate degrees. Overall, the Jordanian universities employ about 8,038 lecturers. In addition, the universities in Jordan have about 29,379 international students (MoHESR, 2010). The Jordanian government works hard to improve the educational system at all levels, in which they have spent about $380 million to the Education Reform for Knowledge Economy (ERfKE) program, which focuses on the use of ICT in teaching and learning process. The program tries to develop the national curriculums with incorporation of ICT tools within.

### 2.6.1 Jordan Education Initiatives

One of the initiatives taken by the Jordanian government to encourage ICT in education is the Jordan Education Initiative (JEI) in 2003, with the assistance of the World Economic Forum (WEF). It is proposed to encourage the public-private partnerships to develop the ICT application in the basic and secondary educational system in Jordanian schools. According to the Jordanian government in the WEF (2004), the primary objectives of the JEI are as follows:

1. To improve the growth and delivery of education to Jordan's citizens through public-private partnerships, and to develop the procedures in helping the government of Jordan to achieve its vision for education as a vehicle for social and economic development.

2. To support the progress of an efficient public-private model for the acceleration of educational reforms in developing countries based on unleashing the innovation of teachers and students through the effective use of ICT.

3. To increase the capacity of the local information technology industry for the expansion of innovative learning solutions in partnership with international companies to improve the education system.

4. To establish commitments among the national government and corporate citizenship to construct a model of reform that can be exported to and applicable in other countries.

Accordingly, the JEI project has developed content to enhance the curriculum in core subjects including math, science, Arabic, English as a Foreign Language (EFL), and ICT. This content is provided electronically through the EduWave portal and used by students in computer labs and by teachers that are equipped with laptops and data show. Particularly, the JEI has been implemented in one hundred selected "Discovery Schools" containing more than 50,000 students and 2,300 teachers. The teachers and laboratory technicians were trained and supported by the Ministry of Education. In current state, there are 17 global corporations such as Cisco System, Dell, Hewlett Packard, IBM, Siemens, and Intel, 17 Jordanian entities, and 11 governmental and non-governmental organizations working together to achieve the JEI objectives in partnership with the government of Jordan.

### 2.6.2 National Broadband Learning and Research Network

The Jordanian Ministry of Information and Communication Technology (MoICT) had launched a Broadband Internet Network in 2004 to connect all public universities in Jordan. The major goal of this network is to provide the students and academic staff with ICT tools such as video conferencing, emails, and university services such as e-library. According to the MoICT, a broadband Internet network will connect about 1.5 million students and academic staff through a modern communication infrastructure between the public universities, public schools, and knowledge stations (Abdelrahman, 2004).

With regards to the advancing infrastructure, the Jordan Broadband Learning and Educational Network project will install approximately 5,000 km of fiber optic backbone and several thousand internetworking devices including computers, routers, servers, and printers to create one of the most advanced educational networks in the world. The project contributes to the revolution of Jordan's teaching and learning process, and to improve the development of human resources with skills and knowledge that are capable of contributing to a knowledge-based economy. In 2004, the first component of this network had finalized the connectivity to eight public universities through a 1 gigabit per second high speed connectivity. Regarding the human capital, a great deal has been accomplished so far including the high speed connection among public universities and public schools through the national broadband network with more schools on the way in the near future. Consequently, the network will be implemented in two tracks: Firstly, University Broadband

Research and Learning Network – connecting 8 public universities, and secondly, Schools Broadband Learning Network, connecting 3200 public schools, 23 community colleges, and 75 knowledge stations (MoICT, 2011).

## 2.7 ICT in Higher Education Institutions

"*In the early twenty first-century, people will be able to study what they want, when they want, where they want, and the language they prefer, electronically*". Peter Knight, July 1994.

The Jordanian MoHESR has launched many initiatives to promote the use or adoption of ICT in teaching and learning process in all universities in the country, including the implementation of the higher education strategies 2007-2012 (MoHESR, 2011). In fact, Jordan begins introducing the use of ICT in universities in 1999, when the ministry of higher education announced that $65 million was allocated for the development of public higher education institutions. The importance of this money is to establish appropriate information technology infrastructure and to purchase and support public universities with thousands of new computers. For all that, Jordanian higher education institutions especially public universities were facing financial difficulties, because they have to utilize their own fund to spend on purchasing new computers, laptops, data show, and other ICT tools. Also, they have to spend on training programs for academic staff and the management to be capable of using the ICT in their teaching and learning process and other services in the university (MoHESR, 2011).

In spite of the wide range and rapid growth of ICT adoption in higher education institutions, many academic staffs are still reluctant in using new technologies in their teaching and learning process (Wee and Abu Bakar, 2006). According to the report issued by the UNDP, there is a lack of ICT utilization in higher education institutions in Jordan; this is due to the lack of technical infrastructure and lack of training program (AlFarawati, 2001). Particularly, the physical infrastructure is not the only important factor in ICT adoption in university, but also human infrastructure (Daigle and Jarmon, 1997).

### 2.8 Issues of ICT Adoption in Teaching and Learning Process

The ICT is essential for economic development in the broad endeavor of global business (Torre and Moxon, 2001) as well as in the underdeveloped nations (Stafford et al., 2006). Very few research have been done to examine the innovativeness and ICT diffusion process in the developing nations, particularly in the Middle East (Ali, 2004; Khasawneh and Stafford, 2008). This is imbalanced, since half of the world lives in developing economies (Sahay and Avgerou, 2002), and the developing economies in the Middle East are worthy of special consideration (Loch, Straub, and Kamel, 2003).

The diffusion of the Internet and web-based technologies provides a new trend for universities to design new teaching and learning environment. The trend of ICT such as e-learning and web learning has been around since 1998. In its early implementation, it has emerged from being a radical idea where the effectiveness of which was yet to be proven to something that is widely regarded as the mainstream. ICT has achieved strong growth in a short time and e-learning becomes a service offered by most colleges and universities and the core activity to their managerial and educational plans. Particularity, e-learning referred to delivering instructions at a distance over the Internet and mainly takes the form of online courses, where the dominant learning technology employed today is a type of system that organizes and delivers these courses.

ICT is widely deployed in the higher education institutions that changed the fundamental structure and scope of education in universities (Turan and Khasawneh, 2008). The explosive growth of ICT has made it a popular platform for providing electronic services to business and education (Chiu, Hsu, Sun, Lin, and Sun, 2005). It is widely accepted that advances in technology and new developments in educational system provides opportunities to create well-designed, student-centered, and facilitated e-learning environments (Khan, 2005). While many institutions and educators have integrated or utilized ICT technologies into their educational environments, the effectiveness and efficiency of those new technologies in the education system as well as their ability to deliver instruction, are still questionable (Qudais et al., 2010).

### 2.8.1 Theoretical Lens: Technology as National Competitive Advantage

Educational technologies have diffused far and wide in a global world. The adoption process for the educational technologies and the Internet in developing countries face obstacles such as culture, language, tribes, and income (Khasawneh and Ibrahim, 2008). Jordan can be considered as a free market economy and unique among countries in the Middle East because it has less mineral resources and different cultural dynamics from other developing nations in the region (Straub et al., 2001). In relation, the HKJ is lately engaging in a concerted Internet diffusion initiative under the leadership of the new King to raise economic productivity and standards of living (Stafford et al., 2006). While other countries in similar circumstances have successfully leveraged ICT for national competitive advantage, it is also being deployed in the Kingdom towards similar ends under the leadership of H.M King Abdullah II.

On the other hand, Stafford et al. (2006) found a comparison between Turkish and Jordanian Internet users that despite theoretical expectations that Turkish Internet users would be far more interested, self-assured, and appreciative of ICT; Jordanian Internet users are actually more highly motivated and interested in ICT use towards economic ends than Turkish. This is perhaps an indicative of the importance Jordanians place upon technology as an engine of economic growth in their nation. Jordanian Internet users were also found to be significantly more interested in Internet technology than Turkish users, operationalized as computer involvement. Jordanians had much higher affinity for computers than did Turkish users, and

Jordanian Internet users were far more likely to report strong intentions to shop online than were the Turkish Internet users. In studying ICT user adoption processes, one half of the issue revolves around the propensity of the user to accept new innovations, while the other half deals with specific motivations for use. Hence, Al-Omari and Al-Omari (2006) introduce the idea of “readiness” with regards to the eGovernment processes. eReadiness is a useful concept, having theoretical basis and validated.

### 2.8.2 Education and ICT Diffusion in Developing World

İn current practice, universities and schools actively mix traditional lectures and technological support (Berger and Toppol, 2001; Casini and Vincino, 2003; Van der Rhee, Verma, Plaschka, and Kickul, 2007), which is popular among the administrators and instructors. Stafford and Simon (2002) call this Web-based supplement to regular lectures “the high-tech adjunct,” while more recent characterizations described the approach as “Web Enhanced Instruction,” which denotes the enhancement of standard lecture formats with Internet-based course management technologies such as blackboard (Landry, Griffeth, and Hartman, 2006). It appears that, despite much initial attention to the concept of the totally online completely asynchronous course, technology-supported live classes are more popular with students than the generic substitute of the all-technology delivery channel (Brewer, 2004), probably because students come to realize that computers will never totally substitute for the learning experience they get from an instructor (Stafford, 2005).

Communications skills are also important in technological education, since technology learning is still impacted by the nature of the social relationship between the participants. Hence, instructors can more actively guide the learning process by mixing both synchronous and asynchronous methods (Clouse and Evans, 2003). Effective utilization of ICT is hindered by the digital divide between the developed nations and the developing nations, which points to the need for more IT related research dealing with developing countries in order to help redress the balance (Ali, 2004). ICT diffusion patterns, however, in the developing world tend to reinforce the digital divide rather than immediately ameliorating it, suggesting that simply implementing technology in a developing world is not the entire solution (Müller et al., 2007).

Learners in disadvantaged areas struggle both with tight budgets for technology and with the cultural context to convert ICT use into something useful for them. As a result, global technology diffusion trends may be inadvertently and adversely impacting poorer nations. Even though ICT deployment provides stimulus for economic growth, this outcome is dependent upon the role of the educational sector in producing an educated and technologically-trained workforce (Mistry, 2005). This education-based digital divide is doubly problematic, since the cost for technology-supported education systems development and training is a challenge for educational institutions in developing countries that want to be competitive in the global society (Fei Yang, 2006). Moreover, the adoption of educational technology in these developing nations does not always result in directly proportional increases in student learning outcomes. To help improve the adoption of educatinal technology with ICT supports, it is important to understand the critical success factors in play, in order to optimize outcomes (Fei Yang 2006; Müller et al., 2007).

### 2.8.3 Areas for Investigation – Technology-Mediated Learning

This study hopes to play a significant role in the development of the education system in general, and in higher education in particular. İt guide the academic staff and students to accept technologies necessary for the delivery of web based technologies and eLearning processes. Also, the study examines the success factors that would influence the academic staff in utilizing the ICT. It can be witnessed that Jordanians have great enthusiasm for the adoption and use of ICT, as compared to other nations in the region (Stafford et al., 2006). In a comparative study between US and Jordanian technology students, it is shown that Jordanian students have more interest in and enthusiasm for technology use in classroom and as an aspect of educational support (Stafford et al., 2008). This is a motivating finding, as a support for the eReadiness for critical services of interest to the Royal Family such as eGovernment which is greatly enhanced through the development of an educated citizen. Jordanians are highly motivated by the use of computer technology in the classroom, as are the American. The key distinction found in the comparison is that Jordanians found information technology in the classroom as providing significantly greater degrees of flexibility in the learning process than do American students (Stafford, Jackson, Khasawneh, and Zhang, 2008), as well as the Jordanian are more self-professed. However, there is no significant differences in terms of technology use in the classroom in support of learning goals (Stafford et al., 2008). On the contrary, the Jordanian students perceive significantly better in terms of the uses for and benefits from technology-mediated learning. The study also found that Jordanians perceive better in terms of technological flexibility in support of learning goals, and in technological confidence, as indicated in disagreement to a technical difficulty question.

### 2.9 Concluding Comments

This chapter gives an overview of Jordan in terms of its geographical location, economic status, education system, initiatives from the king and the governments in Jordan, and the current implementation of ICT in the country. Jordan as one of the Arab world in developing counties faces many difficulties in terms of natural resources that affects on the county's prosperity. The chapter concludes the usage of ICT in developing countries with focusing on Arab world, Jordan in particular. However, there are many initiatives from the king and governments in Jordan to support and encourage the adoption and usage of ICT in several fields and in educational system in particular. The chapter also includes a comparative between Jordan and other countries in terms of use technologies which is addressed to provide a basis for the next chapter. The next chapter presents operational definitions and highlights the adoption theories which have been used in IS studies, particularly, DOI, TRA, TPB, and DTPB. Also, it elaborates about Technology Acceptance Model (TAM), and Unified Theory of Acceptance and Use of Technology (UTAUT).

# CHAPTER Three

# ICT ADOPTION THEORIES

## 3.1 Introduction

This chapter reviews the previous studies on the adoption of new technology in relation with theories used. It begins with definitions of adoption, innovation, and some of IS concepts from the previous related study. Further, the chapter explains the characteristics of the adoption and diffusion of innovation and explores the adoption theories, including the DOI, TRA, TPB, and DTPB. As this study focus on the adoption of ICT in teaching and learning process among the academic staff in the higher education institutions, the chapter explains the factors, reviewed from the past studies, which have influenced the use of ICT in teaching and learning process. It continues with the discussion of the BI to use ICT in teaching and learning process and the relationship between the BI and actual use. The chapter also discusses the adoption process and the characteristics of individual, university, and technology which have influenced the acceptance or rejection ICT in the teaching process. Finally, the chapter concludes the previous studies related to ICT adoption in the higher education institutions.

### 3.2 Operational Definitions

This section explores some of the definitions related the study to understand the concepts of technology adoption in general, and ICT adoption in higher education institution in specific. The study belongs to the field of IS, in which it focuses on the adoption and utilization of ICT in teaching and learning process among academic staff in universities and other higher education institutions. In general, adoption, acceptance, and use of innovation in IS issues have existed in the literature since the last four decades (Agarwal and Prasad, 1998), and is considered a very important field and take a high consideration from IS researchers (Hu, Chau, Sheng, and Tam, 1999).

Lately, the clarification and forecasting of adoption, acceptance, and successful use of new technologies by individuals and organizations has been one of the most important aspects (Agourram and Ingham, 2003; Venkatesh, Morris, Davis, and Davis, 2003). This section starts with the definition of IS in general, and followed by the definition of technology life cycle. Later, it defines the adoption and diffusion of new technology from various perspectives and finally it highlights on the innovation as new such as educational technology.

IS is one of the major sciences which concerns many perspectives such as people, hardware, software, network, and data resources, which collect, transform, and diffuse information in an organization decision making (O'Brien, 2002). Lucas (1986) defines IS as "a set of organized procedures that when executed, provides information to support decision making and control in the organization". Consequently, it was agreed by many researchers (Hutchinson and Sawyer, 1996; Laudon and Laudon, 2002; Mclead and Schell, 2004).

Technology like any other product has a life cycle, in which it delivers and obsoletes within a specific period of time. Luftman, Bullen, Liao, Nash, and Neumann (2004) outline that a technology life cycle consists of four phases. It starts with (1) emerging technology, the initial phase of the technology life cycle. In this phase, the technology is considered as an innovation, in which its benefits are still not clear. It is not easily accepted by individuals or organizations. The second phase refers to (2) pacing technology, where the technology starts to get acceptance from individuals and organizations but is still not widely used. Its relative advantage begins to appear to the social system. The third phase, (3) key technology, is referred to the state in which the technology becomes widely diffused and its relative advantages appear to all social systems. Finally, (4) base technology is the moment in which technology becomes consumed and not useful for the new requirements to individuals or organizations. Usually, new technology appears in this phase and started the cycle again with the emerging technology.

The adoption and diffusion of technologies is considered as one of the major aspects in the IS studies. A widely used definition of innovation is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption", while diffusion is "the process by which an innovation spreads" Rogers (1983). Later, he defined the diffusion of innovation as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995). The definition explains that, when a new technology is discovered, the individuals or organizations begin to feel its benefits; they will be interested to adopt and be the early adopters. Further, when the social system witnesses the advantages of the technology from the innovators or early adopters, they are encouraged to adopt and use the technology. This will be a chain as shown in Figure 3.1.

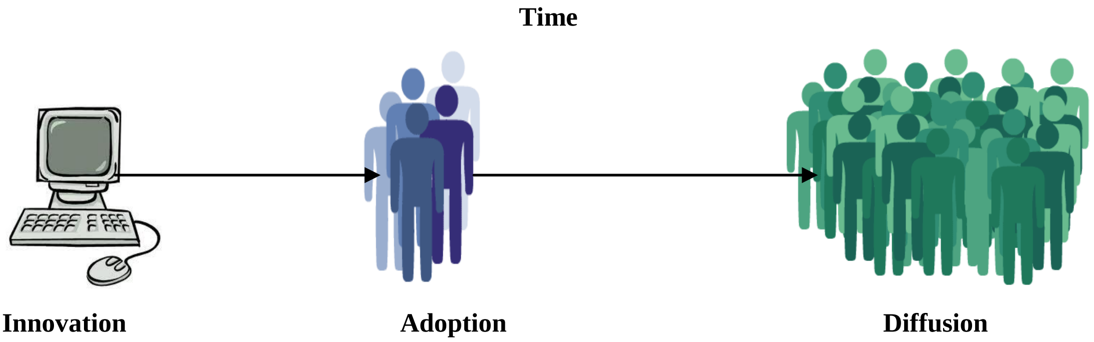



*Figure 3.1: The Diffusion of Innovation Definition*

Besides, researchers define the adoption as physically gets on the technical innovation and reliability to use it with the assuredly being on the decision adopt (Evan and Black, 1967; Aiken, Bacharach, and French, 1980; Fichman and Kemerer, 1993). Adoption is defined as the first time use of idea, product, technology, or program and accepts it; meanwhile, innovativeness is "the degree to which an individual is relatively earlier in the adoption of new idea than the other members of his social system" (Rogers, 1995). Similarly, Chong (2006) defines adoption as the complete use of an innovation in the best way to get the benefits. The concept of diffusion is often related with the effort to extend the innovation by good listeners using communication channels, while adoption is often related with the decision to agree and use the innovation (Schon, 1971; Rogers, 1995; Bøving and Bøker, 2003).

Also, innovation is related with something novel, such as ideas, artifacts or products (Rogers, 1995). In this study, new technology equipment, infrastructure, or systems established into the institutions are considered as new. Essentially, there are three different meaning of adoption of innovation. The DOI by Rogers (1995) describes an adoption as the physical gaining of technical artifacts or an assurance to execute the innovation with the emphasis on the decision to accept (Evan and Black, 1967; Aiken et al., 1980; Fichman and Kemerer, 1993). In specific, the adoption of technology is defined as using this technology to sustain business (Thong and Yap, 1995), and according to Bøving and Bøker (2003), technology adoption means the use of innovations as planned by the designer.

Consequently, the study is focused on the adoption of ICT among academic staff in the universities to improve the teaching and learning process. The most important concept that must be clarified is concerning the adoption of ICT in the educational system in higher education institutions. Initially, ICT consists of all types of technology such as hardware, software, networks, and media which are used to collect, store, process, transmit, and present information in the form of voice, data, text, and image (Cartwright, 2007). The adoption of ICT in education and learning process means the actual use of the technology facilitation, new tools, and applications (for example laptop, data show, CD player, video conferencing, electronic portal, and so on) by all entities in the university to develop and facilitate the education process.

## 3.3 Adoption Theories

Many researchers concern on the adoption and acceptance of ICT technologies in many perspectives, such as computers (DeLone, 1988; Davis et al., 1989; Oyediran and Odusami, 2005), E-commerce (Bhattacherjee, 2000; Sahawneh, 2002; Al-Qirim, 2007), mobile commerce (Siau et al., 2001; Khalifa and Cheng, 2002; Pedersen and Ling, 2002), and Internet banking (Tan and Teo, 2000; Al-Ashban and Burney, 2001; Pikkarainen et al., 2004). These studies applied the adoption theories to identify and measure the factors that influence the individuals and organizations to adopt or reject new technologies. Each theory is described in the following subsections in details.

### 3.3.1 Diffusion of Innovation Theory (DOI)

The famous diffusion theory that has been widely used in the studies of technology adoption is DOI by Rogers (1962, 1983, 1995, and 2003). The works on this theory was started in 1950 when Rogers saw his father who was a farmer had resisted to use the hybrid seed corn. Based on the situation, he began to study the factors which affect the adoption or rejection of a new technology until he published the first edition of his book on Diffusion of Innovation in 1962.

The focus of this theory is to help organizations and individuals to decide whether to adopt or reject a new innovation and to estimate how it would take to accept and use a new technology (Fagan, 2001). In reality, the theory has been used to clarify and evaluate a wide range of IT adoption such as the adoption of Internet (Prammanee, 2003), database machine (Hoffer and Alexander, 1992), software engineering techniques (Bayer and Melone, 1988), and IT in general (Moore and Benbasat, 1991).

The theory has four main elements: (1) the innovation, (2) communication channels, (3) time, and (4) social system (Rogers, 1995). These four components explain the process of adoption as determined by individuals, decision-makers, or organizations.

(1) The **Innovation** refers to a new idea, product, or technology that appears as new to individual or organization. The perceived newness of the idea, product, or technology for the individual makes a reaction to him/her to adopt it.

(2) **A communication channel** means the tools to transfer a message about newness of idea, product, or technology from individual to another. Rogers (1995) defines the communication as the process by which individual discovers, constructs, and allocates from one to another in order to perceive a communication understanding.

(3) **Time** as an important element in the theory, and it has three factors: (a) the innovation decision process by which an individual who gets on the knowledge about the innovation, to decide whether to adopt or reject it, (b) the innovativeness which refers to relative time (earliness/lateness), the individual or groups adopt the innovation compared with other individual or groups, (c) the rate of adoption to the innovation which measures the number of individuals from a set of individuals decide to adopt the innovation in a period of time.

(4) **Social system** that refers to a set of interrelated unit that are engaged in joint problem solving to accomplish a common goal. The units of the social system may be individuals, groups, organizations, and/or subsystem.

Rogers (1995) also implies that the adoption of innovation is voluntary to an individual who makes a decision to adopt or reject the innovation in the social system. To decide adopting the innovation, there are five phases that happen to the members of the social system. Rogers (1995) explains these five phases as the Innovation–Decision Process Model (IDPM) (Figure 3.2).

1$^{st}$ Phase: **Knowledge** - at this stage, individuals have opportunity to know about the innovation itself from relative, reading, media, and so on. Aggarwal, Cha, and Wilemon (1998) defined knowledge as "*a person becomes aware of an innovation, and has some idea of how it functions, through information channel*".

$2^{nd}$ Phase**: Persuasion** - the effect of the behavioral attitude for the individuals to adopt the innovation by members of the social system.

$3^{rd}$ phase: **Decision** - at this stage, individuals begin the behavior that leads to adopt or reject the innovation. The individual in this phase decides to use or reject the innovation.

$4^{th}$ Phase: **Implementation** - at this stage, individuals begin using innovation in a real life. Individuals in this phase are considered an adopter on the innovation.

$5^{th}$ Phase: **Confirmation** - at this stage, individuals begin evaluating the outcomes of his/her decision to adopt the innovation. In this phase individuals make a confirmation to continue use or stop after he/she use the innovation.

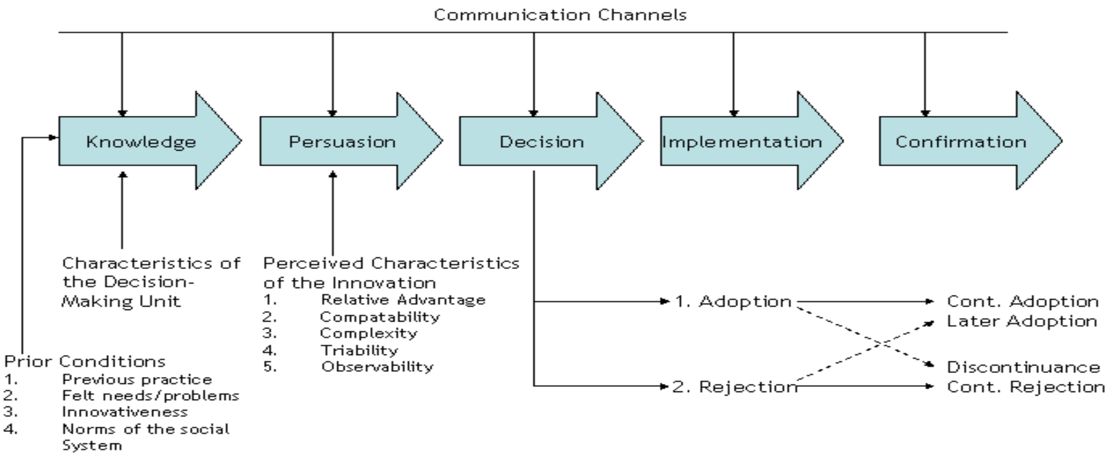



*Figure 3.2: Innovation–Decisions Process Model (*Rogers, *1995)*

The five phases explain in the previous paragraphs, however, do not necessarily occur as step by step, in fact some of them could be ignored (Rogers and Sheomaker, 1971). IDPM also incorporates the conditions prior to the knowledge phase which affects on the individual to know about the innovation. These conditions are previous practices, the need to solve the problem, innovativeness, and the norms in the social systems. In addition, IDPM suggests that the adoption process is continuous (Rogers, 1995). Thus, a decision to adopt or reject an innovation may be changed by individuals with the time consumption especially when the knowledge and persuasion become more available to the decision-making unit. Also, it might change when they implement the innovation in real life. However, not every innovation is desirable by the community, and not every innovation will be adopted. Hence, Rogers (1995) presents the innovation characteristics (relative advantage, compatibility, complexity, trialability, and observability) which influence individuals' decision-making towards the innovation.

#### 3.3.1.1 The Classification of Adopters According to Time

One of the most important elements in the DOI process is the time of adoption. Adopter's classification of innovation according to the time is identified when the individuals adopt the innovation (earliness/ lateness) in the social system compared with other members in the same system, which follows an 'S' shape curve as seen in Figure 3.3.

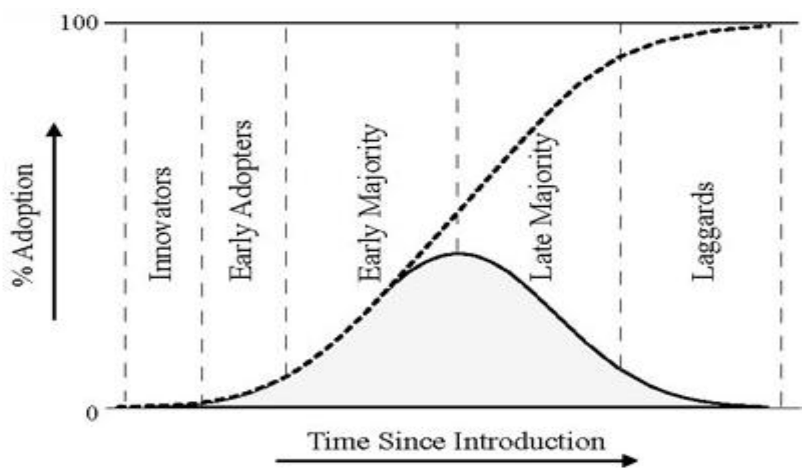



*Figure 3.3: Adopters Classification of Innovation over the Time (*Rogers*, 1995)*

Figure 3.3 explains that, within time element the measurement of the diffusion of innovation among individuals or organizations can simply appear. The growth begins slowly until it is used by the majority. Consequently, a more rapid rate of adoption takes place after majority of the users use it which means less time is spent to know about the innovation and fast in making decision to adopt the innovation.

In particular, Rogers (1995) defines the innovativeness as "*the individuals adopt innovations in direct proportion to their economic status; with each added unit of income, education, and other socio-economic status variables, an individual is expected to become more innovative by an equivalent amount*". He also extends the Figure 3.3 by explaining five main categories of the adopters as (i) the innovators, (ii) early adopters, (iii) early majority, (iv) late majority, and (v) laggards (Figure 3.4).

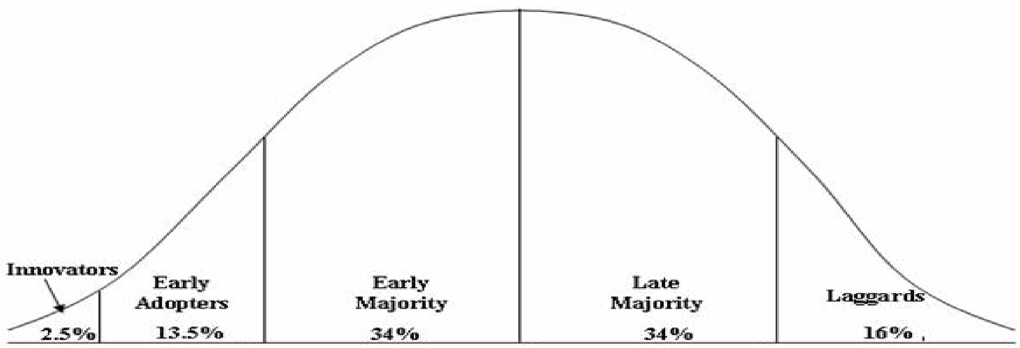



*Figure 3.4: Categories of Adopters (*Rogers*, 1995)*

**(i)** **Innovators**: Innovators are enthusiastic to adopt new technology and normally they are considered as well-educated, with the talent to collect information about the innovation from many resources especially scientific resource and experts. They are considered the first individuals deciding to adopt innovation in the social system, so, they are ready to take high risks. Innovators represent the first two and half per cent (2.5%) from all possible adopters and they are not influenced by the social norms and the diffusion of innovation is not increased with the reputation of the innovation.

**(ii)** **Early adopters:** Early adopters are also considered well-educated and prosperous. They are represented as the leaders and getting a high respect in their social system. They represent 13½ per cent of all adopters in the social system and they support the others in the information about the new innovation.

**(iii) Early majority:** Early majorities are different from innovators and early adopters. They are individuals adopting the innovation when it has a reputation in the social system but they adopt this innovation before the average population. They are conscious before adopting, so they do not take the risk from the adoption because they have good knowledge by collecting more information about the innovation, and depend on the group norms. They represent 34 per cent of the adopters in the social system.

**(iv) Late majority:** Late majorities have limited education and limited income. They do not take any risk because the innovation has become majority in the social system and more than the average of population use it. They represent 34 per cent to adopt, which are also depending on the group norms.

**(v) Laggards:** Laggards are usually adopting the innovation when it is already a normal product in the market. They are skeptical of all new products. Laggards are the lowest education with the lowest income and they are not taking any risk. They often adopt a new product as another is taking its place. This group represents the final 16% to adopt the innovation. Laggards are the last group in using the innovation in the social society. They are similar with the innovators who are not depending on the social norms.

### 3.3.1.2 The Chasm

Moore (2002) in his book "*Crossing the Chasm"* argues that there is a gap between the early adopters and the early majority. Moore (1999) redefines Rogers' (1995) adopter's classification to clarify the ICT adoption by individuals and organizations and present a new concept called "Chasm", to explain the essential differences between visionaries (early Adopters) and pragmatists (early Majority) in terms of their adoption characteristics. Moore's adopter classification and their affiliation with Roger's (1995) adopter classification are listed in Table 3.1.

*Table 3.1: Adopters Classification by Rogers (1995), and Moore (1999)*

| **Rogers' Classification** | **Moore's Classification** |
|---|---|
| Innovators | Technology Enthusiasts |
| Early Adopters | Visionaries |
| Early Majority | Pragmatists |
| Late Majority | Conservatives |
| Laggards | Skeptics |

According to Moore (1999), the concept of chasm represents a threshold for adoption to achieve critical mass (early majority). Thus, addressing the differences between visionaries and pragmatists is critical for an innovation to reach mainstream markets (early majority, late majority, and laggards). Moore (1999) does not draw clear limits between these adopter categories in terms of their adoption characteristics especially between visionaries and pragmatists. Figure 3.5 illustrates the Moore's adopter categories in the technology diffusion.

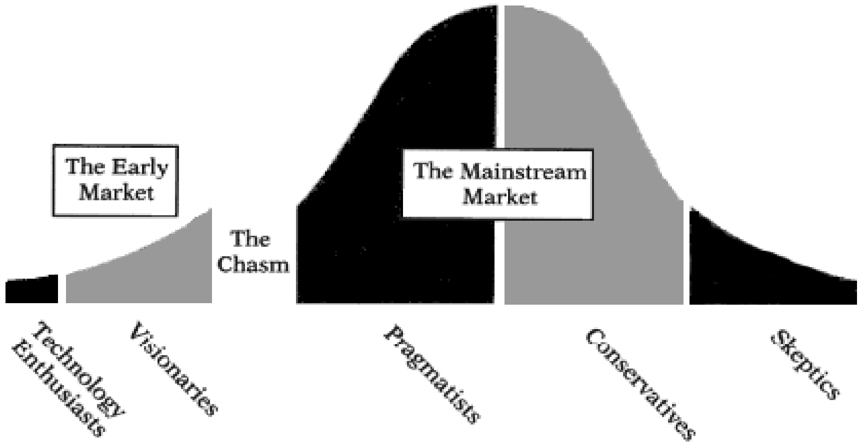



*Figure 3.5: The Chasm (*Moore*, 1999)*

### 3.3.1.3 The Bass Model

The Bass diffusion model was developed by Bass (1969) to explain the process of how an innovation is adopted as an interaction between users and potential users. It has been very influential in innovation forecasting and technology forecasting. Unlike Rogers, Bass classifies the adopters into two categories: **innovators** who are defined as Rogers' definition, and **imitators** who are a total of the rest of the adopters as shown in Figure 3.6.

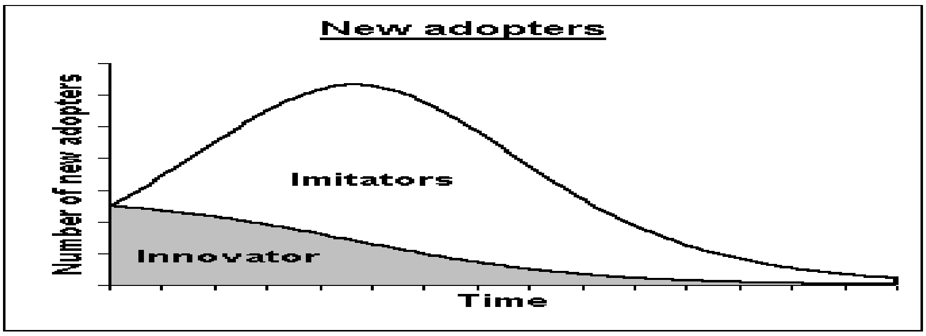



*Figure 3.6: A Model of the Bass Diffusion (*Bass*, 1969)*

Innovators as addressed earlier are driven by the desire to decide to use a new technology. They are considered the first user of the technology, so they do not depend on the number of other users who use the same technology. On the other hand, imitators are usually influenced by the behavior of other individuals who use the new technology. They depend on the number of individuals who are already using the technology.

#### 3.3.1.4 Limitations of DOI

The DOI tries to clarify the innovation decision process, factors that determine the rate of adoption or rejection and the categories of adopters. It helps in forecasting the likelihood rate of adoption of the technologies. Nonetheless, it has been argued that the theory does not explain evidence on how attitude evolves into accept or reject decisions, and how the innovation characteristics fit into the decision process (Karahanna, Straub, and Chervany, 1999; Chen, Gillenson, and Sherrell, 2002). Conversely, Rogers (1995) states that as adoption decisions, the rejection decisions can also occur at any stage in the decision process and the attitudes appear along the way in the knowledge-reinforcement path. However, Rogers never clarifies that the role of innovation characteristics can take part in forming attitudes. On the other hand, it is important to mention that an adoption of innovation has different categories of adopters; it is unrealistic to support one model to be capable to generalize how significant or insignificant attitudes can be formed in respect of innovation characteristics, stages of adoption, and the categories of adopters.

### 3.3.2 Theory of Reasoned Action (TRA)

TRA is one of the adoption theories being used in studying the BI of individual to adopt and use the new innovation. It was developed by Fishbein and Ajzen (1975). It focuses on the individual's BI to adopt innovation by studying the factors that affect on the human's attitude and social influences.

Ajzen and Fishbein (1980) divide the model into three parts as illustrated in Figure 3.7. The first part is the (1) BI: defined as the relatively strong intention to do the behavior by the individual. The second part of the theory is the (2) attitude: which is defined as an individual's emotion to execute the behavior absolutely or not. The last part is the (3) SN: which refers to individual's beliefs to perform the behavior are normative in nature that the referents think he/she should or should not execute the behavior.

Figure 3.7 explains that the individual's ATT and the influences from the SN are the main factors that affect on individual's BI to accept or reject certain innovation. In other words, the ATT and SN affect the individual's BI, and the intentions consequently impinge on performing the behavior. ATT is considered as an assessment of one's beliefs concerning the importance of a behavior and an evaluation of the desirability to perform it, while SN is the offer of opinions from referents to motivate the individual about the behavior. Algebraically, TRA can be represented as BI = ATT + SN. According to Ajzen and Fishbein (1980), the attitudes and norms do not have the same weight to effect into performing the behavior. Indeed, it depends on the individual himself and the situation. For example, an individual do not care about what the others think and use, in this case the SN have a little weight in predicting the behavior.

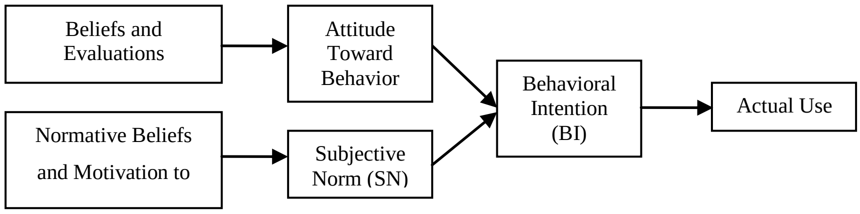



*Figure 3.7: Theory of Reasoned Action (*Ajzen and Fishbein, *1980)*

Limitations of TRA

The corresponding issue is considered as the main limitation in the TRA (Ajzen, 1985). In order for the theory to predict the individual BI to use the innovation, their ATT and SN, all these attributes, must agree on individual action, target, context, and time frame (Sheppared, Hartwick, and Warshaw, 1988). The greatest limitation of this theory comes from the assumption that BI is under volitional control. This mean, the theory only applies to BI that is consciously thought out previously. Illogical decisions, usual actions or any behavior that are not consciously addressed are considered out of explanation by this theory.

### 3.3.3 Theory of Planned Behavior (TPB)

The TPB developed by Ajzen (1985) is based on TRA to present the situations when the human do not have complete control over their behavior (Ajzen, 1991). TPB defines the relationships between beliefs, attitudes, norms, behavioral control, intentions, and behavior. As an illustration, Figure 3.8 shows that ATT, SN, and PBC have influence on an individual's BI to perform a given behavior.

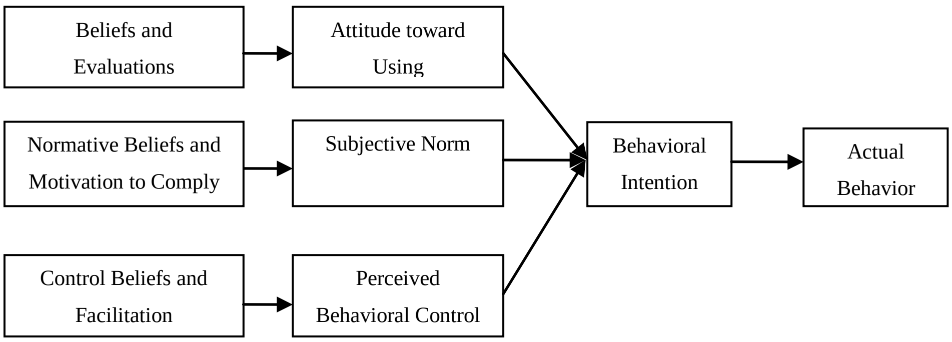



*Figure 3.8: Theory of Planned Behavior (*Ajzen, *1991)*

Behavioral beliefs refer to the influencing attitude towards the behavior. It is a subjective probability that the behavior will produce a given outcome. Although an individual may hold many behavioral beliefs in respect to certain behavior, only a relatively small number are readily accessible at a given moment. Normative beliefs refer to the perceived behavioral expectations of important influential referent individual(s) or group(s). It is assumed that normative beliefs, in combination with the individual motivation to comply with different referents, determine the prevailing SN. In other words, the motivation to comply with each referent contributes to the

SN in direct proportion to the individual's subjective probability that the referent thinks the person should or should not perform the behavior in question.

Control beliefs refer to the belief that has to do with the perceived presence of factors that may facilitate or hinder the performance of behavior; each control factor enjoys a certain power. This perceived power contributes to the PBC in proportion to the factors present in a given situation calling for the performance of behavior. In other words, PBC is the aggregation of the set of belief control factors, present at the situation, weighted by the factors' strength or power. The TPB has another salient construct that may have a direct effect on behavior and PBC. The construct is named actual behavioral control which is referred to the extent to which a person has the skills, resources, and other prerequisites to perform a given behavior.

Consequently, the main difference between TPB and TRA is that the TPB presents new determinant factor (i.e. PBC) which is defined as the "*perceived ease or difficulty of performing the behavior*" (Ajzen, 1991). In detail, the PBC is divided into two factors: (i) control beliefs and (ii) perceived facilitation. Control beliefs refer to the availability of skills to perform the behavior, the availability of the resources which help to perform a given behavior, and the opportunities to perform the behavior. Specifically, control beliefs are defined as the presence or absence of necessary resources and opportunities to perform a behavior (Ajzen, 1991), while, perceived facilitation is defined as an individual's evaluation of the significance of those resources to the achievement the behavior.

Limitations of TPB

TPB and TRA are not out of criticism. For instance, Eagly and Chaiken (1993) enhance with other factors such as habit, perceived moral obligation, and self identity that may affect on the individuals' BI in the context of TRA model. On the other hand, TPB as a substitute for the volitional control limitation of TRA, argues that behaviors are planned and deliberate, but it does not show how individuals plan and how planning mechanism relate to TPB. Besides, TPB presents one factor (PBC) as an answer to all non controllable elements of the individual's behavior. Beliefs behind the PBC are aggregated to generate a measurement for it. This aggregation has been criticized for not identifying and explaining specific factors that might predict the individual's behavior. Therefore, Taylor and Todd (1995a) introduced the DTPB to provide a better understanding of behavior.

### 3.3.4 Decomposed TPB Model (DTPB)

The DTPB model was introduced by Taylor and Todd (1995a, 1995b). They present a new design of the TPB model, which is considered as helpful to the perception of the relationships between the belief structure and the BI. According to Taylor and Todd (1995b), DTPB model presents three sets of belief structure which are attitudinal beliefs, normative beliefs, and control beliefs. The formal PBC is constructed into the DTPB in which Taylor and Todd (1995) categorize into SE and FC, where FC consists into technology facilitating condition (TFC), resources facilitating condition (RFC), and government facilitating condition (GFC), as seen in Figure 3.9. Additionally, Taylor and Todd explain that, when comparing the TPB and DTPB, the decomposition outcomes some added values, in terms of increased descriptive, high accuracy, and more understanding of the antecedents of behavior. Also, the DTPB provides a complete understanding of a behavior practice and more effective assistance to IS managers and researchers who are interested in the field of study. The DTPB model uses constructs from the innovation characteristics by Rogers (1995) as ATT dimension (Relative advantage, Compatibility, Complexity, Trialability, Observability), SN dimension (e.g., social influence), and PBC. In other words, DTPB supports a widespread approach to understand how an ATT, SN, and PBC can influence in the individuals' intention to perform the behavior.

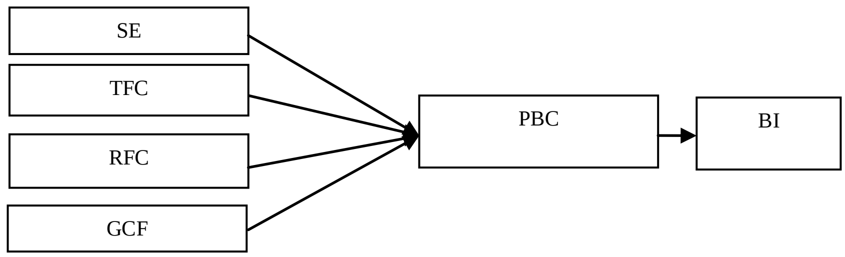



*Figure 3.9: Perceived Behavioral Control Antecedents (*Taylor and Todd*, 1995)*

### 3.3.5 Technology Acceptance Model (TAM)

TAM is one of the most popular theories in technology adoption. The theory was developed by Davis (1989) to study the diffusion and adoption of new technology at individual level, and to clarify computer usage behavior. It is widely used in technology adoption studies (Davis, 1989; Gefen, Straub, and Boudreau, 2000; Legris, Ingham, and Collerette, 2003; Khasawneh and Ibrahim, 2008). The model is different than TRA and TPB in which it provides a different measurement to estimate the individuals' adoption of technology. These measurements were derived from the TRA by Ajzen and Fishbein (1980).

According to TAM, there are two variables used to assess user acceptance of new technologies called "perceived usefulness" (PU), and "perceived ease of use" (PEOU) as illustrated in Figure 3.10, which are influencing the attitude towards the use of innovation. The Figure explains that the ATT influences the BI to use the technology, and the actual use of this technology. Davis (1989, 1993) define the PU as the "*degree to which individual believes using the information system will enhance the performance*" while, PEOU as "*individual believes the given information system will reduce the intensity of their work*". Although, both PU and PEOU are important to decide the BI, the PU is considered more important. The reason is, after a period of time of using the innovation (post adoption), the beliefs of PEOU has lost effect on intention, while PU has cohesiveness strong positive and effect on intention (Gardner and Amoroso, 2004).

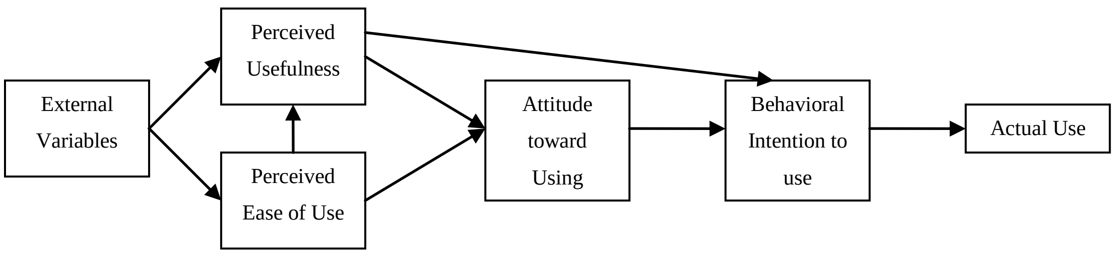



*Figure 3.10: Technology Acceptance Model (*Davis*, 1989)*

Researchers can use external variables in the extended TAM to measure the acceptance of new technology in their study. The external variables in TAM include:

- System design characteristics.
- User characteristics (Cognitive style and other personality variables).
- Task characteristics (Nature of the development or implementation political influences and organization structure).

Also, individual influences to use the technology by PEOU through two factors: (i) the availability of training and support and (ii) the ability to accessibility of the technology (Karahanna el al., 1999). PEOU is also influenced by computer self-efficacy, usability, knowledge and experience (Venkatesh and Davis, 1996). Consequently, PU may be influenced by three factors: (i) the availability of training and support, (ii) the affected from the social system to use the new technology, (iii) and the affected through the communication channels of the technology among the social system (Karahanna et al., 1999).

#### 3.3.5.1 Extension of TAM (TAM2)

TAM has been extended and evolved into TAM2 as depicted in Figure 3.11 to explain the PU and usage intentions in terms of social influence and cognitive instrumental processes (Venkatesh and Davis, 2000). TAM2 extends the original TAM to include additional factors divided into two categories such as SN, image, and voluntariness as social influence processes; meanwhile, job relevance, output quality, result in the demonstrability as the cognitive instrumental processes. The last factor is experience which is theorized to mediate the relations between SN and BI, and between SN and PU (Venkatesh and Davis, 2000). TAM2 also contains some factors that are similar to the adoption of innovation model: observability, trialability, and compatibility (Rogers, 1995) as suggested by Legris et al. (2003).

However, previous studies such as Hart and Porter (2004) and Ozag and Duguma (2004) agree upon the need for adding other factors to serve as determinants of the major construct since the original model lacked such determinants for PU and PEOU. TAM2, an extension of TAM, includes additional key determinants of PU and usage intention constructs which are meant to clarify the changes in technology acceptance over time as persons gain experience in using the targeted technology.

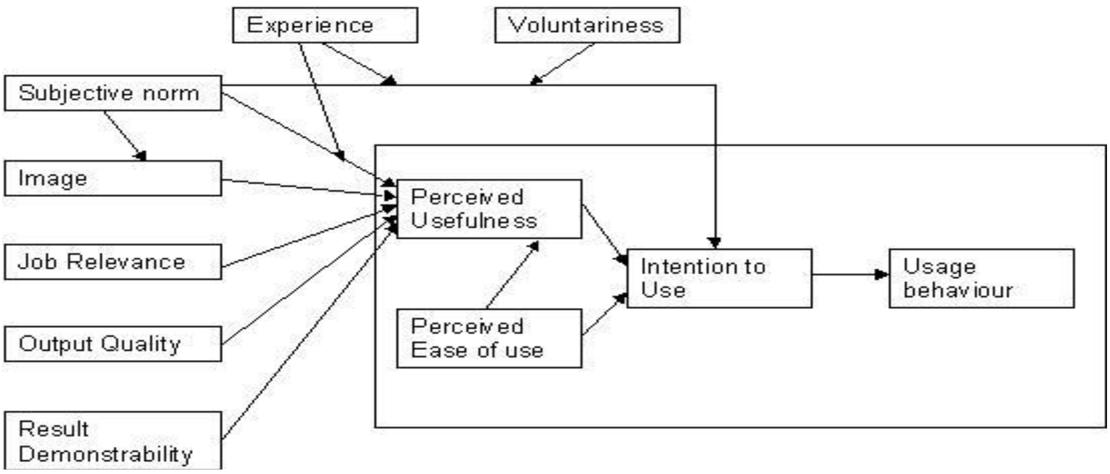



*Figure 3.11: TAM2, Extension of the Technology Acceptance Model (*Venkatesh and Davis, *2000)*

The previous studies mention some of limitations in TAM2 such as, it does not consider the advantage to the organization and ignore the personal and organizational perspectives (Wilkins, 2007). Other limitations are about the issues of access, ability, and policy which might hinder the participation in it, which are not addressed by the theory. It focuses on participation of usage but do not focus in the barriers to the usage (Wilkins, 2007).

#### 3.3.5.2 Limitations of TAM

The participants, in studies utilizing TAM vary depending on the studies themselves, in which some involve professional users, university students or sample from all the community, which gives some difficulties in making generalization (Legris et al., 2003). Another limitation is that TAM presents only limited guidance about how to influence the acceptance and usage through design and implementation phases (Taylor and Todd 1995; Venkatesh et al., 2003). Also, TAM provides feedback about PU and PEOU but does not provide feedback about aspects of improvement that might improve the adoption rate such as integration, flexibility, and completeness of information.

Additionally, Sun and Zhang (2006) address two major limitations of studies using TAM; the explanatory power of the TAM and the incompatible relationship among constructs. In their study, they examined data from 55 studies and indicated the weakness of explanatory power in two parts: the relatively low explanatory power of the TAM (40 per cent on average) (Venkatesh et al., 2003; Sun and Zhang, 2006), and the variation of explanatory power due to different ways to use it, such as field against experimental studies. However, the experimental studies were performed mostly with a convenience sample of students, which makes it far away from being representative of an actual workplace. Consequently, TAM studies are best carried out in a longitudinal approach since participant’s perceptions tend to change between technology introduction and actual usage.

### 3.3.6 Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT is a technology acceptance model developed by Venkatesh et al. (2003). The significance of UTAUT is to clarify the individual intentions to use information technology. Actually, Venkatesh et al. (2003) developed UTAUT through analyses on combination of eight models and theories that have been used by researchers to identify and explain information technology acceptance and usage. The theories are (a) TRA, (b) TAM, (c) Motivational Model, (d) TPB, (e) A Combination of TAM and TPB, (f) Model of Personal Computer Utilization, (g) DOI, and (h) Social Cognitive Theory. Consequently, UTAUT provides for managers a useful way to estimate and evaluate the success of using new technologies. Also, it is used in understanding the influencing factors on the individuals’ acceptance of the innovation. Upon review, Venkatesh et al. (2003) found five limitations of prior theories include:

(i) The IS studies were conducted as simple and individual-oriented rather than sophisticated and organizational oriented.

(ii) Most participants in these studies were students, not employees of an organization, except for a few studies.

(iii) Time of measurement to decide accept or reject the technology was in general appearing later not during decision-making process.

(iv) The nature of measurement was in general cross-sectional

(v) Most of the studies were conducted in voluntary usage contexts.

In the analyses, the authors empirically compared the eight theories in a longitudinal field study conducted in four different organizations. It involved participants among whom have been introduced with new technologies in the workplace. The sample was divided into two groups for the eight theories according to the compulsory and voluntary settings.

The authors also studied the influence of moderating factors that have been reported in previous theories as affecting the acceptance and the usage decision, particularly the experience, voluntariness, age, and gender. At the end, it was found that, with exception to Motivational Model and Social Cognitive Theory, the predictive validity of the theories increased after including the moderators. The authors then examined the commonalities among theories and found seven factors to be influenced directly of BI or actual usage in one or more of the individual models. They hypothesized that four of these factors play significant roles as direct determinants of individual's acceptance and usage behavior. The constructs that do have a direct effect on BI and usage are: performance expectancy, effort expectancy, social influences, and FC. On the other hand, there are three other constructs does not have a significant impact on BI which are SE, computer anxiety, and ATT. The relationship among these constructs is shown in Figure 3.12.

The four main factors of UTAUT; (i) performance expectancy, (ii) effort expectancy, (iii) social influence, and (iv) FC,  which are the direct determinants of BI and use. Gender, age, experience, and voluntariness of use are presented to mediate the influences of the main four factors on the BI and usage. The four features of UTAUT are defined by Venkatesh et al. (2003) as in the subsequence paragraphs.

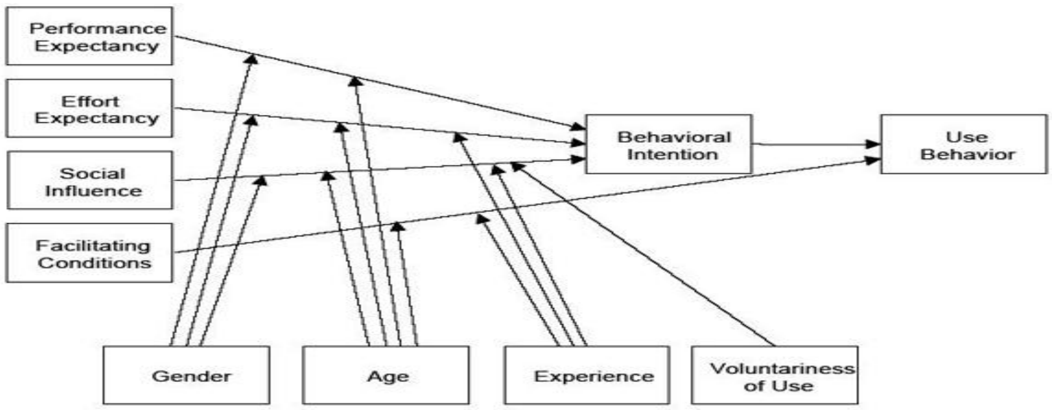



*Figure 3.12: Unified Theory of Acceptance and Use of Technology* (*Venkatesh et al.*, 2003)

**Performance expectancy** is "*the degree to which an individual believes that using the system will help him or her to attain gains in job performance*".

**Effort expectancy** is "*the degree of ease associated with use of the system*".

**Social influence** is "*the degree which an individual perceives that important others believe he or she should use the new systems*".

**Facilitating conditions** is "*the degree which an individual believes that an organizational and technical infrastructure exists to support use of the system*".

### 3.3.7 Adoption Theories Comparison

The previous section discusses the most adopted theories. Also, it discusses their evolution and describes how some of the theories were extended when the researchers found the limitations. As an illustration TRA was extended into TPB which was later extended to DTPB. This extension of theories supports it to improve the usage quality and reduces its limitations. Another extension to the TRA is the TAM, which contains two main constructs; PU and PEOU, and named as TAM2. Table 3.2 illustrates the common determinants of the adopted theories.

*Table 3.2: Behavioral Determinants of the Adoption Theories*

| Model | Determinants of behavior |
|---|---|
| DOI (Roger, 1995) | Innovation attributes (Relative Advantage, Compatibility, Complexity, Trialability and Observability). |
| TRA (Ajzen and Fishbein, 1975) | Attitudes towards the behavior + Social influences. |
| TPB Ajzen (1991) | ATT + SN + PBC. |
| DTPB (Taylor and Todd, 1995) | ATT + SN + PBC decomposed to (SE, TFC, RFC, GFC). |
| TAM (Davis, 1989) | PU + PEOU. |
| TAM2 (Venkatesh and Davis, 2000) | PU (SN, Image, Job relevance, Output quality, Result demonstrability, Experience and Voluntariness) + PEOU. |
| UTAUT (Venkatesh et al., 2003) | Effort expectancy + performance expectancy + social influence + FC. |

Although social psychological models such as TRA and TPB have been widely used as a theoretical base in the studies of new technology adoption and IS acceptance, there are a few studies used these theories in educational technology sector in general and higher education in specific. According to the literature, the adoption, acceptance and use of new technology studies attempt to forecast the individual's behavior to adopt the technologies. The literatures note that the TPB and TAM are both rooted and developed from the TRA.

TRA and TPB have been applied to predict the individual intentions and behaviors to use from the measurement of ATT and SN. Later, Ajzen (1991) introduced a new determinant factor that is PBC. It in the TPB refers to an individual's perception that technology is under his/her control and the ability to use it. After that, Taylor and Todd (1995) defined the PBC factors such as SE and FC which is considered as new theory named the DTPB. There is a similarity between TAM variables and DOI variables. PU and PEOU in TAM are similar with relative advantage and complexity respectively, which both applied to estimate the individual's ATT, whilst, the factors such as compatibility, trialability, and observability which are included in DOI are not included in the TRA, TPB, TAM and UTAUT.

The complex processes in the higher education institutions and the complex characteristics of the academic staff such as culture, trip, and language, in developing countries in general, and the Arab world in specific, require an integration of the adoption theories to build a new research framework that will determine the factors influencing the adoption and acceptance of new technologies in teaching and learning process. This section has presents and discusses the literature on technology acceptance theories and models related to IS. An important note from the theories is the ability to distinguish between two or more types of models.

On one hand, there are some models advocate and enjoy parsimony as TAM, but lack of the comprehensiveness needed to consider them complete or sufficient. On the other hand, there are comprehensive models that cover most of the constructs contributing to the adoption and acceptance behavior (such as UTAUT) but are considered complex and impractical to be relevant in a single investigation. Between these two extremes, this study considers three models i.e DOI, TPB, and DTPB to ensure comprehensiveness and understandability. Consequently, the following section describes about the BI to use technologies which is considered as the main dependant factor of the proposed model.

### 3.4 Behavioral Intention to Use the Technology

A review on the adoption theories discussed in the previous section shows that the major dependent variable in those theories is the individual's BI to adopt or reject the innovation. In order to measure the individual's awareness and knowledge to adopt and accept the technology, it is very important not only to understand the diffusion steps but also to expect the timing for the decision makers to decide when they should use the proposed innovation. The success in expecting individual's BI will be a critical way to the successful of the technology diffusion in the society system.

Briefly, individuals' behavior toward the new technology as in the previous theories depends on attitudes towards innovation, the social influences in the social system, besides the perception to the individuals to be able to use the proposed technology or not. In particular, the focus of this study is the BI towards adoption and acceptance of new technology in higher education institutions among the academicians and the factors which affect them towards positive or negative BI to use the new technology in their teaching and learning process.

### 3.4.1 Behavioral Intention (BI)

Adoption of ICT is very important in the social sciences field such as management information system discipline (Baskerville and Myers, 2002). It is focusing on the individual BI which is considered the most determinant in adopting or rejecting the innovation. Davis et al. (1989) argues that intention is the determinant of the theoretical foundation in IS researches by individual behavior to use or not use the technology. Also, BI refers to some of commands and instructions that individual feel it to doing certain behaviors (Triandis, 1979).

By definition, intention is defined as the "*person's location on a subjective probability dimension involving a relation between himself and some action*", while BI is "*a person's subjective probability that he will perform some behavior*" (Ajzen and Fishbein, 1980). In response to these definitions, most of adoption related theories including TRA, TPB, and TAM incorporate the individual's BI to perform the innovation as the main factor within. Specifically, TRA introduces BI as a combined factor of individual’s ATT and SN, or simply BI= ATT + SN. Similarly, TPB determines the BI to use technology as depending on the same factors; ATT and SN, in up of that, it adds the PBC factor. Therefore, the equation of the BI in TPB according to Ajzen (1991) is BI = ATT + SN + PBC. TAM, also suggests that the BI to use the technology could have been determined by the individual’s ATT and the PU. Therefore, the equation of the BI in TAM become as BI = ATT + PU.

BI is also the main dependent variable in the UTAUT. The theory has four determinants of BI to use the technology which are (i) performance expectancy, (ii) effort expectancy, (iii) social influence and (iv) FC. Also it has four demographic factors which are (i) gender, (ii) age, (iii) experience, and (iv) voluntariness of use to mediate the influence of the main four factors on the BI and usage (Venkatesh et al., 2003). On the other hand, Rogers (1995) suggests that the DOI depends on the knowledge about the innovation which can possess from the social system, followed by the characteristics of the individuals and the innovation itself which are considered the influenced factors of the BI to take the decision of adoption. From the above literature, this study considers the BI as the main dependant variable. It is the key for academic staff to accept or reject the technology with respect of other factors (ATT, SN, and PBC) that influence of individual’s BI. The next sub-section explains the relationship between the BI to use a new innovation and the actual use of it.

### 3.4.2 Relationship between Behavioral Intention and Actual Use

The relationship between BI and actual use of the behavior is extensively described in most of the adoption theories such as the TRA (Fishbein and Ajzen, 1975), TPB (Ajzen, 1991), TAM (Davis et al., 1989), and UTAUT (Venkatesh et al., 2003). In general, many studies on the adoption and acceptance of IS discuss the relationship between intention and actual use of the technology.

Ajzen (1991) defines the intentions as the individual's feeling to get the motivational factors that affect the behavior. Also he outlines how the individuals are influenced to use the technology, and how much they exert the effort to use a certain behavior. Meanwhile, Kim and Malhotra (2005) define the concept of BI as the individuals' intention to use some application. Similarly, Rawstorne, Jayasuriya, and Caputi (2000) address that when an individual carries out some activities this means that he/she states an intention to the way in adopting or rejecting an innovation.

TAM clarifies that the adoption decision is a direct function from the BI of the individual, which is connected with the attitude of the individual by two determinants: PU and PEOU. Surely, BI is also influenced indirectly by the external variables among the PU and PEOU (Davis, 1985). In conjunction, Figure 3.13 shows the reaction of individual who is influenced by many factors which affect in his/her BI and the decision to use the technology.

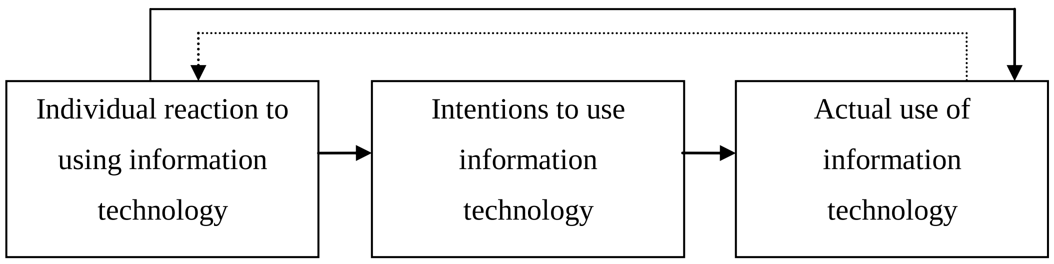



*Figure 3.13: Basic Concept Underlying User Acceptance Models (*Venkatesh et al.*, 2003)*

Consequently, Davis (1989) defines the intention to use of the technology as "*individual's intention to carry out a certain behavior immediately with determines his/her overt performance of that behavior*". This definition glance the differences between the readiness to perform a behavior and its actual performance (Ajzen, Brown, and Carvajal, 2004). On the other hand, the TPB clarifies that the individual is influenced by three determinants which are ATT, SN, and PBC. These three determinants lead to the formation of the individual's BI (Ajzen, 1991).

Further, Ajzen et al. (2004) outlines the relationship between these three combination determinants (ATT, SN, and PBC) and the individual's BI to use the technology**,** whereby, positive ATT and SN toward certain behavior, and the greater of PBC, concluding positively intention to use and perform certain behavior (Ajzen et al., 2004). This leads to the next section which presents the factors that influence the BI to use technologies such as ATT with the technology characteristics, SN that influence the academic staff from social perspective, and PBC that influence on the teaching staff from FC perspective; with consideration of academician's demographic factors.

### 3.5 Classification of Technology Adoption at the Individual's Level

This section classifies the factors that will influence the intention of an individual to use technology in higher education institutions among academicians. They are namely ATT, technological innovativeness, technology characteristics, SN, PBC, and demographic factors, which are the elements of the adoption theories especially TRA, TPB, DTPB, TAM, UTAUT and DIO. They are the antecedent variables to the BI to adopt and accept the technology. The following are the description of these factors and their relation to this study.

#### 3.5.1 Attitude towards Technology (ATT)

Construct definition refers to "*a person's perception or general feeling of favorableness or unfavorableness towards using technologies in the higher educational system*" (Ajzen and Fishbein, 1980; Rogers 1995; Tan and Todd, 2000). Attitude takes a special interest from the researchers in the fields of the adoption in general and information technology in particular. In fact, attitude toward new innovation is considered as one of the main influential factors which, affecting individuals to adopt or reject a certain innovation. Many researchers study the effect of attitude in the adoption decision. This section explains how attitude affects the individual to adopt and use new technology, particularly the attitude of the academicians to adopt new technology in their teaching and learning process. Ajzen (2002) refers that most studies which are interested in the adoption of innovation from attitudinal factors were conducted based on the structure of the TPB.

Actually, many researchers define attitude in different perspectives and it is very hard to get one definition of attitude (Walker and Johnson, 2005). Erwin (2001) argues that defining attitude is quite challenging to any researchers because any definition must explain the nature of the concept being defined. This study however focuses on the definitions of the attitude, which are given within the adoption theories as well as compatible with the IS research. Ajzen and Fishbein (1980) define attitude as "*an attitude toward any concept is simply a person general feeling of favorableness or un-favorableness for that concept*".

Correspondingly, Rogers (1995) defines attitude as the "*individual's forms favorable or unfavorable attitude toward innovation*", and also pointed out the attitude formation in the persuasion phase. The main result of the persuasion phase in the adoption of an innovation decides the individual favorable or unfavorable attitude towards the innovation (Rogers, 1995). Previously, Davis (1993) considered the attitude towards using the system as "*the assessment of the result that an individual perceived it when he/she use the system in his/her job*". Consequently, some researchers have shown an interest in the need to adapt the definition of the attitude towards IS such as "*a predisposition to respond favorably or unfavorably to a computer system, application, system staff member, or a process related to the use of that system or application*" (Melone, 1990).

In general, major adoption theories have explained the individual attitude, particularly in IS studies. For example, individual's attitude in the TAM is considered as a permission to bring the individual from demand side that contains the innovation to the supply side that contains the intention and the actual use of the innovation (Davis et al., 1989). Rogers and Shoemaker (1971) divide the individual's attitude towards innovation into two levels; (1) the specific attitude towards the innovation itself, and (2) the attitude towards change from the current state to the new state.

TRA, on the other hand, points out that individual's attitude towards behavior is combined by the prominent belief (bi) about the results of performing the behavior cross with the evaluation of those results (ei). It proposes that, the equation of the attitude towards behavior is ATT= $\sum$ bi ei (Davis et al., 1989). According to Davis et al. (1989), beliefs (bi) is defined as the "*individual's subjective probability that performing the target behavior will result in consequence i*", while, the evaluation term (ei) refers to "*an implicit evaluative response to the consequence*" (Fishbein and Ajzen, 1975). Meanwhile, TAM addresses that the attitude factor is created jointly by the PU and PEOU variables. The relation is calculated based on a linear regression ATT = PU + PEOU. It also suggests that PU has a direct influence on the ATT and BI, while PEOU has a direct influence only on the ATT.

The previous paragraphs discuss that attitude is considered one of the most influencing factors over the academic staffs' BI. This study focuses on the academicians' ATT because it has a positively significant relationship with their BI (Wu and Chen, 2005; Chen et al., 2007; Lin, 2007; Chang and Wang, 2008; Liu et al., 2009). Also, teachers' ATT are considered as a major predictor of the use of new technologies in the educational settings (Albirini, 2006). Thus, their attitudes towards computer can play important roles in the acceptance and actual use of computers. In conjunction, a recent study in Jordan found that attitude is significantly important in using the technology in Jordanian higher educational institutions among academic staff and it has a relationship with BI (Qudais et al., 2010).

### 3.5.2 Technological Innovativeness

People vary in terms of the quickness to adopt a new technology (relative to the time when the new technology is introduced). Some people adopt almost immediately after the launch of the new technology, while others adopt a long time after the launch or may not adopt at all. Different streams of the adoption research have been attempted to determine the people who adopt earlier. Those who are the first to buy or try any given product (Midgley, 1977) represent the key to the success of a new product. Most researchers measure innovativeness by time-of-adoption following Rogers' (1962) work on the DOI.

As shown in the previous studies of technology innovation, considerable attention has been given to the measurement of 'innovativeness' (Roger and Shoemaker, 1971; Midgley and Dowling, 1978; Hirschman, 1980a; Hirschman, 1980b; Rogers, 1983; Goldsmith and Flynn, 1992; Flynn and Goldsmith, 1993; Rogers, 1995). Researchers define innovativeness as a quality of personality that is possessed to a greater or lesser degree by all individuals (Midgley and Dowling, 1978). According to Midgley and Dowling (1978), innovativeness is the time to which an individual is receptive to new ideas and product and makes adoption decisions independently of the communicated experience of others. In relation, the diffusion of innovation with the communication processes define innovativeness as a personality trait, also called 'innate innovativeness' operating at the most abstract, global level of conceptualization to influence a variety of domain-specific behaviors, including the relative early purchase of new products. Midgley and Dowling (1978) proposed an intermediary level of product-category specific innovativeness which mediates the effects of innate innovativeness along with a variety of inter-individual difference variables and situational factors on actual innovation adoption. This definition has opened up a new vista for studying innovative behavior as this view of innovativeness is postulated to all product classes. On the other hand, the global characteristics of innovativeness is defined by Goldsmith (1990) and Goldsmith and Hoffacker (1991) as "*willingness to try new things' can be reliably and validly measured using a short version of the innovativeness scale"* (Hurt, Joseph, and Cook, 1977). This conceptualization is very close to the concepts of innate innovativeness defined by Midgley and Dowling (1978).

### 3.5.3 Technology Characteristics

The rapid and growing advancement of technologies and Internet has provided the educational sector, especially higher education institutions, with many innovations. It is very important to perceive the attributes of the innovation itself among the potential adopters whom are considered the most receptive of the new innovation. The characteristics of innovation are considered one of the reasons that affect the adoption rate by the individuals who adopt the new technology and who reject it (Rogers, 1995). The clarification of the factors may affect the individual's decisions to accept or reject an innovation. Rogers (1995) argues that the perceived innovation characteristic is very important in clarifying the rate of adoption and diffusion of the innovation. Based on this argument, he defines five innovation characteristics that may have influences on the adoption and use of innovation, namely (i) relative advantage, (ii) compatibility, (iii) complexity, (iv) trialability, and (v) observability. With respect to those five technology characteristics, researchers such as Kautz and Larsen (2000) argue that the more perception of the innovation among these characteristics by individuals, the better chance for the adoption and acceptance of an innovation to success. Rogers (1983) clarifies that the perceived characteristics of an innovation is 49% to 87% of the variance of the adoption of innovation rate. The clarification of these five characteristics is summarized as follows:

(i) **Relative advantage** is defined as "*the degree to which a technology or any new innovation is perceived as better than the old technology or any alternative methods available*" (Rogers, 1995). Consequently, relative advantage of a new technology that is perceived by the individuals of the social system as influencing positively on the adoption and the diffusion of an innovation (Rogers, 1995).

(ii) **Compatibility** is defined as "*the degree to which an innovation is perceived as consistent with the existing values, past experience, and needs of potential adopters*" (Rogers, 1995). It indicates how the innovation and new technology will be more suitable with an individual working environment and his/her lifestyle. It is influenced positively by the rate of adoption and acceptance of new technology (Rogers, 1995).

(iii) **Complexity** is the "*degree to which an innovation or technology is perceived by individual as relatively difficult to understand and use*" (Kautz and Larsen, 2000). Rogers (1995) indicates that the complexity is negatively influencing the rate of adoption and diffusion.

(iv) **Trialability** is defined as "*the degree to which an innovation may be experimented with on a limited basis*" (Rogers and Shoemaker, 1971).

(v) **Observability** is defined as "*the degree to which the results of an innovation are visible to others*" (Rogers, 1995). Rogers argues that the perceived observability of an innovation or technology is considered positively influencing related to the rate of adoption and diffusion, which is argued by Sooknanan (2002).

As concerned by Rogers (1995), these five attributes might not influence the rate of adoption of innovation in all cases. In other words, some of these attributes are considered important to one case but may irrelevant to other cases. However, this study utilizes all attributes that the researcher considers relevant to the respondents of this study. Such attributes are considered very important in this study which concern to explore the factors that affect the individuals, specifically academic staff in using the technologies in the educational system.

### 3.5.4 Subjective Norms (SN)

**Construct definition** refers to "*a person's perception that most referents who are important to them desire the performance or non-performance of using ICT in the teaching system and their motivation to comply with the views and wishes of referents*" (Ajzen and Fishbein, 1980; Warshaw, 1980).

SN is an influential factor of the BI in both TRA and TPB. It measures the influence of the individual from the social system. TRA agrees that the social influences in the individual BI to use the technology are embodied in the SN. Similarly, the TPB also considers the SN as one of the three determinants of the BI of users. SN recognizes the member's BI to an innovation in the social system and affects the individual's behavior to this innovation (Rogers, 1995).

A review of the literature in IS adoption reveals that SN is an important determinant in predicting the BI of an individual. For instance, Karahanna et al. (1999) in a cross-sectional comparison of pre-adoption and post-adoption belief of information technology use found that the management, supervisors, and peers strongly influence the BI to use those technologies for possible adopters and actual users. They also found that management IS team is a significant influence of possible adopters, while computer experts play a significant role for actual users. In this situation, TRA had identified that the individual perception of the behavior is influenced when others who are important to him/her think that he/she should perform a certain behavior.

According to Warshaw (1980), a SN is a principle of the individual beliefs about the normative views and desires of the referent about his/her behavior; therefore, each individual motivation is complied with the views and desires of each referent. In addition, Ajzen and Fishbein (1980) define SN as "*a person's perception that most people who are important to them desire the performance or non-performance of a specific behavior*".

In the matter of fact, the influence of the SN over the BI is not always in a positive relationship. For instance, Davis (1989) and Mathieson (1991) found that there is a non-significant influence between SN and the individual BI. Also, there is weak significant influence by the SN on BI (Taylor and Todd, 1995a; Karahanna et al., 1999). In contrast, Battacherjee (2000) found that there is a significant relationship between the SN and BI to use e-commerce services. He adds that there are two possible referents of SN, namely external and interpersonal influences.

There are two approaches to measure the SN and its influences on the BI. Firstly, through a survey to identify how the referents influence people to perform a certain behavior and what social factors affect them to perform a certain behavior. Second, the measurement could be done by using theoretical approach by Ajzen and Fishbein (1980). It is a summation of the normative beliefs and the motivation to comply for all potential referents in the SN formation. In this connection, Ajzen and Fishbein (1980) argue that the measure of SN has to correspond to the intention in action, context, and time elements.

Accordingly, Fishbein and Ajzen (1975) propose the SN equation as: $SN=\sum(bi)(mi)$, where $i = 1$ to $n$; $(bi)$ is the normative belief which is defined as the individual belief that a referent group or individual (i) thinks he/she should or should not perform a certain behavior (b); (mi) is the motivation to comply with referent i; and n is the number of the relevant referents. By the way, referents might include the management, supervisors, colleagues, family, friends, partners, political and professional parties, or any person or group to which the potential adopter refers to making a decision or deciding on behavior. According to Mathieson, (1991) and Taylor and Todd (1995), the most important referents in the SN concept which influence the individual to accept and use the technology are peers and superiors.

As explained in the previous paragraph, the SN is divided into normative belief and motivation to comply with the relevant context. According to Taylor and Todd (1995), the DTPB proposes that the individual's normative belief (nb) can refer to the concerns of a particular referent weighted by the motivation to comply (mc) with that referent. So, the equation appears as $SN = (\sum nbi\ mci)$ which is significant related to SN (Taylor and Todd, 1995). Further, Ajzen and Fishbein (1980) argue that all the SN are connected together to decide the position of salient of other referents toward the behavior. In other words, Rogers (1995) believes that the decision to adopt or reject an innovation among the individual is considered as an independent decision, but may be effected by the norms from the social system he/she is in.

In line with Rogers, Bearden, Calcich, Netemeyer, and Teel (1986) and Karahanna et al. (1999) classified social influence into two styles, informational-based influence and normative influence. Both are thought to manage during the processes of compliance, identification, and internalization (Kelman, 1961; Bearden et al., 1986). According to Rogers (1995), the information about innovation itself can be gathered by individuals after they perceive that the innovation exists, and when they know and familiar with the sources and channels that can support the information. Bearden et al. (1986) also explain that the informational influence happens when individuals believe that the information gathered is considered as evidence of reality.

On the other hand, Rogers (1995) with his DOI focuses on the adoption of innovation processes. These processes assert on the outcome of the communication channels of an innovation (Rogers, 1995), and how the individual perceive the existence of innovation and its characteristics (Aggarwal et al., 1998). Therefore, the communication channels play an important role in creating awareness and supporting knowledge versus persuading process to change the individual attitude towards using an innovation. Additionally, Rogers (1995) and Aggarwal et al. (1998) suggest that there are two methods to make an innovation more rapidly adopted by communication channels process which are interpersonal channels and mass media channels.

(i) Interpersonal Channels

Rogers (1995) believes that interpersonal channel is an efficacious factor in persuading an individual to adopt a new innovation. However, the interpersonal channels employ face to face contact that provides a two-way information exchange. This study concerns on the influences of referents like peers, friends, and family, furthermore, the opinion leaders. Particularly, the opinion leaders are considered as individual members in the social system that try to influence and lead other individuals' attitude to adopt an innovation (Rogers, 1995).

Intends to adopt those, the study introduces interpersonal factor as influences the adoption of new technology. In general, the pressures from leaders and peers during the early adoption stage of new technologies usually influence individual's intention.

This implies that, the relationship between SN and intention to use the innovation can be clarified as compliant in which an individual accepts the influence in order to increase his/her favorable reaction from other person or group (Warshaw, 1980; Venkatesh and Davis, 2000).

(ii) Mass Media Channels (MMC):

The MMC is considered the most rapid and influential factor of supporting potential adopters about the innovation to create knowledge about it (Rogers, 1995). Consequently, the mass media contains all those media of broadcasting messages such as radio, TV, newspapers, and the Internet. There are many advantages of the MMC such as ability to make rapid awareness and knowledge to the innovation in the social system. In addition, Rogers (1995) presents that the MMC are influencing on the adoption decision made by individuals and it also important in the knowledge stage which affect the persuasion stage.

The study, however, give social influence factors a special attention, because these factors have a significant effect on the BI to use technologies. Hsieh et al. (2008) found that there is positive relationship between SN and social influences and BI to use technologies. In Jordanian case, the social influence is very important in affecting colleagues in Jordanian universities to accept or reject the new technologies in the educational system. In line with this, a recent study explores that the socially and culturally sensitive reactions are considered among the problems faced by the academic staff in Jordanian universities to adopt or reject the technologies in the educational system (Qudais et al., 2010).

### 3.5.5 Perceived Behavioral Control (PBC)

PBC is the third antecedent variable of the BI in the TPB (Ajzen, 1991). According to Venkatesh (2000), the PBC will help understanding the human behavioral and establish an important interest from psychological perspective than the actual control. In particular, control relates to an individual's awareness of the availability of the resources and knowledge and necessary performing a certain behavior. In fact, the PBC and the BI can be considered as the expectation of the actual use of the behavior (Ajzen, 1991). Further, Venkatesh (2000) argues that PBC has the main influence as the dependent factor, which significantly affects the BI. The significance of PBC was established from the role that acquisition of control and facilitates information since the individual has the resources to administer the behavioral activities (Pavlou, 2002).

Researchers have positively considered the PBC as one of the antecedent factors of the BI. In relation, Ajzen (1991) refers it as the awareness of the individuals on the ease or difficulty of performing a certain behavior. Similarly, Mathieson (1991) defines it as "*the individual's perception of his or her control over performance of the behavior*", which was extended by Doll and Ajzen (1992) who define PBC as "*the perceived ease or difficulty of performing the behavior and assumed to reflect past experience as well as anticipated impediments and obstacles*".

Previous studies have widely utilized the PBC as the influencing determinant of the BI. For instance, Mathieson (1991) found that the PBC affects the BI to use the IS, which is similar with the significant relationship found between the PBC and BI in the computer resources center (Taylor and Todd, 1995a). Also, Pavlou (2002) investigation over the e-commerce behavior found that a positive relationship between the PBC and BI, which is agreed by Battacherjee (2000) and Taylor and Todd (1995). In general, there is a strong relationship between the PBC and BI in the theoretical and empirical studies.

One step ahead, Ajzen (1991) specifies three conditions for a precise prediction of the PBC and BI. The first condition requires that the measurement of the intention and PBC must be compatible with the behavior which is wanted to perform. The second condition requires that the intentions and PBC must be stable in all time between their prediction and observation of a certain behavior. The final condition insists that the important of the accuracy of the PBC to assure the perceptions of behavioral control realistically mirror the actual control.

In a nutshell, the proposed factors of the PBC to examine the adoption of ICT in the higher educational system will be adapted from the DTPB. The determinants of the PBC in the DTPB are (i) SE and (ii) FC which include (a) TFC, (b) RFC, and (c) GFC.

(i) Self-Efficacy (SE)

SE is a determinant factor derived from the social cognitive theory by Bandura (1986). According to Gist and Mitchell (1992), the SE is defined as "*a more complex and generative process involving the construction and orchestration of adaptive performance to fit changing circumstances*". There are three components of SE (i) a comprehensive summary of the perceived ability to perform a certain behavior, (ii) dynamic determinant, and (iii) involve mobilization part.

Compeau and Higgins (1995) define SE from IS perspective as the individual ability to use computer. In the context of utilization of ICT in the educational system among lecturer, SE describes the capabilities to use ICT and Internet in the teaching and learning process by academicians in the higher educational institutions. Also, Compeau and Higgins (1995) view that SE play an important role in the measurement of computer usage.

In view of another angle, Lopez and Manson (1997) reveal that computer SE significantly influences in developing the PU of an ICT. It also measures an individual's confidence to use new technology (Hartzel, 2003). Hartzel also found that SE in using computer is important. In contrast, Igbaria and Livari (1995) found that the SE has an insignificant influence on the PU.

(ii) Facilitation Conditions (FC)

The FC has appeared as an external factor related to the environment (Triandis, 1979; Taylor and Todd, 1995a), in which an understanding of the expected effect from FC is considered as a critical issue. In general, the FC explain that the performed behavior cannot occur if the surrounding conditions prevent it (Triandis, 1979), or if the FC in the environment makes the behavior difficult (Thompson, Higgins, and Howell, 1994). Initially, it has two categories: facilitating resource factors such as time and money, and facilitating technology factors such as compatibility and security (Taylor and Todd, 1995a).

Investigation on the influence of FC on the individual's BI towards ICT adoption in the educational system cannot be neglected. Although, Triandis (1979) found that FC influences only on the actual behavior, Chang and Cheung (2001) suggest that the FC influences the intention to use. As agreed by Venkatesh et al. (2003) who found that the FC determinant is similar to PBC, which influence the BI and also the actual usage.

In response to figuring that the FC has been utilized in the measurement of adoption of new technology, Hung, Ku, and Chang (2003) have utilized it and argue that the FC influences the adoption of wireless application protocol (WAP). Also, Venkatesh (2000) highlights that the FC influences the individual's behavior to use and accept the new technologies. Then, Venkatesh et al. (2003) report that the FC influence the user's acceptance of new technologies. Consequently, the researchers considered that the success in adoption and diffusion of technologies means that the more conditions have been facilitated. Therefore, the FC in the field of adoption and utilization of new technologies can be considered as a motivator that speeds the adoption or inhibitor that delays it. Hence, this study proposes three issues of conditions to be measured: (a) TFC, (b) RFC, and (c) GFC. The following describes each condition of PBC.

(a) Technology Facilitating Conditions

The first factor of FC is the technology which requires the availability of infrastructure, training, and system compatibility. Previous researchers discussed TFC from IS perspective. For instance, Venkaesh et al. (2003) demonstrates that the degree of an individual beliefs and attitudes to use new technologies are influenced by the organizational and technical infrastructure which support the adoption and utilization of the technology. In addition, Ratnasingam, Gefen, and Pavlou (2005) exploit the concepts of technology connectivity by presenting three dimensions, which are compatibility, telecommunication infrastructure, and internal integration.

With respect to the IS researches, the availability of infrastructure and training are considered as a significant form of the TFC, in which it is measured in many of the technology adoption and acceptance studies. Technological support is considered the main issue in motivation towards using technologies such as providing training (Bonk, 2001), instructional design and development support (Dooley and Murphrey, 2000; Bonk, 2001).

(b) Resource Facilitating Conditions

The second factor in FC is the resources, which is required to use specific technologies in the social system. Time and money are considered the important examples of the RFC. Lu, Yu, Liu, and Yao (2003) suggest that regulation, policies, and the legal environment are also considered significant elements in the FC. Cheung, Chang, and Lai (2000) propose that individuals require not only the important resources but also they need to encourage them to adopt the technologies. Consequently, Lee (2001) points out that when academic staff feels that there is an institutional support, their levels of motivation and dedication to use the technologies will be improved.

(c) Facilitating Government Support

The third factor in the FC is government support. Government can play important roles in the diffusion of innovation (Gurbaxani, Kraemer, King, Jarman, Dedrick, Raman, and Yap, 1990). In Jordan, the government encourages the utilization of ICT in the different fields, especially the educational system. They support in facilitating the adoption and diffusion of technology in several forms. For example, they set clear regulations and rules that reduce security risks and playing more specific actions to encourage a higher educational sector to use ICT in the educational system as suggested by Partridge and Ho (2003).

As a result, Hsien et al. (2008) argued that there is a significant relationship between individual's PBC such as the FC to support the use of technologies and their BI to use these technologies. In addition, the FC support encourages them to use technologies in their teaching and learning process. The availability of technologies and their ability to do the functions at best with the availability of resources and government support to use the technology such as hardware, Internet connection, training courses, and motivations support and also considered important to adopt and use the technologies in the teaching system.

### 3.5.6 Demographic Characteristics

Adoption of innovation may also be affected by the individuals' characteristics and the characteristics of the social system which the individual lives in (Rogers, 1995), which include demographic charactristics. Previously, Katz (1992) found that personality traits affects the adoption and attitude to the technology. Accordingly, parts of the factors include the demographic aspects such as (i) gender, (ii) age, (iii) education and major and (iv) teaching experience are adapted in this study.

(i) <u>Gender</u>

Gender differences is an essential phenomenon that influences every feature in daily lives. From the perspective of social cognitive theory, gender is the main factor on which human is differentiated (Bussey and Bandura, 1999) includng in terms of computer and ICT adoption. Studies such as Shashaani and Khalili (2001) found that the adoption and usage of ICT is less among women. A few studies on the relationship between gender and attitude towards adoption of ICT in the teaching system found that there is no significant relationship between gender and lecturers attitude toward using ICT in secondary school (Kim, 1986; Roza, 1994). On the other hand, many researchers have found a significant relationship between human gender and their ATT. İn particular, Francis (1994) found that men are more enthusiastic and confident using ICT than women. Liaw (2002) reveals that men have more positive perceptions toward computers and Web technologies than women.

Besides, Luan, Aziz, Yunus, Sidek, Bakar, Meseran, and Atan (2005) found that there exists a gap between male and female academicians in using technologies in the educational system. In certain cases, the competencies of female academic staff have even surpassed those possessed by males, which is agreed by Chen and Tsai (2005) in terms of web-based learning. In Taiwan, Ong and Lai (2006) found that male's perception on PU was more significant than female's in determining BI in using e-learning.

(ii) Age

Age is also one of the most important demographic characteristics and is considered a significant factor in the adoption of technologies in the universities among academic staff (Blankenship, 1998). Young academic staff may be familiar with ICT in the education system especially who use computers during their college studies or receiving higher education degree from any developed country. On a contrary, older academic staff may be unfamiliar with ICT in their teaching system especially if they do not use it in their studies. They considered the knowledge on using ICT as a new skill and may result in diverse attitudes toward ICT.

Many studies found the relationship between lecturer's age and their attitudes in using ICT in their teaching system. As an illustration, Na (1993) establishes that there is a negative relationship between age and the use of ICT in the education system; specifically young lecturers have more positive attitudes towards than older lecturers, and Lin (2002) found that the older lecturers have lower technological familiarity. The significance of the relationship between age and other factors may be different between cases. This means individuals in a certain age groups might have different factors, which significantly affect each group. For example, Morris and Venkatesh (2000) reveal that the adoption decision by the younger is more significant than the older. In contrast, the older are more significantly influenced by SN and PBC.

(iii) Education

Rogers (1995) argues that the level of educational for an individual may affect his/her adoption of innovation. İt explains that those who have higher level of education could be more familiar in using new technologies. Many researchers have studied the relationship between educational level and ATT. For instance, Al-Tamimi (1998) found that there is no significant relationship between educational level and the lecturer’s ATT in the UAE. In current state, all academic staff in

Jordanian universities have either PhD or master degree. This study therefore, attemps to find the differences between BI and ATT in these two categories of level of higher education degree.

(iv) Teaching Experience

Experiences of the teaching is also considered an influence on the adoption and usage of ICT in teaching system. However, teaching experience depends on the age of the academic staff in the universities. In accordance, Davis (1998) argues that the ATT different between senior lecturers that have experience in teaching and junior lecturers without experience, which summarizes that there is a significant relationship between lecturer's ATT and years of teaching experience, which is supported by Haaparanta (2007).

Besides, Snoeyink and Ertmer (2001) focus on the importance of previous computer experience among teachers and their ATT. They found the lack of experiences make teachers less confident and more depress about changing to use technologies, which is similar with Huang (2003). While this section discusses at length about the relationship among the selected variables, the following section discusses about the studies done in the adoption and acceptance of the ICT in higher education institutions around the world in general and in developing countries in specific.

### 3.6 ICT Usage in Higher Education Institutions

Educational technology and the usage of ICT in teaching and learning system in the universities become one of the most important issues in the world. Although many academic institutions in the developed countries depend on technologies to support their teaching and learning process, they are still unable to fully utilize technologies to improve their educational system.

Researchers all over the world have examined the factors that influence the adoption and usage of ICT in higher educational system. For instance in the USA, Sanders and Morrison-Shetlar (2001) found the importance of using technologies among the students in Georgia Southern University and their attitude toward using Web-based learning. Then, Wilson (2003) explains the use of instructional technologies among academic staff in six universities in South Dakota Regental System. In addition, Sivo, Pan, and Brophy (2004) discuss student's ATT and SN and their effects on the use web-based communication technology in the USA. Meanwhile, Park et al. (2008) argue that the BI is a very important factor that affects academic staff in using the Internet-Based Course Management System.

Previously, Beggs (2000) studied the influence of adoption and utilization of ICT in teaching system in higher education institutions, at State University of West Georgia. Then, Sutherland (2003) discussed the benefits of adoption and technologies usage through teaching and learning process to the students and the lecturers in United Kingdom through a case study at University of Wolverhampton. Masi and Winer

(2005) then continued by studying the vision of the use of ICT in teaching and learning process and its advantages to the learner in McGill University in Canada. Saadé et al. (2008) further confirmed the importance of measuring BI in using e-learning in the higher educational institutions. They measured the BI in accepting the use of a Web-based learning system among students between Canada and China universities. Dixon and Siragusa (2009) followed the previous works and revealed the importance of PBC on the undergraduate teacher education student in Western Australian University towards the BI in accepting and using ICT in the educational system. Then, Tselios, Daskalakis, and Papadopoulou (2011) recently studied the accessibility of the blended learning and it is accepted among the students in Greek university.

On the other hand, Park (2009) suggests that it is necessary to conduct studies that deal more intensively with learners' perception of attitude towards, and intention to use educational technologies in Korean higher education institutions. Meanwhile, Karaali et al. (2010) also argue the importance of the attitude factor in measuring the BI in using technologies in the teaching and training system. They measure the factors affecting the decision of using a web-based learning system among blue-collar workers in Turkish automotive industry. Besides, there are studies conducted in the developing world that reveal the factors affecting the use of technologies in teaching systems in Taiwanese perspective (ChanLin, Hong, Horng, Chang, and Chu, 2006; ChanLin, 2007). Also in Taiwan, Ong and Lia (2006) argue about gender differences in accepting and using e-learning in six international companies. Other examples in developing countries are initiatives and challenges of using ICT in the higher education institutions in Africa (Adam, 2003). Similarly, Enuku and Ojogwu (2006) discuss the issues of adopting ICT in the Nigerian Open University in enhancing the education and learning process, while, Odero-Musakali and Mutula (2007) Macharia and Nyakwende (2010) studied in the Kenyan University.

In another context, Ndubisi (2004) outlines the factors adopted from TPB that influence the intention to adopt e-learning in Malaysian educational systems, while, Luan et al. (2005) explain the gender differences among academic staff in University Putra Malaysia (UPM) in the competency of use of ICT in the educational system. In addition, Khayon and Alias (2006) discuss the exploitation of adoption and utilization of ICT in Malaysian higher education institutions. Further, Wee and Abu Bakar (2006) outline the obstacles that academics face most in adopting and using the technologies in Malaysian higher education institutions. On a contrary, Bidin et al. (2010) explain the effects of PBC in the adoption of Internet technology in the educational system among students in Malaysian public and private universities. In conjunction, some studies have also been done in the Arab world. As an example, Abdel-Wahab (2008) examined the factors that influence students' intention to accept e-learning in the Egyptian University of Mansoura. Meanwhile, Qudais et al. (2010) found the importance and significance of ATT in Jordanian higher educational institutions and its relationship with BI. The contents in this section discuss about the variables used in the previous studies related to BI in adoption and utilization of ICT. A summary of the contents is presented in Table 3.3.

*Table 3.3: Summary of the Previous Studies about ICT in Higher Education System*

| Author/Year | Environment/Country | Scope/Technology | Unit of Analysis |
|---|---|---|---|
| Beggs (2000) | State University of West Georgia, USA | Instructional technologists | Academics Staff (N=348) |
| Sanders and Morrison-Shetlar (2001) | Georgia Southern University, USA | Web-Based Learning | Students (N=110) |
| Adam (2003) | Africa | ICT in the Educational System | Academics Staff and Students |
| Sutherland (2003) | University of Wolverhampton (UK) | Technology Support learning | Academics Staff (N=4) |
| Wilson (2003) | Six Universities in South Dakota Regental System, USA | Instructional technologies | Academics Staff |
| Ndubisi (2004) | Educational System, Malaysia | E-learning | Students (N=300) |
| Ong and Lia (2006) | Six international companies in Taiwan | E-learning | Employees (N=156) |
| Sivo et al. (2004) | USA | (WebCT) | Students (N=217) |
| Luan et al. (2005) | University Putra Malaysia, Malaysia | ICT Competencies | Academics Staff (N=109) |
| Masi and Winer (2005) | McGill University, Canada | ICT in Teaching System | Academics Staff |
| Enuku and Ojogwu (2006) | Nigerian Open University, | ICT Services | Secondary and Primary data. |
| Khayon and Alias (2006) | Higher Education Institutions, Malaysia | ICT for Strategic Education Marketing | Secondary and Primary data. |
| Wee and Abu Bakar (2006) | Malaysian Universities, Malaysia | Obstacles toward using ICT in the Teaching System | Academics Staff (N=151) |
| ChanLin (2007) | Taiwan Schools, Taiwan | Integrating Computer Technology into Classrooms | School Teachers (N=407) |
| Odero-Musakali and Mutula (2007) | Kenyan Universities, Kenya | Adoption of Internet in Kenyan University Libraries | Literature Review |
| Abdel-Wahab (2008) | Egyption University of Mansoura, Egypt | E-learning | Students (N=258) |
| Park et al. (2008) | a private research university in the western United States | Internet-Based Course Management System. | Academics Staff (N=191) |
| Saadé (2008) | Canada Vs China Universities | Web-BLS | Students (N=362 Canada, 120 China) |
| Dixon and Siragusa (2009) | Western Australian University, Australia | ICT-Based Interactions | Students (N=30) |
| Park (2009) | Korean Higher Educational, | e-Learning | Students (N=628) |
| Qudais et al. (2010) | Jordanian Higher Education Institutions | ATT | Academics staff (N=226) |
| Bidin et al. (2010) | Public Universities, Malaysia | Internet Usage | Students (N=422) |
| Macharia and Nyakwende (2010) | Public and Private Universities, Kenya | Learning Management Systems (LMS) | Academics Staff (N=82) |
| Karaali et al. (2010) | Turkish automotive industry, | Web-BLS | Workers (N=546) |
| Tselios et al. (2011) | Greek University, Greece | Blended Learning | Students (N=130) |

### 3.7 Concluding Comments

This chapter provides an overview of diffusion and adoption theories such as DOI, TRA, TPB, DTPB, TAM, and UTAUT. Followed with a discussion of the main variables in the adoption of ICT and, more particularly, in ICT education. Several influential factors of adoption of ICT in higher education institutions are also identified and discussed such as BI, ATT, SN, PBC, and demographic characteristics. These factors were included the attributes that influence the individual's decision to accept or reject the technology from many views such as technological, psychological, and management perspectives. The chapter presents previous studies in the field of usage of ICT tools in the educational institutions around the world. In conjunction, identification of a revised model for the adoption of ICT education in Jordan is introduced in the next chapter to facilitate the understanding of the critical factors of the adoption of ICT in educational system among the academic staff. The literature review provides a firm basis for this study on the adoption of ICT in educational sector in teaching and learning among academician in Jordan. While, there are insufficient studies in relation with this scope of research, especially in Jordan, this study aims at making a significant contribution to the understanding and knowledge of improving the adoption process and conditions of new ICT in teaching and learning process in educational institution in developing countries such as Jordan.

CHAPTER Four

# CONCEPTUAL MODEL FORMULATION AND RESEARCH METHODOLOGY

## 4.1 Introduction

This chapter explains the research design and methodology of this study. It starts with the introduction of the study including the purpose of the study, followed with the description of exploratory and explanatory research methods and qualitative and quantitative research methods. The discussion continues with an explanation of the issues relevant to the model building and hypotheses formulation. It adds with the instrument development for the study and the sample which involves academic staff in Jordan. Finally, this chapter details the data collection and the data analysis techniques used in the study.

## 4.2 Research Background

The literatures reveal that the adoption of ICT in teaching and learning process provides the inference that an individual, such as teacher or lecturer adopts ICT in teaching and learning process through three perspectives: (i) technology characteristics, (ii) psychological characteristics, and (iii) external factors. Generally, these perspectives have been utilized in several studies in IS field. For example, some adoption studies focus on technology characteristics, best exemplified by the study which was accomplished by Agarwal and Prasad (1999) which found that the technology characteristics were influencing on the adoption and the approval of new innovations. Agarwal and Prasad (1997) also found the role of technology characteristics in the adoption and acceptance of technologies. Although there are many studies in the IS field include these perspectives, but studies that include sets of antecedent factors to each perspective are rare. For example, the external factor perspective in this research stands for the FC which are definitely the element of the DTPB by Taylor and Todd (1995), and the psychological factors stands for SN which are derived from the TPB by Ajzen (1991). Besides, the technology characteristics perspective is represented by individual's perception of using the technology. In that order, lecturer's perceptions of using ICT in their teaching system are limited to Rogers' five characteristics of innovation (1995).

From the theoretical view, the factors that are described in the framework of this study were chosen from the DOI, TPB, and the DTPB, incorporated with external factors. The model is proposed as an innovation in the adoption and acceptance of technology in general, and in the Jordanian higher education system in specific.

**4.3 Purpose of the Study**

The review on literatures as described in Chapter 3 reveal a gap in ICT adoption and utilization. In particular, studies in the adoption of ICT in the field of higher education has been done and examined in many developed countries such as the USA, Canada, UK, and Australia. In contrast, similar studies in developing countries and the Arab world are still lacking. Hence, this study is aimed at bridging the gap.

Consequently, this study attempts to support the literatures of ICT and technology adoption by focusing on higher education in new environment particularly in Jordan.

In current state, the communities in Jordan tend to upgrade their educational level. It leads to the increase number of the universities whether public or private, which eventually demands sufficient observation and development of high quality educational systems. In accordance, this study attempts to propose a suitable model that can answer the research questions and achieve the research objectives as stated in Chapter 1 that specify the critical success factor of the study. The study follows a scientific way to achieve its goals, which involves five phases as follows:

(i) The first phase is the review of the literatures related to the study to identify the problem of the study. This phase helps in the understanding of the concept of technology adoption, adoption theories, and the factors influencing individuals to adopt or reject new technologies.

(ii) The second phase contains the identification of the factors that might influence the adoption and utilization of ICT among the academic staff in Jordanian public universities. In addition, this phase also guides the developments of the research model that intends to answer the research questions and achieve the research objectives. Besides, the dependent and independent variables and their relationships are also identified.

(iii) The third phase is the data collection, which starts with designing and testing the questionnaires. This study distributes the questionnaire to a sample consisting academic staff who were randomly selected among the Jordanian public universities. The questionnaire was piloted to ensure its validity and reliability.

(iv) The fourth phase is data analysis, which involves testing of using Statistical Package for Social Science (SPSS).

(v) Finally, the results and findings of the study are presented.

**4.4 Exploratory and Explanatory Research**

Exploratory research is carried out to experiment the understanding of a problem of the study, and is supposed to be used as the effort for further studies (Malhotra, 1999). On the other hand, explanatory research intends to present an indication of the interaction of causes and effects (Aaker, Kumar, and Day, 2001). Usually, a researcher tries to use the independent variables related to the research and tries to organize the effect with other variables (Davis and Cosenza, 1993). This study, however, intends to present an initial exploratory stage followed by a widespread of the explanatory stage.

The exploratory stage of this study begins with a review of literatures about ICT in Jordanian universities by studying the facilities from the government to encourage the use of technologies in the higher educational system. The next stage is a review of the literatures about the adoption theories which have been mostly used in the IS field and a presentation of the variables which have influenced or might influence the academic staff in universities to adopt or to reject new technologies in their teaching and learning process. The study continues with unstructured interviews with Jordanian higher education leaders and the manager of the e-learning center in the Hashemite University for collecting significant information about the problem of the study and identifies the factors which may have affected the lecturers in adopting the technologies in the teaching process. As a result of the exploratory stage, the study proceeds with the explanatory stage that focuses on the examination of the variables that are highlighted in the research model. Hypotheses are formulated to test and explain the relationship between dependent and independent variables by using quantitative method, as explained in the next section.

### 4.5 Qualitative and Quantitative Research Approaches

The quantitative approach concerns on numerical representation and management of the observations for clarifying and describing the phenomena that the observations mirror. In contrast, the qualitative approach focuses on non-numerical representations and the explanation of observations, with an intention to discover the fundamental meaning and defining the relationships.

Further, the qualitative approach highlights on the research, which contains factors and variables that are not thoroughly measured and examined, but in terms of quantity, explains the huge number of processes and frequency. On contrary, quantitative approach concerns on the measurement and investigation of relationships between variables (Bellenger, Bernhardt, and Goldstucker, 1976; Casebeer and Verhoef, 1997; Zikmund, 2000). The variables and their relationships are considered the main idea in a quantitative approach (Neuman, 2003). A quantitative study is valuable as long as the preparation of the research prior to collecting and analyzing data is exhaustive, because it supports the instrument development for measuring ideas and arrangement for sampling. Also, the quantitative approach develops a deductive research by examining the relationship among variables and present facts for a certain hypotheses (Neuman, 2003).

Basically, the qualitative approach uses the induction of the research as the first step (Wimmer and Dominick, 1994; McDaniel and Gates, 1996). This means that the collection of data in the qualitative approach depends on discovering information from the interviews related to the study, for example, the behaviors and attitudes that are difficult to be observed directly (Patton, 1990). Therefore, the results of the qualitative method are not used to examine a theory and to establish generalization concept to the study population; but more to construct a theory for supplementary measurement during the quantitative methods (Maykut and Morehouse, 1994; Aaker et al., 2001).

Based on the descriptions on the previous paragraphs, this study applies both the qualitative and quantitative approaches. The induction feature of the qualitative approach is important for the exploratory stage for two reasons: (1) at the moment, this study was first initiated and adoption of the new technology and using Internet environment in teaching and learning process among lecturers in Jordanian public universities is considered relatively new in the IS studies. In addition (2) in studying a new phenomenon, it appears not clear to be understood by applying theories in the early phase and the quantitative approach considers uncertain findings when used prematurely (Denzin and Lincoln, 1994).

A qualitative approach is more essential to discover the new subjects in depth by expert researchers who have applied their knowledge practically to produce ideas rather than to estimate it (Crimmons, 1988). Therefore, the qualitative approach is considered more flexible in collecting data and a simple exploration of research matters in a less structured design, with a lesser number of respondents than quantitative research method (Bellenger et al., 1976; De Ruyter and Scholl, 1998). This information will be applied to help in the construction of a theory that will be examined in the next step of the research in the quantitative method. In addition, the qualitative approach is also important in this study because the deepness and detail of data which is needed in order to recognize the phenomena can be acquired only by being psychologically closed to the research phenomena. In this situation, unstructured interviews with the manager of e-learning center in the Hashemite University and experts in the statistical field can help understand the key components of the questionnaire to be used for data collection, a part of the quantitative approach. Then, the quantitative approach is used in the second phase of this study because the study involves a large sample. The use of a statistical method is considered significant to understand the findings of all population in general (Zikmund, 2000; Neuman, 2003). The major differences of the approaches are outlined in Table 4.1.

*Table 4.1: Characteristics of Qualitative and Quantitative Paradigms*

| **Qualitative Paradigm** | **Quantitative Paradigm** |
|---|---|
| 1. Qualitative methods preferred, Phenomenological | 1. Quantitative methods preferred. Logical-positivistic |
| 2. Concerned with understanding human behavior from the actor's frame of reference. | 2. Seeks the facts or causes of social phenomena without advocating subjective interpretation. |
| 3. Phenomenological approach. | 3. Logical-positivistic approach. |
| 4. Uncontrolled, naturalistic measurement. | 4. Obtrusive, controlled measurement. |
| 5. Subjective; “insider” perspective; close to the data. | 5. Objective; “outsider” perspective; distanced from data. |
| 6. Grounded, discovery-oriented, exploratory, expansionist, descriptive, inductive. | 6. Ungrounded, verification-oriented, confirmatory, reductionist, inferential, hypothetic-deductive. |
| 7. Process-oriented. Holistic —attempts synthesize. | 7. Outcome-oriented. Particularistic —attempts analyze. |
| 8. Validity is critical; "real," "rich," and “deep”. | 8. Reliability is critical; “hard” and replicable data. |

*Note*. Source (*Deshpande*, 1983) Adapted from *Reichardt and Cook* (1979).

## 4.6 Issues Relevant to the Model Building

Chapter 3 discusses that the BI to use technology is considered the main dependant factor in the social psychology theories such as TRA, TPB, TAM, UTAUT and characteristics of DOI, in addition to external variables such as SN and PBC (Ajzen, 1991; Taylor and Todd, 1995). Therefore, this study adapts the adoption theories and external variables to build the research model. The study is conducted among the academic staff in the Jordanian public universities to identify the relations between their beliefs to use ICT in teaching and learning process. For this purpose, this study develops the research model based on the principals of the TPB (Ajzen, 1991), the DTPB (Taylor and Todd, 1995a), and combined with aspects of the DIO (Rogers, 1995).

Model Building

The review of the literature and academic resources such as books, journals, and conference papers as well as case of real world examples that are gathered through participants' observation was examined to support for the existence and proposed identified factors and associations. Any resource, which involves any of those factors directly or indirectly, is useful to reveal possible associations among them. Figure 4.1 presents the proposed model of the research which contains the main factors that could have affected the adoption and use of ICT in the educational system among academic staff in Jordanian higher education institutions.

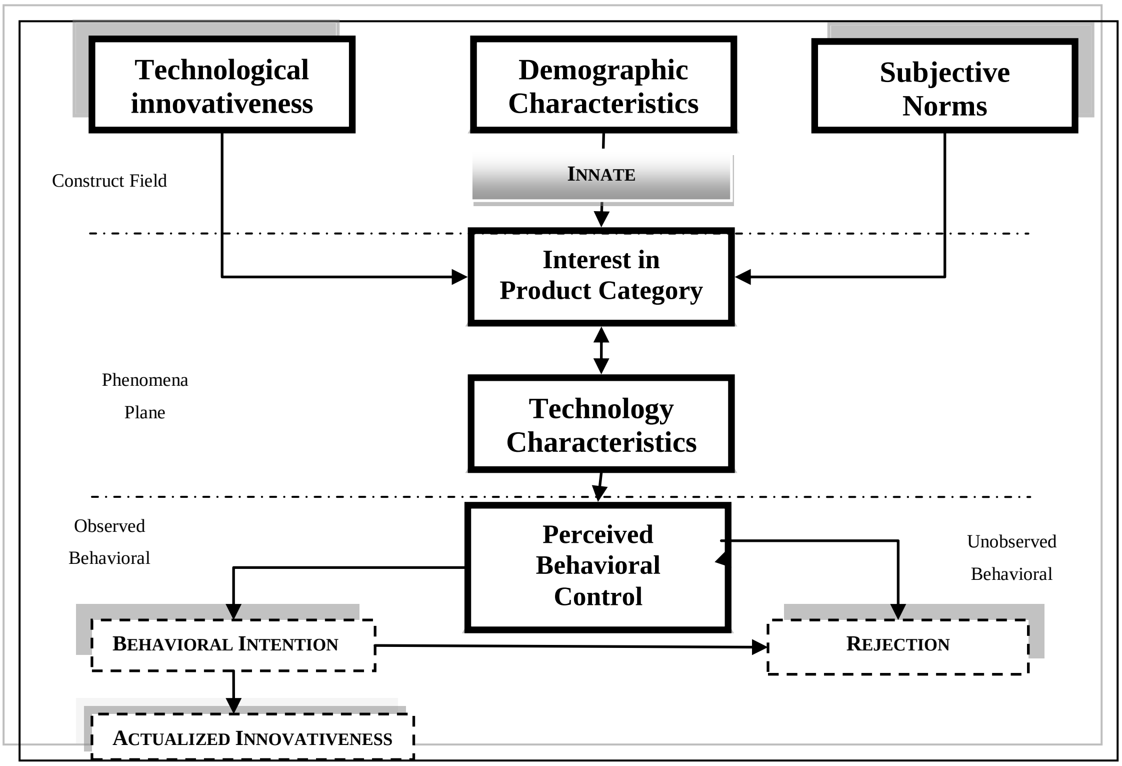



*Figure 4.1: ICT Adoption Model*

This is a theory-building investigation to explore the factors that are likely to influence the adoption and use of new technologies and services in educational sector among academicians. The proposed variables are useful in understanding the individual adoption behavior. Since the mid-1970s, a stream of research has led to the design of innovative scales through a structured validation process. Most of these scales which concern on the individuals such as early adopters, late adopters, and laggard are different in terms of their theoretical premise and internal structure. The resulting set of scales therefore lacks homogeneity between individuals.

Theoretically, the research model in Figure 4.1 is divided into three parts: the (i) construct field, (ii) phenomena plane, and (iii) (un)observed behavior. The construct field comprises of (a) demographic variables, (b) technological innovativeness, and (c) subjective norms. The phenomenon plane starts with an interest in the product category for instance ICT, which is bolstered or dampened by intervening variables pertaining to technology characteristics. All these lead to the next phenomenon by intervening and PBC including constraints and facilitators.

The model shows the importance and recognition of external situational factors commonly acknowledged in the literature as influencing factors such as PBC, which are missing from the general diffusion of innovation developed for innovations in general, discussed in Chapter 3. The research model proposes that these factors impact upon the individual's adoption in addition to demographic variables. The identification of technological innovativeness and technology characteristics as possible factors in explaining adoption is an important outcome of the exploratory study. Demographic characteristics comprise of traditional variables such as age, gender, educational degree achievements (PhD or Master) and the teaching experience; and some demographic variables found in the literature deemed to be appropriate for ICT-technology adoption, such as place of obtaining higher education.

Technological Innovativeness

Technology Innovativeness refers to "*People's propensity to embrace and use new technologies for accomplishing goals in home life and at work*" (Parasuraman, 2000). It revolves around four specific dimensions of perception and motivation. These includes two drivers: optimism and innovativeness, and two potential inhibitors: discomfort and insecurity (Parasuraman, 2000). According to Parasuraman (2000), optimism refers to a positive ATT, and a belief that it offers people increased control, flexibility and efficiency in their lives; Innovativeness is about a tendency to be a technology pioneer and thought leader; while Discomfort means a perceived lack of control over technology and a feeling of being overwhelmed by it. Finally Insecurity refers to a distrust of technology and skepticism about its ability to work properly.

On the other hand, demographic characteristics such as age, gender, education, and experience have received most attention in the previous literature of diffusion. Many empirical studies have found that the adopters of high technology in general and in education sectors in particular have higher levels of educational attainment, and are generally younger than non adopters. It plays an important role in determining how the ICT is used (Zmud, 1979). In an analysis of diffusion research, Rogers (1995) found that early adopters of a new product have higher socioeconomic status than later adopters. Status was typically indicated by variables such as education, the country of receiving higher education, and occupational prestige. As an example, respondents who obtain higher education from advanced western countries might have been exposed to technology earlier than those at home. This could have some positive impacts on their adoption decision.

### 4.7 Hypotheses Formulation

A hypothesis is one of the main components of a research, and is defined as "*an unproven proposition or supposition that tentatively explains certain facts or phenomena; a proposition that is empirically testable*" (Zikmund, 2003). Actually, the main goal of building the research hypotheses is to help the researcher to find and explain the relationship between existing factors that are proposed in the research model (Sekaran, 2003). In this study, hypotheses are intended to examine and measure the positive or negative relationship among factors that would determine the academic staffs' BI to use ICT in their teaching and learning process with specification of the significant influential factors were used in the research framework.

The null and alternative hypotheses techniques are considered the most suitable in this research because they clarify a precise relationship between two variables. The null hypothesis is defined as $H_0$ that is used to support a chance to nullify it (Zikmund, 2003). Additionally, Sekaran (2003) suggests that the null hypothesis $H_0$ considers no significant relationship between factors, while, the alternative hypothesis creates the relationship between factors. As a result, this research utilizes the alternative hypotheses design which is specified as $H_i$ where (i=1 to n) and examined by finding any significant relationship between dependent and independent variables or not. Figure 4.2 presents the research model in a hypothetical view of the study. This part of the study tries to explain the relationship between factors in the form of the alternative hypotheses.

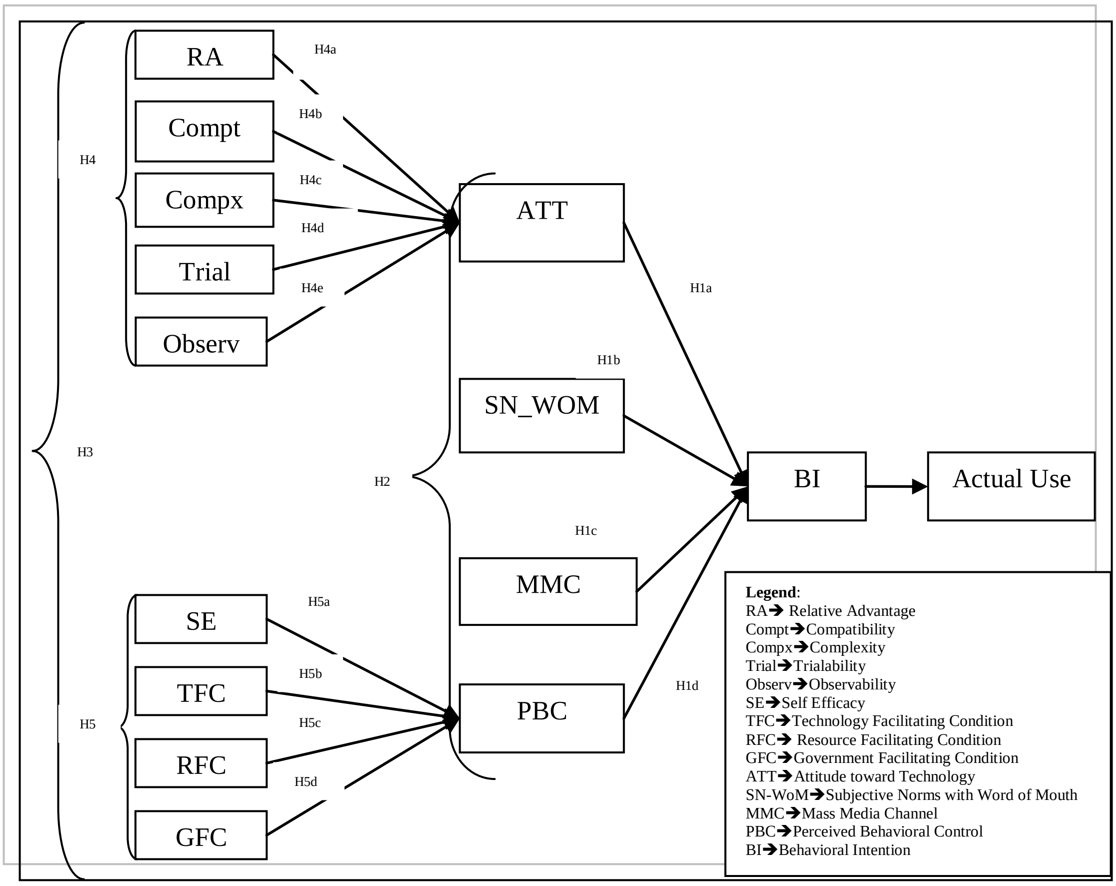



*Figure 4.2: Research Model (Hypothetical's View)*

Consequently, the suggested research framework and the alternative hypotheses have been designed based on the TPB, DTPB, and technology characteristics in the DOI, in addition to external factors from the previous works. In the past, TPB (Ajzen, 1991) and DTPB (Taylor and Todd, 1995) had proven the hypothesis on the relationship between ATT, SN, and PBC factors with the BI. On the other hand, Rogers (1995) proves that there is a relationship between technology characteristic and the adoption of technology.

### 4.7.1 Predicting Intention to Use ICT in the Educational System

As a rule of Ajzen's (1991) in TPB, "*the stronger the intention to engage in behavior, the more likely should be its performance*". Meanwhile, the TPB suggests that direct determinants could be used to predict the BI to use ICT in the educational system, which is consistent with Ajzen's proposition (1991) that states "*The more favorable the attitude and subjective norm with the respect to a behavior, and the greater the perceived behavioral control, the stronger should be an individual's intention to perform the behavioral under consideration*".

This study has utilized Ajzen's (1991) theoretical hypothesis in the context of using ICT in the educational system as follows;

Hypothesis H1: *There is a relationship between direct determinants (ATT, SN_WoM, MMC, and PBC) of academicians in Jordanian higher education institutions and the adoption of ICT in their teaching and learning process.*

Accordingly, four sub hypotheses have been derived from the above hypothesis as follow:

Hypothesis H1a: *There is a positive relationship between academic staffs' behavioral intention to use ICT in the teaching and learning system and their attitude to use it.*

Hypothesis H1b: *There is a positive relationship between academic staffs' behavioral intention to use ICT in the teaching and learning system and their subjective norm with personal communication channels to use it.*

Hypothesis H1c: *There is a positive relationship between academic staffs' behavioral intention to use ICT in the teaching and learning system and media channels to use it.*

Hypothesis H1d: *There is a positive relationship between academic staffs' behavioral intention to use ICT in the teaching and learning system and their perceived behavioral control to use it.*

Following Ajzen (1991), the direct factors of the proposed model (ATT, SN_WoM, MMC, and PBC) collectively can explain significantly the BI of the academic staff towards using the ICT services in their teaching and learning process.

Hypothesis H2: *The model direct factors (ATT, SN_WoM, MMC, and PBC) provide a significant model fit in explaining academic staffs' behavioral intention towards using ICT services in the educational system.*

### 4.7.2 The Role of the Beliefs in ICT Educational System Behavior

Ajzen's (1991) TPB postulates that behavior is

*"a function of salient information, or beliefs, relevant to the behavior ... these salient beliefs that are considered to be the prevailing determinants of a person's intentions and actions… behavioral beliefs which are assumed to influence attitudes toward the behavior, normative beliefs which constitute the underlying determinants of the subjective norms, and control beliefs which provide the basis for perceptions of the behavioral control".*

Based on the theory, the next research hypothesis is stated;

Hypothesis H3: *There is a relationship between salient beliefs, indirect determinants, as antecedents of the respective direct determinants of the TPB theory of academicians in Jordanian higher education institutions and the adoption of ICT in their teaching and learning process.*

Hypothesis H3 is answered by testing the following two hypotheses;

Hypothesis H4: *There is a relationship between Jordanian academic staffs' attitude towards technology and its antecedent factor, behavioral beliefs, comprising beliefs about perceived attributes to use ICT in the teaching and learning process.*

Hypothesis H5: *There is a relationship between Jordanian academic staffs' perceived behavioral control and its antecedent factor, control beliefs, comprising beliefs about facilitating factors and the use of ICT in the teaching and learning process.*

### 4.7.3 Behavioral Beliefs Antecedents and Attitudes towards Behavior

A sophisticated and elegant new technology may fail because no one is aware of it. An inferior new technology may achieve wide acceptance or at least usage if the users' incentives are structured appropriately. In some cases, new technology is accepted or resisted because of a positive or negative value along a single dimension. The differential rate of acceptance and adoption of various technologies can be explained by their characteristics as perceived by their potential users.

Accordingly, Ajzen (1991) points out that belief about an object can be formed by associating it with certain attributes. The attributes that come to be linked to the behavior in this study attempt to examine the adoption of ICT in the universities teaching and learning system. Hence, this study postulates some propositions that are relevant to employ Rogers' (1995) five perceived attributes of innovation that are considered as the direct antecedents of ATT. In this part the relevant hypotheses related to examining the ATT variable and its antecedents are developed from predetermined propositions in Rogers' characteristics of innovation. With respects to the ATT variable, this study expects that academicians' ATT would play a role in determining their BI to use them. With regards to Rogers (1995), this study argues that the greater the perceived relative advantage, compatibility, ease of use, trialability, and observability of using ICT in the educational system, the more likely that these ICT will be adopted. In this study, attention is paid to those proposition exist in Rogers' (1995) review, which are utilized and converted to hypotheses that are easy to test and fit the context of ICT in the educational system as follows;

Hypothesis H4: *There is a relationship between Jordanian academic staffs' attitude towards technology and its antecedent factor, behavioral beliefs, comprising beliefs about perceived attributes to use ICT in the teaching and learning process.*

The aforementioned research hypothesis H4 can be answered by testing the 5 sub hypotheses of H4; H4a to H4e;

Hypothesis H4a: *There is a positive relationship between perceived relative advantage of academic staff and their attitude toward using ICT in the teaching and learning system.*

Hypothesis H4b: *There is a positive relationship between perceived compatibility of academic staff and their attitude toward using ICT in the teaching and learning system.*

Hypothesis H4c: *There is a positive relationship between perceived complexity of academic staff and their attitude toward using ICT in the teaching and learning system.*

Hypothesis H4d: *There is a positive relationship between perceived trialability of academic staff and their attitude toward using ICT in the teaching and learning system.*

Hypothesis H4e: *There is a positive relationship between perceived observability of academic staff and their attitude toward using ICT in the teaching and learning system.*

### 4.7.4 Antecedents of Perceived Behavioral Control

PBC deals with a consumer's perception of whether a particular behavior is within their control which is affected by their beliefs regarding access to resources and opportunities and to self-confidence (Ajzen, 1991). As PBC is included as a component of the research framework, this factor carries out the control beliefs through four factors identified as the: (i) SE, (ii) TFC, (iii) RFC, and (iv) GFC.

Hypothesis H5: *There is a relationship between Jordanian academic staffs' perceived behavioral control and its antecedent factor, control beliefs, comprising beliefs about facilitating factors and the use of ICT in the teaching and learning process.*

The research hypothesis H5 can be answered by testing the four sub hypotheses H5a to H5d as follows;

Hypothesis H5a: *There is a positive relationship between the self-efficacy and the academic staffs' perceived behavioral control in using ICT in the teaching and learning system.*

Hypothesis H5b: *There is a positive relationship between the technology facilitating condition and the academic staffs' perceived behavioral control in using ICT in the teaching and learning system.*

Hypothesis H5c: *There is a positive relationship between the resource facilitating condition and the academic staffs' perceived behavioral control in using ICT in the teaching and learning system.*

Hypothesis H5d: *There is a positive relationship between the government facilitating condition and the academic staffs' perceived behavioral control in using ICT in the teaching and learning system.*

The dependent variable in this study is the BI to use technology. The literature shows that IS studies deliberated the intention variable as the main construct of the individual actual behavioral as supported from the theoretical foundations. Therefore, a significant relationship between BI and actual use of ICT in higher education institution among academic staff is expected. Particularly, the use of ICT in higher education institutions is still introductory, so, it is difficult to measure the actual use directly because the numbers of the potential adopters are still little.

## 4.8 Research Instrument Development and Constructs Operational Definition

This section will highlight the conceptual definitions of all constructs included in the proposed model. The model's major construct such as BI to use ICT, ATT, SN, and PBC are defined from a combination of such definitions allocated from the same constructs in the literatures. The previous studies have argued many conceptual definitions of the same variables. This study, however, has selected definitions that are most suitable and more appropriate to serve for a further understanding of the constructs. This section therefore will present the description and explanation of the research's constructs as it is very important for the success of the research.

In relation, Ajzen and Fishbein (1980) point out that once a researcher has decided on the behavioral of interested research, it is important to consider the action, the target at which the action is directed, the context in which it occurs, and the time at which it is performed. Consequently, in this study, the target is "*ICT in teaching and learning process*", the action is "*adoption and utilization of ICT*", the context is "*academicians in Jordanian public universities*", and the time is the "*time services are available*". In conjunction, the specific behavior in this study is, "*the academic staff in the Jordanian public universities*". This section is designed specifically to explain the development of the research constructs as well as their operational definitions. For example, issues on variables such as BI, technology characteristics or ATT, SN, and PBC highlighted.

### 4.8.1 Construct Name: Behavioral Intention (BI)

*Construct definition r*efers to "*a person's subjective probability that he will perform some behavior*" (Fishbein and Ajzen, 1975).

<u>Operational Definition of BI</u>

There is a variety of theoretical models deployed to present an understanding of the determinants of the technology usage. Taylor and Todd (1995a) recognize three collections of models; the first model was sought and designed to investigate the "constructs of intention", which employs intention-based models that use BI to predict the innovation usage. Studies of this type rely on models from social psychology such as TRA, TAM, TPB, and DTPB, which investigate attitude, social influences and behavioral control. The second collection of model investigate the "determinants of the adoption and usage" of information technology from the DOI perspective in which researchers examine factors such as the user's characteristics, the technology characteristics and external factor. The third model as presented by Taylor and Todd (1995a) are the decomposed TPB model which deploys constructs from the innovation characteristics literature, which in the SN and PBC dimensions are decomposed in specific belief dimensions.

There are some intention-based models, which were developed by well-established theories that consider BI to use innovation as the main dependent variable such as those presented by Ajzen and Fishbein (1980), Davis et al. (1989), Davis (1989), and Ajzen (1991). Besides, several other models of IS adoption have been developed to facilitate the understanding of the "intention" of technology. Studies such as by Liao, Shao, Wang, and Chen (1999), and Shih and Fang (2004) not only made use of BI to use the innovation but also have investigated the actual behavior and usage. This type of variable might have several operational measures but the researchers noted that Fishbein and Ajzen's (1972) means the best to describe the way researchers can operationalize "behavioral intention". They have highlighted that BI can be viewed as "*usually presenting the subject with a stimulus person or object and with one or more behaviors that could perform the behavior(s) on scales like would-would not, willing-unwilling, intend- not intend, and will try- will not try*". On the other hand, Agarwal and Prasad (1998) point out that adoption of new information technologies by their intended users is an important issue for researchers and practitioners of IS.

More recently, Kim and Malhotra (2005) suggest that an accurate prediction of system usage requires a more rigorous approach than that often applied in IS research. In addition, they argue that some intention's measures may be more effective than others in the prediction to use. In relation, Taylor and Todd (1995a) earlier indicated that the DTPB provides a full understanding of BI by focusing on the factors that are likely to influence the systems' use. On the other hand, an instrument to measure the BI to use the Internet was developed recently by Gardner and Amoroso (2004). They postulate a construct with five items. Besides, Agarwal and Prasad (1998) also developed a construct and validated in the context of the innovation represented by the World-Wide-Web in which two items were used;

firstly, "*I intend to increase my use of the WWW for work in the future" and secondly, "For future work I would use the WWW*".

Accordingly, this study decides to utilize the "*intention to adopt ICT in the teaching system*" as the core key dependent variable. Furthermore, the BI construct has been developed based on the previous research of IS. In conjunction, there are four useful notes that the study wants to list prior to commencing a discussion on the intention construct development as follows:

A) The timing of the behavior measurement in relation to the intention measurement is important (Szajna, 1996).

B) In technology acceptance, measuring the intention to use is quite different from the actual usage (Vijayan, Perumal, and Shanmugam, 2005).

C) Some of the TPB items on the intention's construct as recommended by Mathieson (1991) require an explicit behavioral alternative so that the basis for comparison is clear when the researcher intends to measure an individual's intention.

D) From the previous research, there is considerable evidence that intention to perform behavior predicts actual behavior (Mathieson, 1991; Pavlou, 2003).

Generally, user acceptance of an IS is measured in terms of whether people repeatedly decide to make frequent use of a system or not. In line with that the construct `intention to use' refers to the intention of the user to make use of the system in the future. Such researches placed more emphasis on the `intention to use' construct than on the `actual system use' factor. Most researchers in previous studies of IS adoption preferred to investigate adoption via the intention construct rather than the construct of actual use. Preferring the intention rather than actual use' is driven by two main factors. The first is that the "actual use" construct is not considered to be consistent as change might occur to any of the adoption's partners. The other factor concerns about the pre-implementation studies sought to explore determinants of adoption that reshape the BI.

Mathieson (1991) mentions that over time there will be change either in the systems or in the user's expectations or maybe in the environment. Thereupon, measuring user acceptance based on the "intention to use" before the system implementation is ready will be required especially when the system does not yet exist. In fact, Venkatesh and Davis (2000) found a strong connection between the constructs 'intention to use' and 'actual system usage'. The strong empirical basis for the connection between 'intention to use' and 'actual system usage' thus validates the current focus of attention in adoption research. Overall, variables of BI are used to describe the model constructs frequency of system use in the completion of specific tasks, intended future frequency of use of the ICT services in the educational system, and the future importance to use these services in the case of universities provision.

In this study, the respondent's BI to perform the focal behavior in the near future is measured through a construct consisting of four items. The developed construct uses a seven-point Likert scale. It is chosen as they are easy to administer and the respondents merely indicate their degree of agreement or disagreement (Malhotra, 2004). The study examines the BI to use educational technologies as a combination of respondents' planned utilization in the future (Gardner and Amoroso, 2004; Shih and Fang, 2004) and recommend it to others (Lai and Li, 2005). The study also uses the measures from Venkatesh and Davis (2000) to examine behavioral inclinations now; referred to as BI_Q3 and in the future referred to as BI_Q1.

The study modifies the selected items to suit the context of this study. For instance, the first item in this study for BI is adapted from the construct of Venkatesh and Davis (2000) and Pavlou (2003), which is "*Given the chance, I predict that I should use ICT in the teaching system in the future*". The second item for BI is adapted from Lai and Li (2005), which is "*I will strongly recommend others to use ICT in the teaching system*". Meanwhile, the third item for BI is adapted from Mathieson (1991) and Agarwal and Prasad (1999), which is "*My favorable intention would be to use technologies in the educational system rather than the traditional way in the teaching system*". While, the fourth item, which is adopted from Gardner and Amoroso (2004) and Shih and Fang (2004) is "*I plan to use ICT in the teaching and learning process*". All the measures are listed in Table 4.2.

*Table 4.2: Items Selected and Operationalized BI Construct*

| Q.No | Item (A 1-7 Likert scales Strongly disagree (1) and Strongly agree (7)) | Models References |
|---|---|---|
| (BI_Q1) | Given the chance, I predict that I would use ICT in the teaching system in the future. | Venkatesh, and Davis (2000) |
| (BI_Q2) | I will strongly recommend others to use I CT in the teaching system. | Lai and Li (2005) |
| (BI_Q3) | My favorable intention would be to use technologies in the educational system rather than my traditional way in the teaching system. | Mathieson (1991) |
| (BI_Q4) | I plan to use I CT in the teaching and learning system. | Shih and Fang (2004); Gardner and Amoroso (2004) |

### 4.8.2 Construct Name: Attitude toward Technology (ATT)

Construct definition refers to "*a person's perception or general feeling of favorableness or unfavorableness towards using technologies in the higher educational system*" (Ajzen and Fishbein, 1980; Rogers 1995; Tan and Todd, 2000).

<u>Operational Definition of Attitude</u>

Measuring an individual's attitude is a difficult task. In relation, Henerson, Morris, and Fitz-Gibbon (1987) argue that "*an attitude is not something this study can measure in the same way this study measure the rate of a person's heartbeat, this study can only infer that a person has attitudes by his/her words and actions*". Several studies have measured attitude and used a variety of measurement methodologies, and have observed a significant link between attitude and usage

(Davis et al., 1989). In this connection, this study is going to use different attitudinal dimensions concerning the academic staffs' relationship to measure ATT. Some of these attitudinal dimensions are directly linked to expected benefits; others result in the expected benefits. This study utilizes two constructs. One of the constructs is adapted as a direct measure of the respondent's ATT in the higher educational system, while, the second attitudinal construct predicts the indirect effect derived from the proposed theories' constructs.

I. Direct Measures of Academician's Attitude towards Educational Technologies

In order to understand the individual's attitude in detail, this study utilizes direct instruments that were proposed to measure the respondent's attitude towards the idea of using ICT in higher educational system, in which four items have been selected based on the guidelines from Taylor and Todd (1995a) and a sample of questionnaire from Ajzen and Fishbein (1980). A seven-point Likert scale is used ranging from (1) strongly disagree to (7) strongly agree. Table 4.3 lists the selected items suggested by the study to measure potential academicians' ATT services.

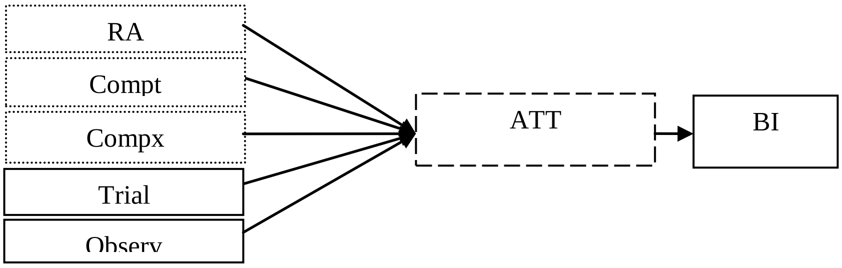
*Table 4.3: Items Selected and Operationalized Attitude Construct*

| Q.NO | Items | Model and References |
|---|---|---|
| ATT_Q1 | In my opinion, using ICT in the teaching system is a good idea. | Taylor and Todd (1995); Ajzen and Fishbeins (1980). |
| ATT_Q2 | I think it is a wise idea for me to use ICT in the teaching system. | |
| ATT_Q3 | I like the idea of using the ICT in the teaching system. | |
| ATT_Q4 | Using ICT in the teaching system would be a pleasant experience. | |

## II. Measures of Respondents' Attitude towards ICT Attributes

TAM posits that attitude towards an innovation is determined by two salient beliefs: PU of the innovation and PEOU. The former belief, PU, in the TAM is similar to Rogers' conceptualization of the relative advantage of an innovation: the extent to which the innovation offers better ways of performing a task than existing means of performance. Similarly, the former belief PEOU, in the TAM is similar to Rogers' conceptualization of the complexity of an innovation: the extent to which an innovation is perceived to be difficult to understand, learn, or operate (Rogers, 1983).

Besides, Ajzen (1991) suggest that attitude should be predicted from a person's leading beliefs; in which five attributes with their relevant items scale are adopted from Moore and Benbasat, (1991) among others, to measure the respondent's ATT in the educational system. In innovation diffusion theory, attitudinal beliefs come through the perceived attributes of an innovation (Rogers, 1995). This study attempts to explore the attitudinal effects based on the attitudinal beliefs. Therefore, this study integrates the individual's beliefs based on Rogers' (1995) innovation theory and the five attributes of the innovation to be used. In support of that, Figure 4.3 explains the sequence of the attitudinal path.




*Note.* ………TAM Behavioral Beliefs Determinants -------- DTPB Beliefs Determinants

*Figure 4.3: Attitudinal Path integrated TPB and DOI (*Mattila, *2003)*

In terms of attitudinal belief components for academician's adoption of ICT, this study suggests that a set of attitudinal belief dimension can be adapted from the literature describing the perceived characteristics of using an innovation (Rogers, 1995). The five dimensions of beliefs derived from Rogers' (1995) innovation characteristics are relative advantage, compatibility, complexity, trialability and observability, which are defined in Table 4.4.

*Table 4.4: Conceptual Definition of the Attributes of Attitude*

| **Attributes** | **Definition** | **References** |
|---|---|---|
| Relative advantage | The degree to which an innovation is subjectively perceived as better than its alternatives methods available. | Rogers (1995) |
| Compatibility | The degree to which an innovation is perceived as being consistent with the existing values, past experiences and the needs of potential adopters. | Rogers (1995) |
| Complexity | The degree to which an innovation is perceived as difficult to understand and use. | Kautz and Larsen (2000) |
| Trialability | The extent to which users would like an opportunity to experiment with an innovation prior to committing to its usage. | Brown, Hoppe, Mugera, Newman, and Stander (2004) |
| Observability | Refers to the degree to which the results of innovation are visible to others and the extent to which users would like an opportunity to observe others with innovation prior to committing to its usage. | Rogers (1995) |

On the other hand, Taylor and Todd (1995b) point out that the first three main characteristics of an innovation as well as in a Meta analysis by Tornatzky and Klein (1982) are consistently related to adoption decisions because they influence attitude formation during the persuasion stage of the adoption decision process (Rogers, 1983). On the other hand, in a cross-sectional comparison of pre- and post-adoption of technologirs use, Karahanna et al. (1999) found that behavioral beliefs of PU are the only belief underlying attitude for both potential users and users; while visibility, demonstrability, ease of use and trialability are significant for potential adopters. The innovation diffusion literature provides these sets of innovation characteristics, in which according to Karahanna et al. (1999), may affect an individual's opinion on the innovation prior to adoption and may affect the rate at which innovations are adopted. Also, these attributes provide a theoretically based set of behavioral beliefs, which the items are listed in Table 4.5.

*Table 4.5: Items developed to measure Behavioral Beliefs*

| Item \ Factor | Reference |
|---|---|
| **Relative Advantage** | |
| RA_Q1: If I were to use ICT in the teaching system, it would enable me to accomplish my tasks more quickly<br>RA_Q2: If I were to use ICT in the teaching system, the quality of my work would improve<br>RA_Q3: If I were to use ICT in the teaching system, it would enhance my effectiveness on my job<br>RA_Q4: If I were to use ICT in the teaching system, it would make my job easier<br>RA_Q5: Using ICT in the teaching system gives me greater control over my work | (Moore and Benbasat, 1991; Karahanna et al., 1999) |
| **Compatibility**<br>COMPT_Q1: If I were to use ICT in the teaching system, it would be compatible with most aspects of my work<br>COMPT_Q2: If I were to use ICT in the teaching system, it would fit my work style<br>COMPT_Q3: If I were to use ICT in the teaching system, it would fit well with the way I like to work | (Moore and Benbasat, 1991; Karahanna et al., 1999; Tan and Teo, 2000) |
| **Complexity** | |
| COMPX_Q1: Training and learning to using ICT in the teaching system would be easy for me<br>COMPX_Q2: Overall, If I were to use ICT in the teaching system, it would be easy to use<br>COMPX_Q3: It would be easy for me to become skilful at using ICT in the teaching system<br>COMPX_Q4: Using ICT in the teaching system requires a lot of mental effort | (Moore and Benbasat, 1991; Karahanna et al., 1999; Tan and Teo, 2000) |
| **Trialability**<br>TRIAL_Q1: Before deciding on whether or not to use ICT in the teaching system, I want to be able to use it on a trial basis<br>TRIAL_Q2: Before deciding on whether or not to use ICT in the teaching system, I want to be able to properly try it out<br>TRIAL_Q3: I want to be permitted to use ICT in the teaching system, on a trial basis long enough to see what it can do | (Moore and Benbasat, 1991; Karahanna et al., 1999; Tan and Teo, 2000; Brown et al., 2004) |
| **Observability** | |
| OBSERV_Q1: I will use ICT in the teaching system when it is used by many<br>OBSERV_Q2: I will use ICT in the teaching system when I have seen others using it<br>OBSERV_Q3: I will use ICT in the teaching system as soon as I get to know about it<br>OBSERV_Q4: I will use ICT in the teaching system if it becomes popular<br>OBSERV_Q5: I will wait until other academicians start to use it<br>OBSERV_Q6: I will use ICT in the teaching system when other academicians have successful experience of using it<br>OBSERV_Q7: If the using ICT in the teaching system is unknown to me, I will not use it | (Karahanna et al., 1999) |

This study focuses on the intention of the academic staff who may be the non-users of ICT in their teaching and learning process. Hence, visibility or observability might not be readily applied to the context of this study, since it requires familiarity and prior interaction. In this case, the target beliefs that are considered as individuals' perceptions of the observability construct either on their visibility expectation or on the nature of the benefit that respondents expect from university service as a whole. The study believes that Rogers' construct on observability is still needed here because observability may be regarded by potential users who are not currently educational technologies users as an important factor, which drives them to have more intention to adopt ICT services. Also, it could be a requirement by a group of respondents among non-internet users. Accordingly, this study anticipates that availability and possibility of observing innovation might have an influence on the attitude towards the adoption.

### 4.8.3 Construct Name: Subjective Norms (SN)

Construct definition refers to "*a person's perception that most referents who are important to them desire the performance or non-performance of using ICT in the teaching system and their motivation to comply with the views and wishes of referents*" (Warshaw, 1980; Ajzen and Fishbein, 1980).

Operational Definition of Subjective Norm Measure

As discussed in the framework, to measure the SN influence within the three constructs, respondents will be asked to indicate their normative beliefs for each referent. The normative influence, according to Bearden et al. (1986), occurs when individuals conform to the expectations of others. They also pointed out that normative social influence might also occur if the individual is motivated to realize a reward or avoid a punishment. Compliance in this situation would occur if the individual believes the behavior is visible or known to others. Similarly, the informational-based normative influence, according to Rogers (1995), occurs when potential adopters are aware of an innovation and are motivated to try it. Empirically, in this study, normative beliefs are determined by indicating "*the extent to which a referent would expect a potential adopter to adopt educational technologies*".

SN has become the alternative for measuring social influence but this has not resulted in a consistently significant measure of social influence. It is usually measured by identifying the degree to which "referents" think that the academic staff in the universities should or should not perform the behavior (Ajzen and Fishbein, 1980). In particular, referents in the context of this study could be any people or any mass media that are important to the respondent. Thereupon, SN is predicted by normative beliefs about whether significant 'referents' proposed in this study for instance peer, family, opinion leader, or mass media would approve the respondent's use of ICT in question, weighted by the respondent's motivation to meet the behavior in a manner which would meet each referent's approval. In this connection, this study attempts to examine the direct and indirect influences of SN in predicting BI of academicians towards the use of ICT.

I. Direct SN Operational Definition

In general, the operational definition of SN is addressed by four selected items borrowed from Taylor and Todd (1995b), which are very widely used in the studies of IS. Using these items as found in Table 4.6, the study attempts to find out the nature of the relationship between SN and the BI of potential adopters; that is the academic staff in Jordanian public universities.

*Table 4.6: Items Developed to Measure SN*

| Items | References |
|---|---|
| SN_Q1: Most people who are important to me would think that I should use ICT in the educational system. | Taylor and Todd (1995b) |
| SN_Q2: The people who influence my decisions would think that I should use ICT in the educational system | |
| SN_Q3: Most people who are important to me would think that I should try out the technologies in the educational system. | |
| SN_Q4: The people who influence my decisions would think that I should try out the technologies in the educational system. | |

II. Operationalizing the Normative Belief Measure

The normative belief in this study will be operationalized based on two different categories of referents. These two referents are personal and mass media. The two types use different channels to communicate with respondents. Regardless of the amount of the influences or how fast each category's influence reaches the respondent, this study seeks to investigate which one may have a significant influence on the potential adopter of educational technologies in the public universities in Jordan. In conjunction, this study develops two variables underlying the SN construct (indicators), which are proposed to play a role in determining the normative belief of the respondents. These two indicators are; personal and mass media (interpersonal influence, external influencer). As defined in the following:

(1) Operational Personal Referents Measure

Construct definition identifies to what extent personal communications are perceived as an important factor in influencing the adoption of ICT services (Rogers, 1995). The personal channel influence is expanded from the "peers influence" scale of Taylor and Todd (1995b). Personal referents are divided into groups, which are peers, colleagues, friends, family, and opinion leaders, in which the items are listed in Table 4.7.

*Table 4.7: Items Developed to Measure Personal Referents (word-of-mouth)*

| Items | Reference |
|---|---|
| WoM_Q1: My Referent (peers/colleagues/friends/family) would think that I should use ICT in the educational system. | Taylor and Todd (1995b) |
| WoM_Q2: My Referent (peers/colleagues/friends/family) would think that I should try out ICT in the educational system. | |
| WoM_Q3: Generally speaking, I want to do what my referent thinks I should do | |
| WoM_Q4: My opinion leaders would think that I should use ICT in the educational system. | |
| WoM_Q5: My opinion leaders would think that I should try out ICT in the educational system. | |
| WoM_Q6: Generally speaking, I want to do what my opinion leaders think I should do | |

(2) Operational Mass Media Measure

Construct definition identifies to what extent mass media communications are perceived an important factor in influencing the adoption of ICT services (Rogers, 1995). Mass Media is the other type of referent in the social system. The mass media referent is used in this study to operationalize to what extent the mass media exert an effect on the potential adopters of educational technologies. This latent variable is operationalized through selected items, which are adapted from Pedersen (2005) and Battacherjee (2000) as listed in Table 4.8.

*Table 4.8: Items Developed to Measure Mass Media Referents*

| Item | Reference |
|---|---|
| MMC_Q1: The media are full of reports, articles and news suggesting that using ICT in the educational system is a good idea | Pedersen (2005) |
| MMC_Q2: The media and advertising consistently recommend using ICT in the educational system. | |
| MMC_Q3: In my profession, it is advisable to use ICT in the educational system. | |
| MMC_Q4: I read/saw news reports that using ICT in the educational system was a good way of managing the teaching and learning process. | Battacherjee (2000) |
| MMC_Q5: I want to do what the media and profession think I should do. | Pedersen (2005) |

### 4.8.4 Construct Name: Perceived Behavioral Control (PBC)

Construct definition refers to "a *person's perception of the ease or difficulty of performing ICT, as well as the beliefs about having the necessary resources and opportunities to adopt educational technologies*" (Ajzen, 1991; Pavlou, 2002).

Operational Perceived Behavior Control (PBC) Measure

This section discusses the development of the instrument that will be utilized to measure PBC and PBC beliefs. Theoretically, Taylor and Todd (1995a) propose that PBC is "*the sum of the control beliefs (cbk) weighted by the perceived facilitation (pfk) of the control belief in either inhibiting or facilitating the behavior*". Further, a control belief, according to Mathieson (1991) is an individual's perception of the availability of skills, resources, and opportunities while perceived facilitation is "the *individual's assessment of the importance of those resources to the achievement of the outcome*". The proposed PBC equation is:

$$PBC = \sum_{i=1}^{ni} cbk\ pfk$$

(*Taylor and Todd*, 1995a; *Mathieson*, 1991)

In general, Mathieson (1991) point out that the weights of evaluation of desirable outcome (ei), motivation to comply (mc), and perceived facilitation (pfk) can be done using two approaches. First, is direct assessment by which the individual can be asked to specify them using a Likert-scale, while the second approach is indirect assessment by which the weights can be estimated as coefficients in regression equations.

Measuring the PBC construct and its relevant control beliefs constructs in this study are based on combinations of several items adapted from the theory of TPB and DTPB. This study explains the PBC measurement items first, then it moves on to identify those items, which operationalize the other PBC belief components of SE and FC.

I. Direct Measure of PBC

Five items are selected to operationalize the PBC constructs, which are adapted from Taylor and Todd (1995a). The third item in Taylor and Todd (1995a) lends itself to different possible answers to its subparts (double-barreled question). Therefore, according to Sekaran (2003) the study needs to separate the PBC question 3 subparts into three specific questions to avoid respondent bias. In accordance, Table 4.9 lists the items selected to measure PBC.

*Table 4.9: Items Developed to Measure PBC*

| Items to Operationalize PBC | Reference |
|---|---|
| PBC_Q1: I would be able to use ICT in the educational system. | Taylor and Todd (1995a) |
| PBC_Q2: I have the resources necessary to make use of ICT in the educational system. | |
| PBC_Q3: I have the knowledge necessary to make use of ICT in the educational system. | |
| PBC_Q4: I have the ability to make use of ICT in the educational system. | |
| PBC_Q5: Using ICT in the educational system would be entirely within my control. | |

II. Indirect Measure of PBC

The indirect measure of the PBC construct depends on four control belief dimensions that are suggested by Taylor and Todd (1995a) and Tan and Teo (2000). These are (a) SE, (b) TFC, (c) RFC, and (d) GFC. The following sections explain each component in detail.

(a) Self-Efficacy (SE)

Construct Definition: A potential adopter's judgments of their own capabilities to use ICT and innovation (Compeau and Higgins, 1995). Gist and Mitchell (1992) point out that the traditional measurement of SE uses a nominal scale (yes or no). In this scale, an individual’s sum of positive responses is the magnitude of SE, while on some occasions, Likert-type scales have been used, which simply ask how well the person thinks he or she can do on the task, and then carry out the statistical correlation between scale score and performance. In relation, Igbaria and Iivari (1995) reported that SE has both direct and indirect effects on usage, demonstrating its importance in the decision to use computer technology.

Besides, there are some helpful SE models available in guiding the researcher to identify the SE attributes of the current study. For example, the proposed model by Lopez and Manson (1997) depicts that computer self-efficacy (CSE) is a function of the two determinants of social pressure and organizational support. Another model proposed by Igbaria and Iivari (1995) views the CSE as a function that can be predicted by the two variables namely "computer experience" as well as "organizational support". Besides, Compeau and Higgins' (1995) model identifies two new constructs; "encouragement by others" and "others use" in addition to "support" which is demonstrated to have an influence on the CSE. With regards to this, the SE constructs in this study are measured using six items on a 7-point Likert scale. Three items are adapted from Igbaria and Iivari (1995) and Hill, Smith, and Mann (1987) by which, individuals are asked to indicate the extent of their disagreement or agreement with the two statements on a 7-point scale. The scales ranges from (1) strongly disagree to (7) strongly agree. The other three items are adapted from Lassar, Manolis, and Lassar (2005). Computer experience, according to Igbaria and Iivari (1995) has a strong positive direct effect on SE. The SE decomposed belief items are presented in Table 4.10.

*Table 4.10: Items Developed to Measure Self-Efficacy Decomposed Belief*

| **Items to Operationalize SE** |
|---|
| SE_Q1: I Would feel comfortable using ICT in the educational system on my own |
| SE_Q2: For me, feeling comfortable using ICT in the educational system on my own is important |
| SE_Q3: If I wanted to, I could easily operate (application/software) for using it in the teaching system from the university (portal, website) on my own. |
| SE_Q4: For me, being able to use the (application/software) for teaching system from the university (portal /website) on my own is important. |
| SE_Q5: I would be able to use the (application/software) for educational system even if there was no one around to show me how to use it. |
| SE_Q6: For me, being able to use the (application/software) for teaching system even if there is no one around to show me how to use it is important. |

With respect to the salient belief of the SE construct, this study will adapt it from Taylor and Todd (1995a) and the items selected are rephrased to suit the study context. Decomposing the belief of SE structures, according to Taylor and Todd (1995a), somewhat increases the explanatory power of the model for BI. Furthermore, the DTPB model suggests specific beliefs that can be targeted by a designer or manager interested in influencing system usage.

(b) Technology Facilitating Conditions (TFC)

Construct definition refers to "*users' perceptions of the necessary technology support and assisting them when they encounter difficulties, also enabling easy accessibility to the Internet, hardware, software, and network connections for educational technologies services*" (Thompson, Higgins, and Howell, 1991; Tan and Teo, 2000).

One of PBC components is the belief in the TFC. This variable is operationalized by asking respondents questions to account for technological situations in which an individual lacks substantial control over the targeted behavior (Ajzen, 1991). The construct has eight items, which ask respondents about technology control and their perceptions of the importance of this technology to be facilitative and maintained. Five items are adapted from Taylor and Todd (1995a), Tan and Teo (2000), Shih and Fang (2004) and Brown et al. (2004) as composed in Table 4.11.

*Table 4.11: Items Developed to Measure Technology Facilitating Conditions*

| Q_NO | Item statement | References |
|---|---|---|
| TFC_Q1 | I have the computer, Internet access and applications which I need to use it in using ICT in the educational system | Taylor and Todd (1995a); Shih and Fang (2004) |
| TFC_Q2 | For me, availability of the computer, Internet access and applications to use ICT in the educational system is important. | Taylor and Todd (1995a); Shih and Fang (2004) |
| TFC_Q3 | Educational technology application "software" might not be compatible with the current style of my work. | Taylor and Todd (1995a) |
| TFC_Q4 | For me, the application (software) which are using in the educational system is important to be compatible with the current work style. | Taylor and Todd (1995a) |
| TFC_Q5 | I am concerned about the application (software) security which are used in the educational system | Tan and Teo (2000); Brown et al. (2004) |
| TFC_Q6 | For me, advances in Internet security, which provide a safer of using ICT in the educational system are important | Tan and Teo (2000); Brown et al. (2004) |
| TFC_Q7 | A reliable Internet connection is available when I want to use ICT in the educational system. | Sciglimpaglia and Ely (2002) |
| TFC_Q8 | For me, reliability of Internet connection services is very important to use ICT in the educational system. | Sciglimpaglia and Ely (2002) |

(c) Development of Facilitating Resources Measure

Construct Definition refers to "*an individual's perceptions of their ability to gain access to resources and opportunities required to facilitate innovation adoption behavior*" (Ajzen, 1991). The belief construct of facilitating resources is operationalized by asking the respondents six questions. All the six control beliefs and their perceived facilitating questions are adapted from Taylor and Todd (1995a, b) and are exhibited in Table 4.12.

*Table 4.12: Items Developed to Measure Facilitating Resources*

| Q.No | Item |
|---|---|
| RFC_Q1 | There will not be enough computers and other ICT tools to use it in the educational system. |
| RFC_Q2 | For me, having computers and ICT tools is important |
| RFC_Q3 | No good infrastructure and network to use ICT in the educational system |
| RFC_Q4 | For me, the good infrastructure which facilitate to use ICT in the educational system is very important |
| RFC_Q5 | There is a lack of the training courses to using ICT in the educational system |
| RFC_Q6 | For me, the training courses is very important to use ICT in the educational system |

(d) Government Facilitating Condition (GFC)

Construct definition refers to "*users' perceptions of government support for a new innovation*". This study believes that investigating the effect of the government support will not be fruitless. An instrument with six items (as found in Table 4:13) is adapted from Tan and Teo (2000) to measure the respondents' control beliefs as well as the respondents' perceptions of government support.

*Table 4.13: Items Developed to Measure Government Support*

| Q.NO | Items | Reference |
|---|---|---|
| GFC_Q1 | The government gives support for using ICT in the educational system | Tan and Teo, (2000) |
| GFC_Q2 | For me, government support for using ICT in the educational system is very important | |
| GFC_Q3 | The Jordanian government endorses using ICT in the educational system. | |
| GFC_Q4 | For me, the government endorsing educational technologies is important to use ICT in the educational system. | |
| GFC_Q5 | The government promotes the use of ICT in the educational system. | |
| GFC_Q6 | For me, the government promotes of using ICT in the educational system is important. | |

## 4.9 Research Methods

A research is defined as a way that people carry out an investigation in order to fulfil their needs, like solving existing problems, assessing and discovering new strategies, and producing new products or services and other things that people seek about it (Saunders et al., 2003). This section explains the research method applied to conduct the study including the approach used for data collection, data analysis, and other related techniques used.

### 4.9.1 Quantitative Methodology

This section outlines and justifies the quantitative methodology selection as a suitable method to collect data to solve the research problems and answer the research questions. Generally, a research methodology contains tactical decisions about the selection of data collection technique, and also more planned decisions about level of the measurement and processes, populations, samples, and analysis of the data (Zikmund, 2003; Aaker et al., 2001).

Vidich and Lyman (1994) argue that a quantitative researcher requests reasons and realities from the foreigners' view and/or worldview perspective. Also, the results are depending on the researcher’s explanations of study circumstances and the relationship between the dependent and independent variables (Morse and Field, 1995), and the relationship between the factors used in the research model are the main issue (Lincoln and Kalleberg, 1990). This shows that the quantitative technique is helpful in providing a comprehensive strategic planning prior to the gathering and analysis of data, because it offers an instrument for measuring the factors, planning design phases, and for concerning of the measuring sampling matters (Neuman, 2003; Zikmund, 2003). Additionally, Guba and Lincoln (1994) found that the quantitative approach is an influential method to measure the research problem, validity and reliability. Therefore, this technique is suitable to raise the quality of the research results.

The post-positivism paradigm which is explained previously highlights on the "impartiality" of the researcher, even as admitting of the probability bias. However, a quantitative technique exploits statistical measures and organizes procedures that reduce the bias level and examines the factors in the good way (Emory and Cooper, 1991). In conjunction, the quantitative phase in this study refers to a large-scale survey of a statistically representatives of a random sample of the academic staff in Jordanian public universities. This sample is based on the population of the study which contains all academic staff in Jordanian public universities.

### 4.9.2 Likert's Scale

A Likert scale is a measuring instrument use in the field of social science, which is presented by Rensis Likert, the first person who used it. It is considered as a psychometric scale usually used in questionnaires, and is the most largely used in survey research (Likert, 1932). Statistically, this scale can be defined as a method of describing quantitative data to qualitative data, to become as amenable data easy to statistical analysis. A numerical value is assigned to each possible choice and a mean figure for all the responses is computed at the end of the survey.

Generally, in the IS field, most empirical studies depend on questionnaires in their data collection process with the supplement of interviews to create full image for the research requirements and examine the relationships between the factors that are presented by a primary model. In the context of this study, questionnaires are employed as an influential tool for the collection of data from the public universities' lecturers. The questionnaire uses a 7-point Likert scales ranging from total agreement to total disagreement.

### 4.9.3 Building and Design the Questionnaire

A survey method is selected in this study for two reasons; (i) survey method is suitable because respondents might not be simply allocated to manage and measuring group on a preceding collection basis, and (ii) Secondly, it is also appropriate because the proposed significant factors such as ATT, SN, and PBC are considered complicated for the study to measure using other methods (Emory and Cooper, 1991). Furthermore, Hakansson and Snehota (1997) suggest that a survey method is the key to begin informant reports. Therefore, a survey method is a suitable technique to examine the hypotheses and measure the factors.

Additionally, Neuman (2003) disputes that survey method is the most valuable in generating information from the data collection methods that essentially depends on statistical issues. Besides, surveys are generally deliberate carefully with the objective of measuring knowledge, awareness, behavior, and beliefs (Zikmund, 2003). As a result, surveys are appropriate to achieve the research objectives and answer the research questions which are concerning of the individuals beliefs and behaviors (Nueman, 2003). Therefore, in this study, survey method is suitable to examine the hypotheses and measure the factors.

A questionnaire is considered the main method of data collection in this study. In the first stage, during the preliminary study, personal interviews were conducted to gather some basic information as a basis to help design the questionnaire. The questionnaire technique was selected in this study for two major reasons. The first reason is due to insufficient study being conducted so far to examine the selected factors that might influence the adoption and acceptance of technologies among the academicians in the higher education institutions in Jordan. Thus, this study applied a questionnaire as an influential and efficient method for covering the population of the research that contains the academic staff in Jordanian universities. The Second reason is related to the perceptions of the academics about the technologies used in the education process among their attitudes and beliefs about these useful technologies. This is including their perceptions of the advantages of using these services of technologies such as the educational process become more useful and easier.

The medium used in the survey is English and Arabic. Although, the official language in Jordan is Arabic, and the majority of Jordanian people converse in Arabic, the teaching and learning process in the academic institutions is mostly English especially for Medical, geometrician and engineering, scientific, and many of philanthropy and humanities specifications. Based on this situation, both the pilot study and the main study were designed in both Arabic and English language. Two copies of the questionnaire were distributed to the participants, in which one copy is in Arabic language and the other in English (Appendices II, III).

The respondents selected their favorite language and answered. However, the pre-test questionnaire was sent to experts to make sure the two versions of the questionnaire are coordinated as closely as possible. The English version was translated into Arabic by a bilingual expert, and then translated back to English by a different bilingual expert. After that, the two versions of the questionnaires were presented on third bilingual expert for comparison and solve any differences. On the other hand, Dillman (1978) built up a set of questionnaire procedures that suggests the possibility to attain higher response rates from the respondents. Commonly, these procedures which are called as Dillman (1978) "Total Design Method (TDM)" consist of two parts:

1- Recognizing and designing each part of the questionnaire method that may influence the respondents in a way that increases the response rates.

2- Arranging the questionnaire effort in a way that guarantees all required data are obtained.

Sets of Questionnaire

The questionnaire in this study comprises six necessary areas:

Part 1: A set of questions related to demographic factors including the respondents' gender, age, higher education degree, place of obtaining the degree, major, and experience in the educational system. There are six questions in this part.

Part 2: A set of questions about the universal traits of participants and their readiness to use the technologies. This part contains questions such as using and frequency of use of the common technologies and services such as computers, Internet, mobile phones, and PDA. Also, the part contains questions about using some of the educational technologies such as Computer-Based Learning, Web-Based Learning (WebCT), and Mobile-Based learning. In addition, the part contains questions such as the preferences to use educational technologies among respondents and if they prefer to use and recommend others to use it in the near future. The last question of this part asks about the reasons that the respondents do not use the educational technologies. Altogether, this part is composed of eight questions.

Part 3: To measure the participant's ATT and their BI to use educational technologies.

Part 4: To measure the technology characteristics of the respondents to use ICT in the teaching and learning process. Also, it contains questions to measure factors such as relative advantage, compatibility, complexity, trialability and observability.

Part 5: To measure the SN and social influences on the individual to use new educational technologies.

Part 6: The final part of the questionnaire concerns on the participant control belief and measures the behavioral control. This part which contains 29 questions measures the factors such as SE and FC.

The survey questions and statements are constructed and selected based on the previous studies in the adoption of ICT fields. In fact, the construction of the questions and statements are done by validating items from the previous studies and depend on the applicability of the items to conform the current study's context. In addition, a 7-point Likert scale is used to all questions and statement to guarantee the statistical variability through the responses of the questionnaires.

On top of that, qualitative interviews were conducted with academicians who are professional in the study field, to ensure that the questionnaire covers all the circumstances and questions constructed and their sequence are suitable for the objectives of the study. In addition, an interview with an expert of statistical measurement to guarantee that the measurement scales is adjusted and expanded suitably to the current context. However, since the study is considered novel in

Jordan and the Arab world which share the same culture, so up to the researcher's knowledge, there is no empirical studies and measurement available about the academicians profile in using ICT among teaching system. Therefore, the questionnaire design was evaluated by ten professional academic staff with worthy of consideration on the changes they want to modify it.

### 4.10 Population and Sample of the Study

The process of selecting sufficient number of respondents to answer the survey question was an early challenge for this study as it is costly. However, Sekaran (2003) states "*study of a sample rather than the entire population is also sometimes likely to produce more reliable results*".

#### 4.10.1 Population of the Study

The target population of this research consists of all academicians who are working in public universities in Jordan. The statistical number of this population according to MoHESR (2010) is 5308 at the end of 2010 academic year (Appendix E). Although the high percentage of them is Jordanian, there are academicians who come from several Arab countries and other foreigners. Therefore, the participants of the research may include local and foreign academic staff. This means, the variation of the respondents between locally (Jordanian), Arabic, and foreigner will make the results more significant and lead to more reliable.

### 4.10.2 Sample of the Study

The sample of the study is considered as one of the most influential aspects to the research success. This research has selected the sample of the study randomly, which means, every academic staff in all public universities (population) has the same chance to be selected as the sample. In order to obtain a sample that is representative, a list of all registered academic staff was gathered from the MoHESR. The list was subjected to crosschecking for duplication and double counting and then the application of a systematic probability sampling technique ($N^{th}$ random sampling) which involves drawing every $n^{th}$ element in the population starting with a randomly selected element between 1 and n based on a computer program particularly designed and developed for the purpose of the study. Consequently, the number of the sample in this research depends on the number of the population. Zikmund (2003) outlines that the convenience sample according to population are considered as significant issue to the research. The prior studies argued that when the population size is 10,000 and more, the sample would be between 200 and 1000 participants. Besides, Sekaran (2003) presents a table contains the sample size for a given population of size from 10 to 1000000. According to the table, if the population size is 5000 then the sample size must be more than 357. While, if the population size is 6000 then the sample size must be more than 361. With regards to the guidelines by Sekaran (2003) the population size of this study which is 5308 academicians, the representative sample size must be between 200 and 1000 (Zikmund, 2003), and between 357 and 361 (Sekaran, 2003). Hence, this study distributed 500 questionnaires to ensure the reliability and validity of the results.

### 4.10.3 The Pilot Study

A pilot study is a small scale of preliminary study which is carried out before the main study in order to verify the validity of the study and to improve the design of the data collection methods. Also, it is to attempt averting the mistakes in the main study and to save money and time for the research. Generally, a pilot study is carried out with among participants from the population of the study. These participants, however, should not be involved again in the main study, because their behavior may be influenced if they are to be involved in another time in the main study.

The validity of the content of the questionnaires is considered among the exact selection and adjustment of the items which are proven from the previous validated studies. Therefore, the questionnaire was piloted among ten academic staff from Jordanian Universities, and ten PhD candidates from the Arab countries in a public university in Malaysia. The comments and suggestions which were returned from the pre-test phase were considered useful and were taken into considerations for correcting the questionnaire. On the other hand, the questionnaire was also sent via email to Jordanian experts in the IS field and their useful comments were taken into consideration. Besides, the study also explores the factors which are included in the proposed model (Figure 4.2) through observations, experience, and relationships with other experts in the higher education institutions situation.

In short, the questionnaire was pre-tested in a pilot study phase in which the sample were Jordanian participants, including Jordanian students studying overseas. The participants were asked to complete the initial questionnaire and offer their suggestions and comments about the instrument on the basis of several criteria such as effort required, clarity of instructions, and ambiguity of the terms used. Following the pre-test, suggestions and comments were considered in making slight adjustments in the questionnaire. For example, one of the scales used was initially designed with a six-point scale. The scale ranged from “strongly disagree” to “strongly agree”, with “agree”, “slightly agree”, “slightly disagree”, and “neither” as midpoints. Several participants felt that the “slightly disagree” and “strongly disagree” scales were not suitable and too unclear for them; others commented that the scales did not reflect any important change in the order of the scale. Accordingly, the scales were modified to seven point scales. Besides, the 22 composite variables developed earlier were reduced to 15, which were operationalized by 76 statements.

## 4.11 Analysis Technique

The analysis used in this thesis is divided into two parts. The first part of the analysis attempts to assess the reliability and validity of the measures while the second part addresses the study's descriptive and statistical analysis. The first part was achieved in a three-stage analysis. The first stage of the analysis involved assessment of the internal consistency of the measures that operationalized the variables in the study. The test includes estimation of the reliability coefficients (Cronbach's alpha) of the measures, as well as items to total correlation. The second stage involved assessment of factorial validity through an examination of the convergent and discriminant validity of the research instruments. This test was performed using factor analysis technique. The third stage involved the analysis and assessment of multivariate assumption of normality, examination of residual, multicollinearity, linearity, homoscedasticity, and outliers. Meanwhile, the second part of the analysis involved two stages. Firstly, the study performed the descriptive statistical analysis in which descriptive techniques including ranking, frequency, mean, standard deviation, and multiple comparisons are used. Secondly, the range of regression analysis techniques such as Multiple Linear Regression and Stepwise regression were used to test the hypotheses and to identify the TPB model of direct and extended determinants.

### 4.11.1 Factor Analysis Techniques and Construct Validity Assessment

The basic assumption of factor analysis, as mentioned by Hair, Black, Babin, Anderson, and Tatham (2006) is that "*some underlying structure does exist in the set of selected variables*". Therefore, an interdependence technique of factor analysis of the exploratory perspective could be utilized with the primary purpose of defining the underlying structure among the variables in the analysis. It is to assess the validity of the measurement involved in the proposed model.

In this study, factor analysis techniques are still required because they are useful, as mentioned by Coakes and Steed (2003) especially in constructing reliable tests and determining whether items are tapping into the same construct. Besides, it is a starting point for many other multivariate techniques and identifying the variables expected to have an impact in the analysis (Hair et al., 2006). Accordingly, the appropriate method of exploratory factor analysis (EFA) was utilized in guiding the data analysis journey in order to establish a good understanding of the research data applied to the whole sample (N = 415).

Through the entire analysis, the number of factors this study is trying to maintain was determined by achieving the priori criterion methods (e.g. factoring ICT attributes). In addition, eigenvalues equal to or above one and the cut-off loading of rotated variables with values exceeding 0.5 were retained. The Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy index was considered for confirming the significance of using factor analysis and must be above the recommended level of 0.5 (Coakes and Steed, 2003; Malhotra, 2004; Hair et al., 2006). In order to achieve the purpose of good utilization of using factor analysis techniques in this study, the obtained data was classified into two groups. The first group includes the data related to the direct predictors of ICT adoption in the educational system suggested in this study framework, while the second group includes data related to the indirect predictors.

### 4.11.2 Data Analysis

A quantitative research method was applied for the collection of the data in this study. The data was gathered from the questionnaire, in which multiple and simple linear regressions, in addition, analysis of variance (ANOVA) were used to examine the proposed model. Specifically, SPSS version 16 for Windows was used for this purpose. Descriptive statistics was used to examine the demographic variables of participants and to run multivariate analysis (Sekaran, 1992). Essentially, through a survey, the study did not request respondents to participate in an unpleasant manner; instead, it convinced the respondents to participate (Zikmund, 2003). In this study, privacy, confidentially, preservation from distortion, anonymity was assured. The respondents were clarified about the principle of the research and the reasons for questionnaire (Zikmund, 2003).

## 4.12 Concluding Comments

This chapter provides an overview of the research design and methodology. It compares issues related to the study such as exploratory and explanatory paradigms and qualitative and quantitative approaches. In addition, the chapter explained in details about the proposed model development which is build using adoption theories. Also the chapter formulates alternative hypotheses that defined the relationship between factors. Besides, the use of questionnaire for collecting data together with the reviews of previous studies that use the same items to measure the research factors are also outlines. Nonetheless, the population of the study and their representative sample are well-defined. Finally the chapter ends with the analysis techniques that are used to measure the proposed model and its factors and testing the research hypotheses. These techniques are explained in more details in the consequent chapters.

CHAPTER Five

# RELIABILITY AND VALIDITY OF MEASUREMENT

## 5.1 Introduction

This chapter consists of five sections, with the first section presents the issues related to data preparation for the preliminary analysis of the study. The description on the multivariate assumptions related to the study is provided in section two, while the third section discusses the reliability of the questionnaire by determining the Cronbach's alpha followed with the fourth section, which discusses the factor analysis of the constructs. In the final section, the validity of the constructs is outlined.

## 5.2 Data Preparation

Data in this study were analyzed using SPSS Version 16. The necessary data preparation process recommended by Malhotra (2004) such as questionnaire checking, editing, coding, data cleaning, and adjusting were deployed in this study. Some steps were considered before selecting the data analysis strategy such as determining missing data and required treatment, the validity and reliability of the constructs, and lastly the assumption required by the analysis techniques

### 5.2.1 Screening Question

During the construction stage of survey, the study aimed to maintain two conditions, a screening questions and the order of questions. A screening question was designed in the beginning of the survey to select only those who have educational technologies in their universities. This question aims to screen out the respondents who are not qualified for this study in order to minimize the chance of biased responses. The screening question was "*Does your university have any ICT services in the educational system?*" with option to answer either Yes or No. If the answer is yes, then the respondent is considered eligible for the study and vice versa. From the test, the results are provided in Table 5.1, which indicates all respondents were eligible.

*Table 5.1: Result of Screening Question*

| Question | Response | Frequency | Percentage |
|---|---|---|---|
| Does your university have any ICT services in the educational system? | Yes | 415 | 100% |
| | No | 0 | 0 |

On other hand, the ordering of questions in the questionnaire is considered as important issue to avoid unnecessary anchoring with regard to perceived rather than actual increasing levels of task difficulty or complexity (Johnson and Marakas, 2000). There are two major implications in the question sequence issue; first, an appropriate sequence can ease the respondent's task in answering. Second, the sequence can either create or avoid biases due to context effects. Accordingly, this study argues that the questionnaire questions sequence is very important, so the questions are arranged in appropriate mode with consideration of these conditions,

- The study ensures that the answer to a question is not influenced by previous questions.
- Questions flow from the more general to the more specific.
- Questions flow from the least sensitive to the most sensitive.
- Questions flow from factual and behavioral questions to attitudinal and opinion questions.

### 5.2.2 Treatment of Missing Data

Missing data, according to Tabachnick and Fidell (2007) is one of the most pervasive problems in data analysis. Hair et al. (2006) clarify that it exists when there are valid values on one or more variables which are not available. Therefore, one of the preliminary techniques used in this study in minimizing the volume of missing data is by monitoring the respondents while they were completing the survey. This method assists the study in recovery the missing data by encouraging participants to fill in the missing items. Also, the Missing Value Analysis (MVA) was conducted and the results reveal that a few missing values occurred in the variables that the study uses in the proposed model. Also, there were a few missing values encountered in some cases and the inspection of these missing values indicated that there is no variable used in the proposed model. In total, the missing value was only 5%.

Therefore, the researcher decided to remove the questionnaires which have missing values to ensure the reliability and stability of the constructs.

### 5.3 Multivariate Assumptions

There are a number of assumptions underpinning the use of regression and factor analysis too. Some of these assumptions relate to research design such as the ratio of cases to independent variables. Along these lines, Coakes and Steed (2003) stated that the minimum requirement is to have at least five times more cases than the independent variables. The second type of assumption relates to normality, outliers, multicollinearity, linearity, homoscedasticity, and independence of the residual. These assumptions, according to Coakes and Steed (2003) are assessed through regression analysis.

#### 5.3.1 Normality

Normality assumption means that all the variables are multivariate normal distributed assuming that "the joint effect of two variables is normally distributed" (Hair et al., 2006). In relation, Sweet and Grace-Martin (2003) address that the better the dependent variable is to a bell shape distribution, the more accurately that the relationship is a result of chance. Thus, multivariate normality is assumed and has no effect on the results. Multivariate statistical methods permit "the effects of more than one variable to be considered at one time" (Zikmund, 2003).

According to Tabachnick and Fidell (1983), as long as the Principal Component Analysis (PCA) and Factor Analysis are used to describe a sample, or as a convenient way to summarize the relationships in a large set of observed variables, the assumption regarding the distribution of variables is not required. In addition, the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity are both tests of multivariate normality and sampling adequacy (Darren and Mallery, 2003). The statistical value of Skewness was used (Hair et al., 2006). The accepted level of Skewness and Kurtosis values should not exceed (± 2.58 if the research considers .01 significance level) and (± 1.96 which correspond to .05 error level) (Hair et al., 2006). Concerning the level of Skewness, this study obtains values within the acceptable ranges (Appendix F) indicated by (Darren and Mallery, 2003; Hair et al., 2006).

### 5.3.2 Examination of Residual

The data shown in Table 5.2 assists the study to do the preliminary evaluation of model validation. It helps in finding out to what extent the research can trust each of the model's findings especially in testing the hypotheses. The assumption of the independence of the errors has been met since Durbin-Watson values fall between 1.5 and 2.5, indicating that the residual values are independent. Table 5.2 presents a brief summary of the regression model output produced during the assessment of the study's hypotheses.

*Table 5.2: Examination of Residual* (Summary of Multiple Regression Analysis Result)

| **DV** | **Predictors *(IV)*** | **R** | **$R^2$** | **Δ $R^2$** | **F-Value** | **p** | **Durbin Watson** |
|---|---|---|---|---|---|---|---|
| BI | ATT, SN, PBC | 0.902 | 0.814 | 0.813 | 599.55 | 0.00 | 1.917 |
| BI | SN_WoM, MMC | 0.848 | 0.719 | 0.717 | 526.27 | 0.00 | 2.085 |
| ATT | RA, COMPT, COMPX, TRIAL, OBSERV | 0.752 | 0.565 | 0.559 | 106.16 | 0.00 | 1.664 |
| PBC | SE, TFC, GFC, RFC | 0.783 | 0.614 | 0.610 | 162.81 | 0.00 | 1.956 |

### 5.3.3 Identifying Multicollinearity

Multicollinearity occurs when any single independent variable is highly correlated with a set of other independent variables (Hair et al., 2006) with two most common and direct measures for assessing it are tolerance and the Variance Inflation Factor (VIF). The common cut-off threshold is a tolerance value of 0.10, which corresponds to a VIF value of 10 (Hair et al., 2006). As long as the VIF is less than the value of 10, the multicollinearity is not a concern (Burns and Bush, 2000).

Regarding this guidelines, Table 5.3 shows that all tolerance and VIF values fall within the acceptable range with tolerance, greater than 0.10 and values are less than 10.0 for VIF indexes mentioned by Hair et al. (1998). Therefore, the predictive ability of the regression models is not affected here by the multicollinearity since it does not exist and the assumption is not being violated.

*Table 5.3: Result of Multicollinearity Test*

| Model's DV | Independents Variables | Collinearity Tolerance | VIF |
|---|---|---|---|
| BI | Att | 0.668 | 1.496 |
| | SN | 0.430 | 2.323 |
| | PBC | 0.504 | 1.982 |
| BI | SN_WoM | 0.869 | 1.151 |
| | MMC | 0.869 | 1.151 |
| ATT | RA | 0.830 | 1.205 |
| | COMPT | 0.542 | 1.845 |
| | COMPX | 0.896 | 1.116 |
| | TRIAL | 0.829 | 1.206 |
| | OBSERV | 0.499 | 2.005 |
| PBC | SE | 0.541 | 1.849 |
| | TFC | 0.265 | 3.774 |
| | RFC | 0.252 | 3.967 |
| | GFC | 0.619 | 1.617 |

### 5.3.4 Linearity

The variables used to examine the predictor of the BI were subjected to the factor analysis process. In particular, factor analysis is an interdependence technique in that an entire set of interdependent relationships is examined because it is based on correlation (Malhotra, 2004). This study assumes that linearity is not violated in using variables that resulted from the PCA of factor analysis (Tabachnick and Fidell, 2007). Besides, Hair et al. (1998) suggest the use of partial regression plot for each variable when the researcher uses more than one independent variable, to ensure its best representation in the equation. On the other hand, the output for linearity test is displayed graphically in Appendix L.

### 5.3.5 Homoscedasticity

According to Hair et al. (2006), homoscedasticity is desirable and it refers to the assumption that dependent variables exhibit equal levels of variance across the range of predictor variables (Hair et al., 2006). It is related to the assumption of normality, according to Tabachinck and Fidell (2007), and when the multivariate normality is met, the relationships between variables are homoscedastic. Tabachinck and Fidell (2007) also mention that when data is grouped (summated), the homoscedasticity is known as homogeneity of variance. On the other hand, the presence of unequal variance called heteroscedasticity, it is one of the most common assumption violations (Hair et al., 2006). In order to determine whether heteroscedasticity exists or not, Hair et al., (2006) suggest plotting (as see in Appendix M). With regards to the plot, this study never finds any pattern of increasing or decreasing residual, as well as neither a diamond-shaped pattern nor a triangle-shaped one in either direction. Thus, it is concluded that the homoscedasticity exists for the independent variables of the study. Additionally, Hair et al. (2006) stated that SPSS provides the Levene's test for homogeneity of variance, which is particularly recommended for use because it is less affected by departure from normality. The result of this test, which is shown in Appendix M, also, reveals the homogeneity of variance, implying that variables exhibit equal levels of variance.

### 5.3.6 Outliers

Outliers are "*extreme cases which have considerable impact on the regression solution*" (Coakes and Steed, 2003). In this study, both the univariate and multivariate outliers were sought among all cases (Hair et al., 2006). An inspection of box plots (Graphical Methods) of all the variables revealed that no extreme observations were detected (Appendix K). Hair et al., (2006) point out that some observations may occur normally in the out range of the distribution. To identify those truly distinctive observations and designate them as outliers both methods of univariate and multivariate analysis are used. Then, in order to determine how much of a problem these outlying cases are likely to be, a comparison is made between the original mean for a particular variable and the 5% trimmed mean (the new mean calculated after the top and bottom 5 percent of cases are removed from the distribution). If these two means indicate that the outlying values are very similar, the values are not too different from the remaining distribution, and then the outlying scores do not have a lot of influence and will be retained. In this study, an inspection of the box plots for the variable PBC revealed the presence of outlying cases. When the study compares the original mean (m=5.17) and the 5% trimmed mean (5.30) values for these cases, it indicated that they are not very different. This shows that those outlying cases are not too different from the other remaining cases in the distribution. Similarly, the RA shows the presence of outlying cases because the original mean (m=5.52) and the 5% trimmed mean (5.62) values are closed (Appendix K). In addition, the COMPX also contains outlying cases, with the original mean (m=2.87) and the 5% trimmed mean (2.82) values are closed. Also, the Trial contains outlying cases because the original mean (m=2.40) and the 5% trimmed mean (2.31) values are closed. Moreover, in the case of MMC the original mean (m=5.64) and the 5% trimmed mean (5.76) values for these cases are closed. Lastly, the variables (SE, TFC, RFC, GFC) show the presence of outlying cases, the original mean (m=5.72, m=4.94, m=4.91, m=5.73) and the 5% trimmed mean (m=5.87, m=5.07, m=5.04, m=5.78) respectively.

Hair et al. (2006) believe that outliers "*should be retained unless demonstrable proof indicates they are truly aberrant and not representative of any observation in the population*". Accordingly, Cook's Distance and Centered Leverage values were deployed in this study as a technique to examine the influence of outliers on the tested models. According to Hair et al. (1998) the acceptable Cook's Distance value is when it is less than one.

## 5.4 Construct's First Internal Consistency and Reliability Test

It was recommended that any summated scale should be analyzed for its reliability in order to ensure its appropriateness before proceeding to an assessment of its validity (Hair et al., 1998; Battacherjee, 2000). According to Malhotra (2004), an instrument cannot be valid if it is not reliable but it will be reliable when it is valid.

Therefore, the reliability test is required as it is part of the preliminary analysis as also indicated by Pallant (2005) in exploring the nature of the variables. According to Pallant (2005), it is in readiness for conducting specific statistical techniques to address research questions. Reliability, according to Malhotra (2004), refers to the extent to which a scale produces consistent results if repeated measurements are made.

In this section, the study attempts to assess the degree to which the measures are free from random error and, therefore, yield consistent results. Here, the study used the internal consistency reliability method, which is applied to assess the homogeneity of a set of items when several items are summated in order to form a total score. In order to achieve that, the study used two techniques of internal reliability tests. The first technique was the Item-to-total correlation technique according to which scale items were deleted if they recorded Item-to-total correlations of less than 0.25 (Nunnally, 1978).

The second was the common technique used by researchers which is based on Cronbach's coefficient alpha which was utilized by this study to gauge the internal consistency of the measure. The basis for using the latter technique is that measures with coefficient values of 0.70 or above generally indicate satisfactory internal consistency reliability. In some situations, a Cronbach's coefficient alpha of 0.60 may be accepted as the minimum acceptable level of reliability for preliminary research as suggested by Nunnally, (1978) as well as in exploratory research as suggested by Malhotra (2004), Hair et al. (1998) and Sekaran (2000).

### 5.4.1 Scales Evaluation on TPB Direct Constructs (Layer 1)

This study used four main theorized constructs that are anticipated explaining and predicting the adoption of ICT in the educational system in Jordanian public higher education institutions. Four main variables involved in this study include BI, as the key dependent variable, while ATT, SN, and PBC are the independent variables. As a result, Table 5.4 shows the items involved in each construct as well as the relevant reliability test conducted on the four constructs.

*Table 5.4: Reliability Test on Main constructs*

| Variables Included | Coefficients Alpha |
|---|---|
| **BI**<br>1. Given the chance, I predict that I would use ICT in the teaching system in the future<br>2. I will strongly recommended others to use ICT in the teaching system<br>3. My favorable intention would be to use technologies in the education system rather than traditional way in the teaching system<br>4. I plan to use ICT in the teaching and learning system | 0.83 (Appendix H-1) |
| **ATT**<br>1. In my opinion, using ICT in the teaching system is a good idea<br>2. I think it is a wise idea for me to use ICT in the teaching system<br>3. I like the idea of using the ICT in the teaching system<br>4. Using ICT in the teaching system would be pleasant experience | 0.73 (Appendix H-2) |
| **SN**<br>1. Most people who are important to me would think that I should use ICT in the educational system<br>2. The people who influence my decisions would think that I should use ICT in the educational system<br>3. Most people who are important to me would think that I should try out the technologies in the educational system<br>4. The people who influence my decisions would think that I should try out the technologies in the educational system | 0.96 (Appendix H-3) |
| **PBC**<br>1. I would be able to use ICT in the educational system<br>2. I have the resources necessary to make use of ICT in the teaching system<br>3. I have the knowledge necessary to make use of ICT in the education system<br>4. I have the ability to make use of ICT in the education system<br>5. Using ICT in the teaching system would be entirely within my control | 0.91 (Appendix H-4) |

As shown Table 5.4, the measurement scale used with each of the four constructs was reliable and yielded consistent results with very good approximate Cronbach's alpha values of 0.83 for BI, 0.73 for ATT, 0.96 for SN, and 0.91 for PBC. The high values of Cronbach's alpha coefficients obtained in the four constructs could be that these constructs are very well established and reliably tested in several previous studies from which this study adapts from.

#### 5.4.2 Evaluation of the Indirect Constructs Scales (Layer 2)

There are three beliefs suggested by the DOI Theory, TPB, and DTPB. These beliefs are the academic staffs' ATT that will be measured is based on the individual's perceptions of educational technologies characteristics. Then, the normative belief that will be measured based on the two types of influential norms, inferred from Rogers' two types of communication channels and TPB theory. Lastly, the control belief that will be measured based on individual's perceptions of the control of both FC and SE which were derived from the DTPB.

##### 5.4.2.1 Reliability Test on Technology Characteristics Constructs

In measuring the respondent's belief about the use of educational technologies, this study has proposed 22 items. In order to prepare the obtained data on the characteristics of using ICT in the educational system for multivariate analysis, the study determined the internal consistency of this scale using Cronbach's alpha. The appropriate way to achieve this is by looking at the overall scale, the individual items, and the relationship between them. The reliability test was conducted on all the 22 items and the findings show that the overall scale yielded reliable internal consistency with a Cronb1ch’s alpha of 0.81 (Table 5.5).

*Table 5.5: Reliability Test on ICT Characteristics Constructs*

| Constructs | Item Variables | Alpha |
|---|---|---|
| Relative Advantage | 1. If I were to use ICT in the teaching system, it would enable me to accomplish my tasks more quickly. | 0.74 |
| | 2. If I were to use ICT in the teaching system, the quality of my work would improve. | |
| | 3. If I were to use ICT in the teaching system, it would enhance my effectiveness on my job. | |
| | 4. If I were to use ICT in the teaching system, it would make my job easier. | |
| | 5. Using ICT in the education system gives me greater control over my work. | |
| Compatibility | 1. If I were to use ICT in the teaching system, it would be compatible with most aspect of my work. | 0.92 |
| | 2. If I were to use ICT in the teaching system, it would fit my work style. | |
| | 3. If I were to use ICT in the teaching system, it would fit well with the way I like to work. | |
| Complexity | 1. Training and learning to using ICT in the teaching system would be easy for me. | 0.69 |
| | 2. Overall, if I were to use ICT in the teaching system, it would be easy to use. | |
| | 3. It would be easy for me to become skilful at using ICT in the teaching system. | |
| | 4. Using ICT in the education system requires a lot of mental effort. | |
| Triability | 1. Before deciding on whether or not to use ICT in the teaching system, I want to be able to use it on a trial basis. | 0.71 |
| | 2. Before deciding on whether or not to use ICT in the teaching system, I want to be able to properly try it out. | |
| | 3. I want to be permitted to use ICT in the teaching system, on a trial basis long enough to see what it can do. | |
| Observability | 1. I will use ICT in the teaching system, when it is used by many. | 0.79 |
| | 2. I will use ICT in the teaching system, when I have seen others using it. | |
| | 3. I will use ICT in the teaching system as soon as I get to know about it. | |
| | 4. I will use ICT in the education technology if it becomes popular. | |
| | 5. I will wait until other academicians start to use it. | |
| | 6. I will use ICT in the teaching system, when other academicians have successful experience of using it. | |
| | 7. If using ICT in the educational system is unknown to me, I will not use it. | |

The findings showed that variables OBSERV_Q3 and OBSERV_Q7, the correlations between each of them and the sum of all other variables are quite low, moreover, the item-total correlation of these two items were very low 0.066 and 0.157 respectively. Correspondingly the alpha value would increase if these items were deleted from the scale (Darren and Mallery, 2003). When this study repeated the test without OBSERV_Q3 and OBSERV_Q7, the Cronbach's alpha for the overall scale increased to 0.91. However, this finding could be accepted as satisfactory in achieving the reliable internal consistency, but examining the individual items indicates that OBSERV_Q3 and OBSERV_Q7 have the lowest corrected item-to-total correlations.

In these circumstances, Zaichkowsky's (1985) solution was to drop the low item-to-total correlations. Accordingly, if these two items were removed from the scale, the Cronbach's alpha is then raised to 0.91. Therefore, the dropping of these items may be considered appropriate. Using the 20 remaining items after the deletion of the two less misleading items, the study wishes to determine the reliability of Rogers' (1995) five independent ICT characteristic scales, namely relative advantage, compatibility, complexity, trialability, and observability. Then, the reliability test was carried out on each attribute separately and the results show that the scales in each attribute are consistent with a Cronbach's alpha greater than 0.60 and involved relevant items (see Appendix H-5).

#### 5.4.2.2 Reliability Test on Normative Belief Constructs

Cronbach's alpha reliability test was conducted on the overall normative beliefs to ascertain that the indirect predictors function as a whole set and do not violate the reliability with Cronbach's alpha of 0.95. Since this study looked into the normative beliefs based on two categories of norm interactions, there are personal interaction referents (word-of-mouth) and impersonal interaction referents represented by Media. Another reliability test was conducted separately on each of the constructs relevant measures.

The result shows that the scales used to measure personal referents are statistically reliable and yield a consistent result with a Cronbach's alpha of 0.97 and the Cronbach's alpha of the media norms construct is 0.69 which yields a satisfactory internal reliability of the construct. The MMC_Q3 in the media norms construct was deleted because its value of item-to-total correlation is very low 0.137 (Appendix H-6). Therefore, the Cronbach's alpha of the media norms construct was increased to 0.75. Table 5.6 specifies the output of the internal consistency reliability check, including both personal and media referents, constructs.

*Table 5.6: Reliability Test on the decomposed Normative Beliefs*

| Constructs | | Item Variables | Alpha |
|---|---|---|---|
| Inter-Personal Channel | 1. | My referents (peers, colleagues, friends, and family) would think that I should use ICT in the educational system**.** | 0.97 |
| | 2. | My referents (peers, colleagues, and friends, and family) would think that I should try out ICT in the educational system**.** | |
| | 3. | Generally speaking, I want to do what my referent thinks I should do**.** | |
| | 4. | My opinion leaders would think that I should use ICT in the educational system**.** | |
| | 5. | My opinion leaders would think that I should try out ICT in the educational system**.** | |
| | 6. | Generally speaking, I want to do what my opinion leaders think I should do | |
| Mass-Media Channel | 1. | The media are full of report, articles, and news suggesting that using ICT in the educational system is a good idea**.** | 0.69 |
| | 2. | The media and advertising consistently recommend using ICT in the educational system. | |
| | 3. | In my profession, it is advisable to use ICT in the educational system | |
| | 4. | I read/saw news report that using ICT in the educational system was a good way to manage the teaching and learning process**.** | |
| | 5. | I want to do what the media think I should do | |

#### 5.4.2.3 Reliability Test on Control Belief Construct

Table 5.7 presents scale evaluations on four decomposed beliefs that are relevant to the control belief construct. Findings show that the coefficient alpha of the SE constructs scored 0.90, above the recommended Cronbach's Alpha. This indicates that the summated scale of the construct yields satisfactory internal consistency reliability. The reliability test on the eight decomposed variables relevant to measure the technology support constructs indicates satisfactory internal consistency reliability with an alpha value of 0.87.

*Table 5.7: Reliability Test on Control Belief Construct*

| Constructs | Item Variables | Alpha |
|---|---|---|
| SE | 1. I would feel comfortable using ICT in the education system on my own.<br>2. For me, feeling comfortable using ICT in the education system on my own is important.<br>3. If I wanted to, I could easily operate (application, software) for using it in the teaching system from the university (portal, website) on my own is important.<br>4. For me, being able to use the (application, software) for teaching system from university (portal, website) on my own is important.<br>5. I would be able to use the (application, software) for the educational system even if there was no one around to show me how to use it.<br>6. For me, being able to use the (application, software) for teaching system even if there is no one around to show me how to use it is important. | 0.90 |
| TFC | 7. I have the computers, Internet access and applications which I need to use it in using ICT in the educational system.<br>8. For me, availability of the computers, internet access and applications to use ICT in the educational system is important.<br>9. Educational technology applications (software) might not be compatible with the current style of my work.<br>10. For me, the applications (software) which are using in the educational system is important to be compatible with the current work style<br>11. I am concerned about the applications (software) security which is used in the educational system.<br>12. For me, advances in Internet security, which provide a safer of using ICT in the educational system, are important.<br>13. A reliable internet connection is available when I want to use ICT in the educational system.<br>14. For me, reliability of internet connection services is very important to use ICT in the educational system. | 0.87 |
| RFC | 15. There will be not enough computers and other ICT tools to use it in the educational system.<br>16. For me, having computers and ICT tools is important.<br>17. There will be no good infrastructure and network to use ICT in the educational system.<br>18. For me, the good is infrastructures which facilitate to use ICT in the educational system very important.<br>19. There will be lack of the training courses to using ICT in the educational system.<br>20. For me, the training course is very important to use ICT in the educational system. | 0.94 |
| GFC | 21. The government gives support for using ICT in the educational system.<br>22. For me, government support for using technologies in the educational system is very important.<br>23. The Jordanian government endorses using ICT in the educational system.<br>24. For me, the government endorsing educational technologies is important to use ICT in the educational system.<br>25. The government promotes the use of ICT in the educational system.<br>26. For me, the government promotes of using ICT in the educational system is important. | 0.71 |

Whereas, the reliability test on the six decomposed variables relevant to measure the resource support construct indicates satisfactory internal consistency reliability with an alpha value of 0.94. Pertaining to the government support construct, the alpha value of 0.71 also indicates that the scales are satisfactorily reliable. Subsequently, dropping items such as TFC_Q3 and TFC_Q4 from the technology support scale because their values of Item-total correlation is very low (0.127, 0.119) (Appendix H-7). Therefore, TFC construct will improve the reliability gradually to a Cronbach's alpha of 0.96. To sum up, Table 5.8 displays a summary of the first reliability test as follows.

*Table 5.8: Summary of the first Reliability Test*

| Variables | No. of Items | Cronbach's Alpha |
|---|---|---|
| Variable: BI | 4 | 0.83 |
| Dimension: BI | 4 | 0.83 |
| Variable: Psychological Determinant | 13 | |
| Dimension: ATT | 4 | 0.73 |
| SN | 4 | 0.96 |
| PBC | 5 | 0.91 |
| Variable: Behavioral beliefs to use ICT | 22 | |
| Dimension: RA | 5 | 0.74 |
| COMPT | 3 | 0.92 |
| COMPX | 4 | 0.69 |
| TRIAL | 3 | 0.71 |
| OBSERV | 7 | 0.79 |
| Variable: Normative beliefs to use ICT | 11 | |
| Dimension: WoM | 6 | 0.97 |
| MMC | 5 | 0.69 |
| Variable: Control beliefs to use ICT | 26 | |
| Dimension: SE | 6 | 0.90 |
| TFC | 8 | 0.87 |
| RFC | 6 | 0.94 |
| GFC | 6 | 0.71 |

### 5.5 Factor Analysis

Having conducted the first reliability test and results on the initial internal consistency having been obtained, this study moves on to the following steps of factorial validity analysis. A wide series of factor analysis in the shape of PCA is utilized to test for both the convergent and discriminate validity of the measurements. Factor analysis is an interdependent technique and the primary purpose of using it, is to define the underlying structure among the variables in the analysis (Hair et al., 2006; Zikmund, 2003). In particular, PCA and principal factors are the most commonly used (Tabachinck and Fidell, 2007; Cooper and Schindler, 2003). The aims that this study seeks to achieve from the factor analysis technique are discussed in the subsequent paragraphs.

The first aim is to analyze the scale items of each construct and verify their discriminate validity. According to Davis (1989), discriminate validity concerns with the ability of a measurement item to differentiate between the objects being measured. Malhotra (2004) puts it in another way, saying that discriminate validity aimed to identify new uncorrelated variables to be used in subsequent multivariate analyses such as regression. The second aim is to reduce the large number of interrelated variables to a small number of underlying factors that ensures the construct validity. According to Malhotra (2004), it addresses the question of what construct or characteristic the scale is, in fact, measuring. The third aim is to explain the interrelations between the constructs and the variables measuring them. According to Davis (1989), it is concerned with whether constructs' items form distinct constructs. The fourth aim is to identify a smaller set of salient variables for use in subsequent multivariate analysis (Malhotra, 2004). For example, ICT in the educational system attributes statements, normative belief statements and control belief statement, that correlate highly with the identified factors may be used as independent variables explain the dependent variable in the second layer of the model. Lastly, factor analysis according to Zikmund (2003) may be utilized to meet the statistical assumptions of various models.

### 5.5.1 Factors Analysis for Criterion Variable BI

The four items of the construct assumed related to BI shown in Table 5.9 were subjected to PCA, Varimax with Kaiser Normalization as rotation method to determine how many dimensions those items which measure BI will converge along.

*Table 5.9: PCA Result Component Matrix and Factor Loading: BI*

| Constructs | Coding | | Items | Component, 1 Loading |
|---|---|---|---|---|
| (BI) | BI_Q1 | 1. | Given the chance, I predict that I would use ICT in the teaching system in the future. | 0.817 |
| | BI_Q2 | 2. | I will strongly recommend others to use ICT in the teaching system. | 0.746 |
| | BI_Q3 | 3. | My favorable intention would be to use technologies in the education system rather than traditional way in the teaching system. | 0.844 |
| | BI_Q4 | 4. | I plan to use ICT in the teaching and learning system | 0.830 |

*Note*. Eigenvalues: 2.626
The variance explained: 65.628%
KMO: 0.801
Cronbach's Alpha: 0.83

The result of factor analysis in this study revealed the following:

I. The presence of one component with eigenvalues of 2.63 exceeding the recommended value of one.

II. The factor analysis provided a solution in one component which explained 65.6% of the variance.

III. An assessment of the KMO value was of 0.801, which shows that the sampling adequacy for factor analysis was appropriate and the Barlett's Test of Sphericity reached statistical significance, supporting the factorability of the correlation matrix (Appendix I-1).

The interpretation of this component was consistent with previous research on the BI scale. In addition, the result of this analysis supports the use of selected items as a scale of BI as suggested by the scale authors (Mathieson, 1991; Venkatesh and Davis, 2000; Gardner and Amoroso, 2004; Shih and Fang, 2004).

### 5.5.2 Direct Psychosocial Determinants of BI (Layer 2)

Table 5.10 presents the coding used for the ATT (4 items), SN_WoM (10 items), MMC (5 items), and PBC (5 items). In this study, the EFA was employed to identify the factors underlying direct predictors (ATT, SN_WoM, MMC, and PBC). In this case, the factor extraction method of PFA was selected because it is useful in determining the number of factors necessary to represent the data (Coakes and Steed, 2003). Both PFA and PCA provide similar solutions on the direct factors of BI. The set of 24 items comprising of four constructs (ATT, SN_WoM, MMC, and PBC) was subjected to factor analysis and the solution was rotated using rotational method with the Oblimin with Kaiser Normalization approach.

*Table 5.10: The Coding of Measurements Scale of BI Psychosocial Antecedents*

| Constructs | Coding | Items |
|---|---|---|
| ATT | ATT_Q1 | 1. In my opinion, using ICT in the teaching system is a good idea |
| | ATT_Q2 | 2. I think it is a wise idea for me to use ICT in the teaching system |
| | ATT_Q3 | 3. I like the idea of using the ICT in the teaching system |
| | ATT_Q4 | 4. Using ICT in the teaching system would be pleasant experience |
| SN_WoM | SN_WoM_Q1 | 1. Most people who are important to me would think that I should use ICT in the educational system |
| | SN_WoM_Q2 | 2. The people who influence my decisions would think that I should use ICT in the educational system |
| | SN_WoM_Q3 | 3. Most people who are important to me would think that I should try out the technologies in the educational system |
| | SN_WoM_Q4 | 4. The people who influence my decisions would think that I should try out the technologies in the educational system. |
| | SN_WoM_Q5 | 5. My referents (peers, colleagues, friends, and family) would think that I should use ICT in the educational system. |
| | SN_WoM_Q6 | 6. My referents (peers, colleagues, friends, and family) would think that I should try out ICT in the educational system. |
| | SN_WoM_Q7 | 7. Generally speaking, I want to do what my referent thinks I should do. |
| | SN_WoM_Q8 | 8. My opinion leaders would think that I should use ICT in the educational system. |
| | SN_WoM_Q9 | 9. My opinion leaders would think that I should try out ICT in the educational system. |
| | SN_WoM_Q10 | 10. Generally speaking, I want to do what my opinion leaders think I should do. |
| MMC | MMC_Q1 | 1. The media are full of report, articles, and news suggesting that using ICT in the educational system is a good idea. |
| | MMC_Q2 | 2. The media and advertising consistently recommend using ICT in the educational system. |
| | MMC_Q3 | 3. In my profession, it is advisable to use ICT in the educational system |
| | MMC_Q4 | 4. I read/saw news report that using ICT in the educational system was a good way to manage the teaching and learning process. |
| | MMC_Q5 | 5. I want to do what the media think I should do. |
| PBC | PBC_Q1 | 1. I would be able to use ICT in the educational system |
| | PBC_Q2 | 2. I have the resources necessary to make use of ICT in the teaching system |
| | PBC_Q3 | 3. I have the knowledge necessary to make use of ICT in the education system |
| | PBC_Q4 | 4. I have the ability to make use of ICT in the education system |
| | PBC_Q5 | 5. Using ICT in the teaching system would be entirely within my control |

The results of the analysis indicate that:

I. Respondents involved in the study sample are able to distinguish the variation among the four BI functions (direct determinants) or predictor of BI whereby these findings are in agreement with the DOI, TPB and its decomposed classifications of the direct predictors.

II. The assessment of direct determinants of BI construct, according to respondents, seemed to be through three predictors; ATT, SN_WoM, MMC, and PBC.

III. An assessment of the KMO value was of 0.947 which shows that the sampling adequacy for factor analysis was appropriate and the Barlett's Test of Sphericity reached statistical significance, supporting the factorability of the correlation matrix (Appendix I-2).

In other words, factor analysis revealed the presence of four components with eigenvalues exceeding one. In addition, the required four factors were retained on the measurement for the three direct factors conceptually and theoretically assumed to be the direct predictors of BI as discussed previously in the literature review. The underlying structure of the 24 items involved in the four constructs; ATT, SN_WoM, MMC, and PBC. In conjunction, Table 5.11 shows the items used to measure the BI and their loading onto four different components as follows;

*Table 5.11: PFA Result: Factors Underlying Direct Attributes of BI*

| Item coding | Factors | | | |
|---|---|---|---|---|
| | **ATT** | **SN_WoM** | **MMC** | **PBC** |
| ATT_Q2 | 0.569 | | | |
| ATT_Q3 | 0.507 | | | |
| ATT_Q4 | 0.294 | | | |
| ATT_Q1 | 0.276 | | | |
| WoM_Q2 | | 0.961 | | |
| SN_Q3 | | 0.928 | | |
| WoM_Q3 | | 0.924 | | |
| WoM_Q1 | | 0.908 | | |
| SN_Q2 | | 0.903 | | |
| WoM_Q6 | | 0.881 | | |
| SN_Q4 | | 0.877 | | |
| SN_Q1 | | 0.863 | | |
| WoM_Q4 | | 0.840 | | |
| WoM_Q5 | | 0.839 | | |
| MMC_Q4 | | | 0.701 | |
| MMC_Q5 | | | 0.694 | |
| MMC_Q2 | | | 0.541 | |
| MMC_Q1 | | | 0.492 | |
| PBC_Q2 | | | | -0.882 |
| PBC_Q3 | | | | -0.860 |
| PBC_Q4 | | | | -0.844 |
| PBC_Q1 | | | | -0.748 |
| PBC_Q5 | | | | -0.704 |
| Eigenvalue | 12.343 | 2.087 | 1.623 | 1.203 |
| Variance explained | 50.395 | 7.115 | 5.213 | 3.185 |
| Cronbach's Alpha | 0.73 | 0.98 | 0.75 | 0.91 |

*Note*. Total Variance Extracted by three factors 65.909%; KMO 0.947; Barlett’s Test<.001

The interpretation of the four components was consistent with TPB on the direct scale of BI (Ajzen, 1991; Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975; Taylor and Todd, 1995a, b). Also, the results of this analysis support the use of ATT, SN, MMC, and PBC items as separate scales as suggested by TPB, DTPB, and DOI.

### 5.5.3 Factor Analysis of Salient Variables (Layer 1)

Three constructs with several items in the study were suggested to represent the individuals' salient beliefs recommended by the DOI, TPB and DTPB. These are behavioral belief, normative belief, and control belief. There are 76 items in the questionnaire used to identify the effect of the three groups of salient beliefs regarding the target behavior. The verification procedures of factor analysis were employed to understand the structure of the 76 items as a whole set. As the first step, the 76 items intended to measure academic staff salient beliefs suggested by the DOI, TPB, and DTPB were factor analyzed to identify underlying factors as a basis for developing clusters. According to Barczak, Ellen, and Pilling (1997), items should be deleted from the factor analysis based on either an improvement in coefficient alpha, weak loadings, or cross-loadings. In addition, the guidelines taken from previous literature and adoption studies, which similarly employed quantitative methods, were helpful in identifying the nature of relationships among variables or determining how they cluster (Cronk and Fitzgerald, 2002).

#### 5.5.3.1 Factor Analysis (PFA): ICT Attributes

The coding of items related to the ICT attributes include the relative advantages of using ICT (5 items), the compatibility of ICT (3 items), Complexity of ICT (4 items), the trialability of using ICT (3 items), and observability (7 items) as shown in Table 5.12.

*Table 5.12: The Coding of Items and Constructs of ICT in the Educational System Attributes*

| Coding | Items |
|---|---|
| RA_Q1 | 1. If I were to use ICT in the teaching system, it would enable me to accomplish my tasks more quickly. |
| RA_Q2 | 2. If I were to use ICT in the teaching system, the quality of my work would improve. |
| RA_Q3 | 3. If I were to use ICT in the teaching system, it would enhance my effectiveness on my job. |
| RA_Q4 | 4. If I were to use ICT in the teaching system, it would make my job easier. |
| RA_Q5 | 5. Using ICT in the education system gives me greater control over my work. |
| COMPT_Q1 | 1. If I were to use ICT in the teaching system, it would be compatible with most aspect of my work. |
| COMPT_Q2 | 2. If I were to use ICT in the teaching system, it would fit my work style. |
| COMPT_Q3 | 3. If I were to use ICT in the teaching system, it would fit well with the way I like to work. |
| COMPX_Q1 | 1. Training and learning to using ICT in the teaching system would be easy for me. |
| COMPX_Q2 | 2. Overall, if I were to use ICT in the teaching system, it would be easy to use. |
| COMPX_Q3 | 3. It would be easy for me to become skilful at using ICT in the teaching system. |
| COMPX_Q4 | 4. Using ICT in the education system requires a lot of mental effort. |
| TRIAL_Q1 | 1. Before deciding on whether or not to use ICT in the teaching system, I want to be able to use it on a trial basis. |
| TRIAL_Q2 | 2. Before deciding on whether or not to use ICT in the teaching system, I want to be able to properly try it out. |
| TRIAL_Q3 | 3. I want to be permitted to use ICT in the teaching system, on a trial basis long enough to see what it can do. |
| OBSERV_Q1 | 1. I will use ICT in the teaching system, when it is used by many. |
| OBSERV_Q2 | 2. I will use ICT in the teaching system, when I have seen others using it. |
| OBSERV_Q3 | 3. I will use ICT in the teaching system as soon as I get to know about it. |
| OBSERV_Q4 | 4. I will use ICT in the education technology if it becomes popular. |
| OBSERV_Q5 | 5. I will wait until other academicians start use it. |
| OBSERV_Q6 | 6. I will use ICT in the teaching system, when other academicians have successful experience of using it. |
| OBSERV_Q7 | 7. If the using ICT in the educational system is unknown to me, I will not use it. |

By closely adhering to the nomological structure of TPB and DOI, the proposed model integrates a set of behavioral beliefs whereby all items were drawn from the five common attributes of innovation suggested by Rogers' (1995) theory of DOI. In this part, the study looks for a theoretical solution for ICT attributes as suggested in the proposed model. The PFA analysis method was found to be the best option (Tabachinck and Fidell, 2007) to look into the structure of the predetermined underlying constructs which theoretically account for innovation's attributes. Since there are no well-established scales developed specifically to measure the ICT attribute applicable to measuring the adoption in less developing and non-western countries, this study developed the scale based on previous IS literature reviews such as, Moore and Benbasat (1991) and Taylor and Todd (1995b) as well as ICT in the educational system literature review. Factor analysis was applied to the results in line with the analysis used by Moore and Benbasat (1991), Barczak et al. (1997), and Tan and Too (2000). Two rounds of factor analysis were performed whereby the first round of the reliability test and factor analysis reveals that a few items such as OBSERV_Q3 and OBSERV_Q7, were found to be confounded. These items were dropped from the scale obeying the suggestion of Barczak et al. (1997), and Tan and Teo (2000) in order to produce the results shown in Table 5.13 in the second round. This study provides a justification for dropping confounded items from the proposed scale, based on the literature review and statistical reasons. In the second round of PFA analysis, the 20 items were assessed for the suitability of the data for factor analysis. Also, they were subjected to the purification process of PFA of factor analysis using SPSS with oblimin rotation.

*Table 5.13: PFA Result: ICT Attributes*

| **Items** | **RA** | **COMPT** | **COMPX** | **TRIAL** | **OBSERV** | |
|---|---|---|---|---|---|---|
| RA_Q4 | 0.7 | | | | | |
| RA_Q3 | 0.6 | | | | | |
| RA_Q5 | 0.6 | | | | | |
| RA_Q2 | 0. | | | | | |
| RA_Q1 | 0. | | | | | |
| COMPT_Q1 | | -0. | | | | |
| COMPT_Q2 | | -0. | | | | |
| COMPT_Q3 | | -0. | | | | |
| COMPX_Q1 | | | 0.7 | | | |
| COMPX_Q3 | | | 0. | | | |
| COMPX_Q2 | | | 0. | | | |
| COMPX_Q4 | | | 0.4 | | | |
| TRIAL_Q3 | | | | 0.7 | | |
| TRIAL_Q1 | | | | 0. | | |
| TRIAL_Q2 | | | | 0.6 | | |
| OBSERV_Q2 | | | | | 0. | |
| OBSERV_Q5 | | | | | 0. | |
| OBSERV_Q6 | | | | | 0. | |
| OBSERV_Q4 | | | | | 0. | |
| Eigenvalue | 6.921 | 1.985 | 1.901 | 1.529 | 1.152 | .095 |
| Variance Explained | 30.205 | 6.779 | 6.566 | 4.660 | 3.995 | 1.880 |
| Cronbach's Alpha | 0.74 | 0.92 | 0.69 | 0.71 | 0.91 | |

*Note*. Total Variance Extracted by the five factors 54.085%; KMO = 0.870 ; Barlett's Test <.001 OBSERV_1, OBSERV_Q3 and OBSERV_Q7 dropped in the second round of factor analysis.

Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above and the KMO value was 0.870, above the recommended value of 0.6 (Hair et al., 2006) and the Barlett's Test of Sphericity reached statistical significance supporting the factorability of the correlation matrix. The Cronbach’s Alpha values for the modified scale were not affected considerably.

The study, therefore, considered the modified scale sufficient for the analysis described next. The findings obtained from factoring were examined and compared to Rogers' (1995) five independent characteristics scales.

The result of the analysis indicates that;

I. The five factors; relative advantage, compatibility, complexity, trialability and observability, obtained by factor analysis fit Rogers' attribute and its relevant items showing strong loadings on their own relevant factors.

II. The results of this analysis support the use of the relative advantages scale, compatibility scale, complexity scale, observable scale, and trialability scale as separate scales as suggested by scale authors (Moore and Benbasat, 1991; Rogers, 1995).

III. The result of this analysis show the item OBSERV_Q1 has a weak loading (-0.457) which means this item must be dropped (Appendix I-3).

### 5.5.3.2 Factor Analysis of Normative Beliefs Variables

The coding of items related to the educational technologies norms present in Table 5.14 include personal norms of the interaction with the innovation of these technologies (6 items), norms of the interaction with media norms (5 items) in addition to the main factor subjective norm which have (4 items).

*Table 5.14: The Coding of Items and Constructs of the Normative Belief*

| Construct | Coding | | Items |
|---|---|---|---|
| SN | SN_Q1 | 1. | Most people who are important to me would think that I should use ICT in the educational system |
| | SN_Q2 | 2. | The people who influence my decisions would think that I should use ICT in the educational system |
| | SN_Q3 | 3. | Most people who are important to me would think that I should try out the technologies in the educational system |
| | SN_Q4 | 4. | The people who influence my decisions would think that I should try out the technologies in the educational system |
| W-o-M | WoM_Q1 | 1. | My referents (peers, colleagues, friends, and family) would think that I should use ICT in the educational system. |
| | WoM_Q2 | 2. | My referents (peers, colleagues, friends, and family) would think that I should try out ICT in the educational system. |
| | WoM_Q3 | 3. | Generally speaking, I want to do what my referent thinks I should do. |
| | WoM_Q4 | 4. | My opinion leaders would think that I should use ICT in the educational system. |
| | WoM_Q5 | 5. | My opinion leaders would think that I should try out ICT in the educational system. |
| | WoM_Q6 | 6. | Generally speaking, I want to do what my opinion leaders think I should do. |
| MMC | MMC_Q1 | 1. | The media are full of report, articles, and news suggesting that using ICT in the educational system is a good idea. |
| | MMC_Q2 | 2. | The media and advertising consistently recommend using ICT in the educational system. |
| | MMC_Q3 | 3. | In my profession, it is advisable to use ICT in the educational system |
| | MMC_Q4 | 4. | I read/saw news report that using ICT in the educational system was a good way to manage the teaching and learning process. |
| | MMC_Q5 | 5. | I want to do what the media think I should do. |

To verify the parsimonious set of variables that could represent the large number of variables used to assess the normative belief construct, the extraction method of PFA with Oblimin rotation was conducted to summarize and determine whether items measuring personal norms can discriminate items measuring media norms as well as the main variable SN.

Contrast with the expectations, results of the PFA shown in Table 5.15 reveal that only two factors out of three predetermined variables of TPB were statistically extracted by the study;  the items of the dependent variable SN extracted with the items of W-o-M variable as independent variable to SN, this means that the three variables become two variables, i.e the SN and W-o-M are combined into one variable named SN_WoM, the rest are considered as independent variables to the dependent variable BI.

In other words, all of the items that measure W-o-M, MMC loaded together with those measuring SN. This means the three factors SN, W-o-M, and MMC are extracted into two factors SN_WoM and MMC and these factors are considered as independent variables to the BI as dependant variable. Theoretically, this result is worth to note because it is considered new especially in the IS aspect. The findings also show that PFA is significantly appropriate with a KMO measure of the sampling adequacy of 0.942. Table 5.15 shows the items used to measure normative belief and their loading onto 3 different components as follows.

*Table 5.15: PFA Result: Type of Interaction's Norms Vs Motivation to Comply*

| Coding | SN | MMC | A |
|---|---|---|---|
| SN_Q3 | 0.943 | | |
| WoM_Q2 | 0.942 | | |
| WoM_Q3 | 0.928 | | |
| WoM_Q6 | 0.911 | | |
| SN_Q2 | 0.901 | | |
| SN_Q1 | 0.895 | | |
| WoM_Q5 | 0.886 | | |
| WoM_Q4 | 0.885 | | |
| SN_Q4 | 0.882 | | |
| WoM_Q1 | 0.874 | | |
| MMC_Q4 | | 0.731 | |
| MMC_Q2 | | 0.670 | |
| MMC_Q5 | | 0.654 | |
| MMC_Q1 | | 0.568 | |
| Eigenvalue | 8.907 | 1.914 | 1.006 |
| Variance Explained | 58.234 | 9.398 | 2.503 |
| Cronbach's Alpha | 0.98 | 0.75 | |

*Note.* (a) Total Variance Extracted by two factors 70.134%; KMO = 0.942; Barlett's Test <.001
(b) Extraction Method: Principal Axis Factoring;
(c) Rotation Method: Oblimin with Kaiser Normalization.

Table 5.15 presents the results obtained from conducting PFA and shows that there are just two factors underlying the normative belief obtained from the 14 items. Interestingly, the above 14 decomposed items of SN, W-o-M, and MMC were subjected to the PFA inspection of the KMO value, which was 0.942 showing that the sampling adequacy for factor analysis was appropriate. The Barlett's Test of Sphericity also reached statistical significance, supporting the factorability of the correlation matrix (Appendix I-4). Factor analysis of PFA was conducted on the items after the process of multiplying each belief item by each motive item to get the decomposed output of the normative belief. The results of the analysis indicate that:

I. The SN, W-o-M, and MMC are grouped into two factors SN_WoM and MMC which are considered as independent variables to the BI.

II. Respondents involved in the study distinguished the variation between the two dimensions of normative beliefs that are in line with Rogers' (1995).

III. The assessment of the normative belief construct according to respondents, seemed to be measured through two dimensions; W-o-M and MMC.

**5.5.3.3 Factors Analysis of Control Belief**

The coding of items related to the educational technologies control belief (salient belief) includes the individual's expectations of salient SE of using it (6 items), TFC (6 items), RFC (6 items), and GFC (6 items). According to Ajzen (2002), the belief-based measures approach has the advantage of providing an insight into the cognitive foundation underlying the PBC. In this approach, two sets of questions can be posed with respect to each. Respondents can be asked to indicate (a) the perceived likelihood (strength of control belief), and (b) the power to facilitate performance of the behavior (power of control belief). Table 5.16 shows the coding of these constructs;

*Table 5.16: The Coding of Items and Constructs of the Control Belief of Educational Technologies*

| Construct | Coding | Items Statement |
|---|---|---|
| SE | SE_Q1 | 1. I would feel comfortable using ICT in the education system on my own**.** |
| | SE_Q2 | 2. For me, feeling comfortable using ICT in the education system on my own is important. |
| | SE_Q3 | 3. If I wanted to, I could easily operate (application, software) for using it in the teaching system from the university (portal, website) on my own is important. |
| | SE_Q4 | 4. For me, being able to use the (application, software) for teaching system from university (portal, website) on my own is important. |
| | SE_Q5 | 5. I would be able to use the (application, software) for the educational system even if there was no one around to show me how to use it. |
| | SE_Q6 | 6. For me, being able to use the (application, software) for teaching system even if there is no one around to show me how to use it is important. |
| TFC | TFC_Q1 | 1. I have the computers, Internet access and applications which I need to use it in using ICT in the educational system. |
| | TFC_Q2 | 2. For me, availability of the computers, internet access and applications to use ICT in the educational system is important. |
| | TFC_Q3 | 3. I am concerned about the applications (software) security which is used in the educational system. |
| | TFC_Q4 | 4. For me, advances in Internet security, which provide a safer of using ICT in the educational system, are important. |
| | TFC_Q5 | 5. A reliable internet connection is available when I want to use ICT in the educational system. |
| | TFC_Q6 | 6. For me, reliability of internet connection services is very important to use ICT in the educational system. |
| RFC | RFC_Q1 | 1. There will be not enough computers and other ICT tools to use it in the educational system. |
| | RFC_Q2 | 2. For me, having computers and ICT tools is important. |
| | RFC_Q3 | 3. There will be no good infrastructure and network to use ICT in the educational system. |
| | RFC_Q4 | 4. For me, the good is infrastructures which facilitate to use ICT in the educational system very important. |
| | RFC_Q5 | 5. There will be lack of the training courses to using ICT in the educational system. |
| | RFC_Q6 | 6. For me, the training courses are very important to use ICT in the educational system. |
| GFC | GFC_Q1 | 1. The government gives support for using ICT in the educational system. |
| | GFC_Q2 | 2. For me, government support for using technologies in the educational system is very important. |
| | GFC_Q3 | 3. The Jordanian government endorses using ICT in the educational system. |
| | GFC_Q4 | 4. For me, the government endorsing educational technologies is important to use ICT in the educational system. |
| | GFC_Q5 | 5. The government promotes the use of ICT in the educational system. |
| | GFC_Q6 | 6. For me, the government promotes of using ICT in the educational system is important. |

A PFA was followed by oblimin-rotation, due to the fact that an oblimin factor solution can provide a good fit to the data (Ajzen, 2002). Oblique rotation was chosen as some correlation was expected among the variables. A factor loading of 0.3 was used as the lower cut-off value as recommended for exploratory analysis (Pallant, 2005). The factor correlation matrix, after oblique rotation, showed no correlations greater than 0.30 indicting that the oblimin rotation was reasonable. As shown in Table 5.17, the control belief structure is decomposed into two dimensions: SE and FC.

*Table 5.17: PFA Structure Matrix Result: Control Belief*

| **Coding** | **SE** | **TFC** | **RFC** | **GFC** | **PBC** | **6** |
|---|---|---|---|---|---|---|
| SE_Q4 | 0.732 | | | | | |
| SE_Q6 | 0.695 | | | | | |
| SE_Q3 | 0.673 | | | | | |
| SE_Q2 | 0.634 | | | | | |
| SE_Q1 | 0.616 | | | | | |
| SE_Q5 | 0.541 | | | | | |
| TFC_Q1 | | 0.643 | | | | |
| TFC_Q2 | | 0.639 | | | | |
| TFC_Q7 | | 0.612 | | | | |
| TFC_Q6 | | 0.609 | | | | |
| TFC_Q8 | | 0.494 | | | | |
| RFC_Q2 | | | 0.678 | | | |
| RFC_Q6 | | | 0.642 | | | |
| RFC_Q4 | | | 0.623 | | | |
| RFC_Q5 | | | 0.616 | | | |
| RFC_Q3 | | | 0.569 | | | |
| GFC_Q6 | | | | 0.582 | | |
| GFC_Q5 | | | | 0.565 | | |
| GFC_Q3 | | | | 0.349 | | |
| PBC_Q2 | | | | | 0.888 | |
| PBC_Q3 | | | | | 0.831 | |
| PBC_Q4 | | | | | 0.793 | |
| PBC_Q1 | | | | | 0.628 | |
| PBC_Q5 | | | | | 0.550 | |
| Eigenvalue | 15.008 | 2.220 | 1.224 | 1.180 | 1.137 | 1.093 |
| Variance Explained | 47.492 | 6.153 | 2.824 | 2.238 | 1.838 | 1.653 |
| Cronbach's Alpha | 0.90 | 0.96 | 0.94 | 0.71 | 0.91 | |

*Note.* Total of variance explained = 62.198.

The results of the analysis indicate that:

I. Respondents involved in the study distinguished the variation among the four dimensions of control beliefs whereby these findings are moderately close to the DTPB classification of control belief.

II. The assessment of PBC constructs seemed to show there are items which coincide partially. According to Ajzen (2002), it was demonstrated that there was considerable overlap between control beliefs that predicted FC and SE.

III. The findings also show that PFA is significantly appropriate with the KMO of the sampling adequacy of 0.948 (Appendix I-5).

Table 5.18 summarizes the factor analysis procedures for quick reference.

*Table 5.18: Summary of Factor Analyses Procedures*

| Constructs | KMO | Bartlett test of Sphericity | Observation |
|---|---|---|---|
| BI | 0.801 | Chi-Square=586.521, Df= 6, Sig, 0.00 | One component was extracted |
| Direct Determinants of BI | 0.947 | Chi-Square=9638.562, Df= 276, Sig, 0.00 | Three components were extracted |
| ICT Attributes | 0.870 | Chi-Square=4760.976, Df= 231, Sig, 0.00 | Five components were extracted |
| ICT Normative Beliefs | 0.942 | Chi-Square= 6746.957, Df= 105, Sig, 0.00 | two components were extracted |
| ICT Control Beliefs | 0.948 | Chi-Square= 10868.621, Df= 465, Sig, 0.00 | four components were extracted |

The sampling adequacy was confirmed by the statistical findings of the interdependence tests of factor analyses procedures as displayed in the preceding Table 5.18. The values of the KMO measure of sampling adequacy for the study sets of variables are within the range of (0.948 to 0.801) whereby this study-sampling adequacy would be labelled as 'meritorious'. Since the KMO meets the minimum criteria, the anti image correlation in general meets requirements.

### 5.5.4 Treatment and Justification of Problematic Items

In the previous initial data analysis conducted to check reliability and factor analysis, the statistical assumptions for conducting factor analysis and multiple regressions were met. For both statistical analyses, the requirements for the use of sample size of more than 200 have been met in this study. The missing data problem in some variables has been dealt by deleting them because they are not many and they are below the cut-off standard mentioned by Malhotra (2004).

The preliminary data analysis on the reliability check reveals that there are some problematic items. In checking the overall reliability of ICT characteristics items, items like OBSERV_Q3 and OBSERV_Q7 were found to be very low to the total correlation. In relation, Moore and Benbasat (1991) suggest not to include the items with correlations of less than 0.20. In this study, all items selected to measure observability (OBSERV_Q1 - OBSERV_Q7) were checked for internal consistency. The test reveals that corrected items to total correlation values are 0.066 and 0.157 for OBSERV_Q3 and OBSERV_Q7 respectively. Both values had item scale correlations of less than 0.20. Inspection of the internal consistency of items measuring the MMC construct reveals, as well as another item, show that MMC_Q3 (Item-total correlation value = 0.137) had the lowest corrected item to total correlation. In addition, two items in the TFC show the Item-total correlation values very low (TFC_Q3 and TFC_Q4) which are 0.127 and 0.119 respectively. Statistically, in order to improve the reliability of the ICT scale in this study, all OBSERV_Q3, OBSERV_Q7, MMC_Q3, TFC_Q3, and TFC_Q4 items were discarded from any further analysis (Moore and Benbasat, 1991).

### 5.5.5 Assessment of the Constructs Reliability and Validity

Having conducted the data reduction method of factor analysis, the results obtained revealed that some constructs were successfully distinct from other constructs by the items measuring them (discriminant validity). Also, the items measuring a construct were reduced through the process of PCA and PFA. This study has to re-assess the construct’s new items suggested by factor analysis for summated process and create a new representative variable. In conjunction, Table 5.19 provides the summary of the reliability tests carried out on the entire constructs.

*Table 5.19: Summary of Second Reliability Test (Cronbach's alpha)*

| Variables | No. of Items | Cronbach's Alpha |
|---|---|---|
| Variable: BI | 4 | |
| Dimension: BI | 4 | 0.83 |
| Variable: Psychological Determinant | 23 | |
| Dimension: ATT | 4 | 0.73 |
| SN_WoM | 10 | 0.98 |
| MMC | 4 | 0.75 |
| PBC | 5 | 0.91 |
| Variable: Behavioral beliefs to use ICT | 19 | |
| Dimension: RA | 5 | 0.74 |
| COMPT | 3 | 0.92 |
| COMPX | 4 | 0.69 |
| TRIAL | 3 | 0.71 |
| OBSERV | 4 | 0.96 |
| Variable: Normative beliefs to use ICT | 10 | |
| Dimension: WoM | 6 | 0.97 |
| MMC | 4 | 0.75 |
| Variable: Control beliefs to use ICT | 19 | |
| Dimension: SE | 6 | 0.90 |
| TFC | 5 | 0.95 |
| RFC | 5 | 0.94 |
| GFC | 3 | 0.67 |

Table 5.19 explains that measuring of the five main constructs are reliable and yield consistent results with high Cronbach's alpha; 0.83 for BI, 0.73 for ATT, 0.98 for SN_WoM, 0.75 for MMC, and 0.91 for PBC (Appendix H-8). However, there are two reliability tests performed, the first reliability test was performed with the construct as proposed in the framework, while the second reliability test was performed based on items extracted by the factor analyses procedures.

## 5.6 Validity Test

This study examines the validity of the constructs based on the content validity as well as construct validity. Construct validity was examined in two tests suggested by Hair et al. (2006); (1) Convergent validity, scale correlates with others scales, in which they are homogenous, and (2) discriminant validity, scale is sufficiently different from other related scales. This study examines the predictive validity of the model in the context of intention to allow for a comparison of the models. Also it highlights these validity tests and discusses them in the following sections.

### 5.6.1 Content Validity of Measures

Content validity is defined by Hair et al. (2006) as the assessment of the degree of correspondence between the items selected to constitute a summated scale and its conceptual definition. It is also named as face validity (Malhotra, 2004). In general, face validity refers to the subjective agreement among professionals that a scale logically appears to reflect accurately what it is supposed to measure (Zikmund, 2003). In this study, face validity was assumed through cautious selection and adaptation of standard items of the questionnaire. Most of the questionnaire items have been used in different studies and have been tested for reliability and validity, in the context of IS and ICT that use the content validity of the ICT questionnaire. In this study, content validity has been assumed and instrument items were documented by citing those study’s questionnaires which utilized them first, such as Hall (1977), Taylor and Todd (1995a, b), Tan and Teo (2000), and Venkatesh et al. (2003). Also, the survey was pre-tested by ten academicians with expertise in survey research, and by ten PhD students with experience of IS. The feedback from the pre-test resulted in some restructuring and refinement of the survey to improve its quality and content validity. With regards to that, Sutton, French, Hennings, Mitchell, Wareham, Griffin, Hardeman, and Kinmonth (2003) found that using different question wordings for the open-ended questions may result in different kinds of salient beliefs. This was in agreement with Sutton et al. (2003) recommendation that researchers who use the TPB to investigate the determinants of a given behavior should first conduct an elicitation study to identify the modal salient beliefs in the target population.

### 5.6.2 Constructs Validity of Measures

Constructs validity according to Hair et al. (2006) is the "*extent to which a set of measured variables accurately represent the concept of interest or construct they are designed to measure*". In other words, it refers to how well a questionnaire measures what it claims to measure as reported by Malhotra (2004). The construct validity, according to Malhotra (2004), includes convergent discriminant and nomological validity which is the most widely accepted forms of validity as highlighted by Hair et al. (2006). These two types of the measurement validity are discussed in the subsequent sections.

#### 5.6.2.1 Convergent Validity of Measures

In the context of IS, convergent validity, according to Chau and Lai (2003), can be assessed by factor loading. Validity of the measures used for the constructs was obtained using the orthogonal method of factoring with oblimin rotation. The results of the factor analysis confirm that most of items converged on their hypothesized dimension.

I. Along these lines, all the items in the direct layer converged on their hypothesized dimensions forming four distinct constructs i.e ATT, SN_WoM, MMC, and PBC which are applicable to the research context and the conceptual definition that specifies the theoretical basis for the summated scale.

II. Similarly, the items in the indirect layer, which are related to the attributes of ICT as perceived by individuals (5 constructs), reached the validity requirements as discussed previously in the factor analysis.

III. The dimensions belong to control belief constructs in this study may fail to achieve validity because there are some overlapping among the items related to the TFC accepted 5 items and drop 3 items, which are TFC_Q3, TFC_Q4, and TFC_Q5. Besides, RFC variable accepts 5 items from 6 items, while the RFC_Q1 is dropped. On the other hand, the GFC variable accepts 3 items and drops 3 items: GFC_Q1, GFC_Q2, and GFC_Q3. Factors extracted excluding items relevant to the SE factor in which all are converged in their hypothesized proposed factor.

In regards to that, the results appear to demonstrate satisfactory levels of validity whereas convergent validity was confirmed because all indicators loaded only on their expected constructs when they were judged by factor loadings of 0.3 and above.

**5.6.2.2 Discriminant Validity of Measures**

Discriminant validity is defined by Malhotra (2004) as "*the extent to which a measure does not correlate with other constructs from which it is supposed to differ*". Earlier, Anandarajan, Igbaria, and Anakwe (2000) defined it as the degree to which items differentiate among constructs or measure distinct concepts. Along these lines, respondents of this study were able to:

I. Discriminate the variation among all the items in the first layer of independent variables according to their hypothesized dimensions forming four distinct constructs: ATT, SN_WoM, MMC, and PBC.

II. Discriminate the variation among all the items in the second layer of ICT attributes as independent variables according to their five distinct hypothesized dimensions.

III. Discriminate the variation among all the items in the second layer of ICT control belief as independent variables according to their four distinct hypothesized dimensions.

In other words, convergent and discriminant validity is inferred to when the construct relevant items load are much higher on their hypothesized factor than on other factors. In addition, the own-loadings must be higher than the cross-loadings if they exist.

## 5.7 Concluding Comments

In this chapter, an assessment of the internal consistency of the measures has been performed using Cronbach's alpha and the results show the reliability of the constructs. Some of items were deleted in this stage because their Item to Total correlation values less than 0.20. In addition, an assessment of factorial validity was performed using factor analysis techniques. Also, some of the items were dropped in this stage because factorial loading values is less than ±0.20. The chapter presents the results of factor analysis that shown differences in the SN predictor comparative with the Ajzen's theory. Besides, the convergent and discriminant validity of the research instruments were tested and results show that the validity assumption seems not to be violated. Similarly, this chapter discusses the analysis and assessment of the multivariate assumption of normality, examination of residual, multicollinearity, linearity, homoscedasticity, and outliers. The next chapter discusses the findings and results of the study. It discusses the descriptive behavior of the educational technologies adopters, and the statistical techniques of regression were run to test the research hypotheses as well as the proposed model.

# CHAPTER Six

# FINDING AND DISCUSSION

## 6.1 Introduction

This chapter discusses the findings and the results of the study. The chapter begins with a discussion on the behavior of educational technologies adopters with the focus on demographic characteristics of academic staff and their level of readiness to use the technologies by using some common technologies. The chapter continues by presenting the technologies used most by academicians and the difficulties that affect them and further reject the technologies. Later, the chapter presents in details the techniques used in testing the hypotheses; followed with the results of the hypotheses testing using multiple regression techniques. Finally, the chapter confirms the model based on the results of factor analysis and multiple regression techniques.

## 6.2 Behavior of Educational Technologies Adopters

The descriptive statistical analysis employed in this study is to analyze the sample population characteristics for further understanding of the behavior of the educational technologies adopters. It is utilized, using simple techniques of measuring sample tendency, such as analysis of variance, frequency, percentage, mean and standard deviation for variables in regards to respondents' profile, usage of technologies, ICT educational services ranking, respondent's willingness toward ICT, and difficulties.

The population size in this study is 5308, therefore, the researcher decided to distribute 500 questionnaires to make sure that the number of return and valid questionnaires cover the sample size proposed by Sekaran (2000). However, not all distributed questionnaires were returned, and some of the returned questionnaires are incomplete as showed in Table 6.1.

*Table 6.1: Summary of Sample's Responses to Survey Questionnaire*

| **Sample** | **Size** |
|---|---|
| Initial sample size | 500 |
| Non-returned | 61 |
| Number of form received | 439 |
| Response rate | 88% |
| Incomplete forms | 24 |
| Number of useable forms | 415 |
| Gross response rate | 83% |

### 6.2.1 Demographic Characteristics

This section concerns on the descriptive analysis of the demographic factors that influence the use of new technologies in the educational system in higher education institutions. The description includes the demographic factors of the respondents such as gender, age, education, and their teaching experiences. Human differentiation in gender and age are an essential phenomenon that influences virtually every feature of their daily lives. With regards to that, Table 6.2 reveals that total respondents involved in this study are 415, in which 71.6% are male and 28.4% are female. The total population for the study equals 5308, the rate of male is 79.6% and 20.4% for female (MoHESR, 2010). The age of the participants is grouped into four categories, in which 38.6% are in forties (41-50 years), which is the largest rate. It is followed with 30.4% of those in their thirties (30-40 years), and 18.6% of over 51 years old. The smallest category is under 30 years old with percentage rate 12.5%. In terms of educational level, 57.8% hold a PhD and 42.2% hold a master degree. On the other hand, 38.1% of the respondents obtained their highest degree locally, while 61.9% graduated from abroad. Among the respondents, 54.2% of them specialize in scientific area, while 45.8% specialize in humanities. Table 6.2 presents the summary of responses subjected to demographics factors.

*Table 6.2: Summary of responses depend on demographics factors*

| **Variable** | **Value** | **Frequency** | **Percentage** |
|---|---|---|---|
| Gender | Male | 297 | 71.6 |
| | Female | 118 | 28.4 |
| Age | Under 30 | 52 | 12.5 |
| | 31-40 | 126 | 30.4 |
| | 41-50 | 160 | 38.6 |
| | Older 51 | 77 | 18.6 |
| Educational degree | Master | 175 | 42.2 |
| | PhD | 240 | 57.8 |
| Place of the degree | In home | 158 | 38.1 |
| | Abroad | 257 | 61.9 |
| Major of the degree | Scientific | 225 | 54.2 |
| | Humanities | 190 | 45.8 |
| Experience | 1-5 | 138 | 33.3 |
| | 6-10 | 157 | 37.8 |
| | 11-15 | 93 | 22.4 |
| | Over 15 | 27 | 6.5 |

Experience of teaching is also considered as an influential factor in adoption and the use of ICT in teaching system. However, the experience of teaching depends on the age of the academic staff in the universities. Young academic staff may be familiar with ICT in the education system especially those who have used computers as a part of the college studies or receiving higher education degree from developed countries. On a contrary, the old academic staff may be unfamiliar with ICT in their teaching process because they do not use it in their studies.

As a result, knowledge to use ICT in the education system is considered a new skill and may result in diverse attitudes toward ICT. Regarding the experience, this study divides it into four categories. The largest group (37.8%) is those with experience between 6 and 10 years. It is followed by between 1 and 5 years (33.3%), 11 and 15 years (22.4%), and the smallest percentage (6.5%) is those more than 15 years.

### 6.2.2 Experience with ICTs

Eriksson, Kerem, and Nilsson (2005) pointed out that frequency of technology used as well as the duration of the experience with the technology has been found to capture the consumer's use of a technology. In this study, the distribution of the sample in terms of four common technologies expected to be related to the adoption of educational ICT are outlined in Table 6.3.

The findings show that personal computers, Internet, and mobile phones received a relatively high penetration rate among the respondents. The results indicated that 93.7% of the overall sample use  personal computers, 89.4% use Internet, while 100% use mobile phones, whereas very few of the respondents 3.6% use PDA. With respect to the usage of computers, 6.3% of the respondents never use computers yet. Meanwhile, 22.6% of them have been using computers for at least 5 years.

*Table 6.3: Behavior of Academic Staff in Using Technologies*

| Q | Statement | Responses | Freq. | % |
|---|---|---|---|---|
| Q1 | How long have you been using Computer? | Never | 26 | 6.3 |
| | | 1-3 Years | 186 | 44.8 |
| | | 3-5 Years | 109 | 26.3 |
| | | 5-7 Years | 53 | 12.8 |
| | | 7-9 Years | 13 | 3.1 |
| | | 10 Years > | 28 | 6.7 |
| Q2 | How long have you been using Internet? | Never | 44 | 10.6 |
| | | 1-3 Years | 231 | 55.7 |
| | | 3-5 Years | 112 | 27.0 |
| | | 5-7 Years | 9 | 2.2 |
| | | 7-9 Years | 19 | 4.6 |
| | | 10 Years > | 0 | 0 |
| Q3 | How long have you been using Mobile Phone? | Never | 0 | 0 |
| | | 1-3 Years | 67 | 16.1 |
| | | 3-5 Years | 251 | 60.5 |
| | | 5-7 Years | 39 | 9.4 |
| | | 7-9 Years | 44 | 10.6 |
| | | 10 Years > | 14 | 3.4 |
| Q4 | How long have you been using PDA (Personal Digital Assistant)? | Never | 400 | 96.4 |
| | | 1-3 Years | 15 | 3.6 |
| | | 3-5 Years | 0 | 0 |
| | | 5-7 Years | 0 | 0 |
| | | 7-9 Years | 0 | 0 |
| | | 10 Years > | 0 | 0 |

Therefore, in order to further understand the behavior of ICT adopters, to what extent the introduced technologies had been experienced by the sample need to be understood. This was also used to understand the behavior of both users and the potential adopters of ICT technologies. The frequency of using the four technologies was examined and the responses are shown in Table 6.4.

*Table 6.4: Technology Frequency Usage*

| **Technology** | **Responses** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Never** | **1<a month** | **1=a month** | **1>a month** | **1> a week** | **1> a day** | ∑ |
| Computer | 26 (6.3%) | 0 (0%) | 11 (2.7%) | 75 (18.1%) | 161 (38.8%) | 142 (34.2%) | 415 (100%) |
| Internet | 44 (10.6%) | 0 (0%) | 3 (0.7%) | 70 (16.9%) | 188 (45.3%) | 110 (26.5%) | 415 (100%) |
| Mobile | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 89 (21.4%) | 326 (78.6%) | 415 (100%) |
| PDA | 400 (96.4%) | 0 (0%) | 0 (0%) | 12 (2.9%) | 3 (0.7%) | 0 (0%) | 415 (100%) |

Table 6.4 indicates that majority of the respondents (96.4 %) never used PDA, while (6.3%) never used computer and (10.6%) never used Internet. The most frequently used technologies is the mobile phones (78.6% daily), followed with computers (34.2% daily), and the Internet (26.5% daily). It also indicated that users of computers and the Internet are found to be educational technology adopters and that respondent who are not users of computers and the Internet are also not actual users of these technologies.

## 6.3 Comparison of Respondent's Demographic Factors with Common Technologies

Independent sample t-test analysis and one-way ANOVA were conducted between demographic factors with the use and frequently use of some of common technologies such as computers, Internet, mobile phones, and PDA. In the t-test analysis, there are four groups, divided according to demographic factors such as gender, higher education degree, place of obtaining the higher education degree, and the major, while the test variables are the use of these common ICT services and how frequently use it. Some of the demographic factors have more than two categories in the answer such as age, and experience, in which each of them has four categories to be answered. The best way to describe the relationship between these demographic factors and the use of the technologies is by using one-way ANOVA.

### 6.3.1 T-test between Common ICT Services and Demographic Characteristics

This section presents the results of the use and frequently use of ICT services that affect the academic staffs' BI to use educational technologies and some of the demographic characteristics such as gender, higher educational degree, place of obtaining the higher educational degree and major. The other sides of comparison are the use and frequently use of common ICT services such as computers, Internet, mobile phones, and PDA. With regards to these variables Table 6.5 exhibits the t-test results.

*Table 6.5: T-test Comparison between Selected Demographic Factors and Using of ICT Tools*

| Computer | Value | Mean | SD | F | t | df | Sig |
|---|---|---|---|---|---|---|---|
| Gender | Male\ Female | 2.79\ 2.88 | 1.23\ 1.23 | .000 | -.732 | 413 | .456 |
| H Degree | Master\ PhD | 2.65\ 2.93 | 1.13\ 1.29 | 1.121 | -2.292 | 413 | .022* |
| Place HD | In home\ Abroad | 2.75\ 2.85 | 1.20\ 1.25 | .301 | -.772 | 413 | .441 |
| Major | Scientific\ Humanities | 2.95\ 2.65 | 1.26\ 1.18 | .141 | 2.457 | 413 | .014* |
| Gender | Male\ Female | 2.33\ 2.37 | .866\ .884 | .126 | -.417 | 413 | .677 |
| H Degree | Master\ PhD | 2.26\ 2.40 | .774\ .932 | 4.475 | -1.566 | 405.941 | .118 |
| Place HD | In home\ Abroad | 2.25\ 2.39 | .741\ .938 | 9.41 | -1.653 | 387.800 | .099 |
| Major | Scientific\ Humanities | 2.42\ 2.25 | .863\ .872 | .237 | 1.984 | 413 | .048* |
| Gender | Male\ Female | 3.20\ 3.34 | .945\ .998 | 2.125 | -1.359 | 413 | .175 |
| H Degree | Master\ PhD | 3.09\ 3.35 | .852\ 1.02 | 16.336 | -2.895 | 405.402 | .004** |
| Place HD | In home\ Abroad | 3.18\ 3.28 | .971\ .955 | .239 | -.928 | 413 | .354 |
| Major | Scientific\ Humanities | 3.34\ 3.12 | .993\ .911 | 8.075 | 2.355 | 410.136 | .019* |
| Gender | Male\ Female | 1.02\ 1.06 | .151\ .252 | 19.129 | -1.779 | 151.860 | .077 |
| H Degree | Master\ PhD | 1.02\ 1.04 | .167\ .200 | 2.004 | -.705 | 413 | .482 |
| Place HD | In home\ Abroad | 1.01\ 1.04 | .136\ .211 | 8.932 | -1.620 | 411.868 | .106 |
| Major | Scientific\ Humanities | 1.04\ 1.03 | .196\ .175 | .838 | .457 | 413 | .648 |

*Note*. *P<0.05, **P<0.01.

As displayed in Table 6.5, female academic staff used common technologies more than did male academic staff. In relation to the higher education degree, PhD academic staff used these technologies more than master academic staff, whereas academic staff who got their certificates abroad utilized technologies more than academic staff who got their certificates in home. Lastly, scientific academic staff used common technologies more than did their humanities counterparts. The findings shown there are significant relationship between the higher educational degree and the major of the academic staff with the use of computers and mobile phones. In other words, there are differences between academic staffs' higher education degree and major in terms of using computers and mobile phones. In the

Internet usage, the major of the academicians has significant differences. However, none of these groups show statistical significance difference in the use of PDA at P<0.05 levels (Appendix J). Similarly, as shown in Table 6.6, independent samples t-test, and descriptive statistics were computed to determine the differences of demographic characteristics and the frequent use common ICT services by academic staff in Jordanian public universities.

*Table 6.6: T-test Comparison between Selected Demographic Factors and Frequently Use of ICT Tools*

| **Computer** | **Value** | **Mean** | **SD** | **F** | **t** | **df** | **Sig** |
|---|---|---|---|---|---|---|---|
| Gender | Male\ Female | 4.89\ 4.89 | 1.31\ 1.15 | 4.910 | -.433 | 244.462 | .665 |
| H Degree | Master\ PhD | 4.77\ 4.91 | 1.49\ 1.07 | 15.037 | -1.052 | 299.989 | .294 |
| Place HD | In home\ Abroad | 4.82\ 4.87 | 1.30\ 1.24 | 1.405 | -0.440 | 413 | .660 |
| Major | Scientific\ Humanities | 4.92\ 4.78 | 1.08\ 1.46 | 17.772 | 1.058 | 343.539 | .291 |
| Gender | Male\ Female | 4.68\ 4.60 | 1.44\ 1.39 | .080 | 0.503 | 413 | .615 |
| H Degree | Master\ PhD | 4.61\ 4.68 | 1.46\ 1.41 | 0.245 | -0.494 | 413 | .621 |
| Place HD | In home\ Abroad | 4.80\ 4.56 | 1.40\ 1.44 | 1.013 | 1.633 | 413 | .103 |
| Major | Scientific\ Humanities | 4.77\ 4.52 | 1.22\ 1.63 | 21.891 | -.658 | 344.932 | .081 |
| Gender | Male\ Female | 5.78\ 5.78 | .411\ .410 | 0.026 | 0.081 | 413 | .936 |
| H Degree | Master\ PhD | 5.74\ 5.81 | .438\ .387 | 12.787 | -1.788 | 346.982 | .076 |
| Place HD | In home\ Abroad | 5.77\ 5.78 | .416\ .408 | 0.298 | -.274 | 413 | .784 |
| Major | Scientific\ Humanities | 5.77\ 5.80 | .419\ .401 | 1.750 | -.658 | 413 | .511 |
| Gender | Male\ Female | 1.07\ 1.21 | .504\ .793 | 16.752 | -1.708 | 155.926 | .090 |
| H Degree | Master\ PhD | 1.08\ 1.13 | .501\ .667 | 3.058 | -0.864 | 413 | .388 |
| Place HD | In home\ Abroad | 1.05\ 1.15 | .410\ .693 | 10.106 | -1.749 | 412.507 | .081 |
| Major | Scientific\ Humanities | 1.13\ 1.09 | .661\ .526 | 1.732 | .649 | 413 | .516 |

As shown in Table 6.6, the mean of male and female academic staff with the frequent use of computers and mobile phones are equal, while there is small difference with the frequent use of Internet and PDA. In relation to the higher education degree, there are small differences shows that PhD academic staff used the common technologies more than master academic staff. Also, small differences show that academic staff who got their certificates abroad utilized computers, mobile phones, and PDA more than academic staff who got their certificates in home, while small differences show that academic staff who got their higher education degree in home used Internet more frequently than whose got it abroad. Lastly, scientific academic staff used common technologies such as computers, Internet, and PDA more frequently than did their humanities counterparts, whereas humanities academic staff used mobile phones more frequently that scientific counterparts. As a result, all the findings show no statistical significance differences in the selected demographic characteristics of the academic staff such as gender, higher educational degree, place of obtaining the degree, and major, with the frequent use of ICT services such as computers, Internet, mobile phones, and PDA at $P<0.05$ levels (Appendix J).

### 6.3.2 One-Way ANOVA between Common ICT Services and Demographic Characteristics

This section presents the comparative results between the use of common technologies and the demographic characteristics such as age and experience of the academic staff. It is important to identify that these common technologies play a significant role on the academic staffs' BI to adopt and use educational technologies in their teaching and learning process. One-way between-groups ANOVA with Post-hoc comparisons were computed to determine the effects of academic staffs' demographic characteristics and their use of such ICT services. Table 6.7 presents the findings which reveal that academic staff aged between 41 years old and 50 years old used the common technologies more than other age categories. In relation to academic staff experience, the findings which reveal that academic staff who have experience between 11 years and 15 years used the common technologies such as computer, Internet and mobile phones more than other categories, while who have experience between 6 years to 10 years used mobile phones more than others. The results has also demonstrated a statistically significant difference in the computers usage with age under 30 years old and between 41 to 50 years old (P=0.013), also between 41 to 50 years old and 51 years old or older (P=0.000). In other words, there are differences between academic staffs' age in terms of using computers from two categories that mention earlier. While, there was no statistically significant difference in the computers usage with experience groups. In terms of the Internet usage, the findings show that there is statistically significant difference with age under 30 years old and between 41 to 50 years old (P=0.012), also between 51 years old or older with the age between 30 to 40 years old, and between 41 to 50 years old (P=0.000). While, there is no statistically significant difference in the use of Internet with experience groups. In terms of using mobile phones, the findings show that there is statistically significant difference with the experience between 1 and 5 years, and 6 to 10 years, (P=0.000). While, there is no statistically significant difference in the use of mobile phones with age groups.

*Table 6.7: ANOVA Comparison between Selected Demographic Factors and Using of ICT Tools*

| **Technology** | **Value** | **Mean Difference** | **Sig** |
|---|---|---|---|
| Computer | | | |
| Age | (Under 30) and (41 – 50) | -0.63750 | 0.013* |
| | (41 – 50) and (51 or older) | 0.74789 | .000** |
| Internet | | | |
| Age | (Under 30) and (41 – 50) | -0.43990 | 0.012* |
| | (30 – 40) and (51 or older) | 0.54762 | 0.000** |
| | (41 – 50) and (51 or older) | 0.73661 | 0.000** |
| Mobile | | | |
| Experience | (1 – 5) and (6 – 10) | -0.48869 | 0.000** |
| PDA | | | |
| Age | (41 – 50) and (51 or older) | 0.07500 | 0.037* |
| Experience | (1 – 5) and (11 – 15) | -0.07504 | 0.028* |
| | (6 – 10) and (11 – 15) | -0.07767 | 0.017* |

*Note*. *P<0.05, **P<0.01

Lastly, the findings show that there is a statistically significant difference in the use of PDA with age group of between 41 to 50 years old, and 51 years old or older (P=0.037). Also, there is a statistically significant difference in the use of PDA with experience group between 11 and 15 years with the groups 1 to 5 years (P=0.028), and 6 to 10 years (P=0.017). Table 6.8 indicates the results of the relationship between the selected demographic factors and the using of common ICT services.

*Table 6.8: ANOVA Test for the Use of ICT Services and Demographic Factors*

| Technology | Age\ Experience Groups | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Computer | Between Groups | 35.73\14.51 | 3 | 11.910\4.837 | 8.190\3.212 | $.000^{**}$\ |
| | Within Groups | 597.71\618.93 | 411 | 1.454\1.506 | | $.023^{*}$ |
| | Total | 633.44\633.44 | 414 | | | |
| Internet | Between Groups | 30.57\2.26 | 3 | 10.192\.754 | 14.794\.995 | $.000^{**}$\ |
| | Within Groups | 283.14\311.46 | 411 | .689\.758 | | .395 |
| | Total | 313.72\313.72 | 414 | | | |
| Mobile | Between Groups | 7.05\18.46 | 3 | 2.352\6.154 | 2.571\6.940 | .054\ |
| | Within Groups | 375.87\364.46 | 411 | .915\.887 | | $.000^{**}$ |
| | Total | 382.93\382.93 | 414 | | | |
| PDA | Between Groups | .42\.45 | 3 | .143\.150 | 4.192\4.415 | $.006^{**}$\ |
| | Within Groups | 14.02\14.00 | 411 | .034\.034 | | $.005^{**}$ |
| | Total | 14.45\14.45 | 414 | | | |

*Note*. *P<0.05, **P<0.01

The ANOVA results depicted in Table 6.8 shows that age of the academic staff is significantly different with the use of computers, Internet, and PDA (P=0.000, 0.000, 0.006). While, the experience of the academicians in the educational system is significantly different with the use of computers, mobile phones, and PDA (P=0.023, 0.000, 0.005).

On the other hand, one-way between groups ANOVA with Post-hoc comparisons were computed to determine the effects of academic staffs' demographic characteristics and their frequently use of ICT services. Table 6.9 presents the findings that show there was a statistically significant differences in the frequent use of Internet with age of 51 years old or older and with age groups under 30 years old, between 30 to 40 years old, and between 41 to 50 years old (P=0.000), the most age category that used mobile phones is 51 years old or older. Also in the frequent use of PDA and the age between 41 to 50 years old and 51 years old or older (P=0.035). While, there is no statistically significant difference of the frequent use computers and mobile phones with age groups. In other side, there is a statistically significant difference in the frequent use of PDA and the experience group between 11 and 15 years with experience group between 1 and 5 years, and 6 and 10 years (P=0.016 and 0.009 respectively).

*Table 6.9: ANOVA Comparison between Selected Demographic Factors and Frequently Use of ICT Tools*

| **Technology** | **Value** | **Mean Difference** | **Sig** |
|---|---|---|---|
| Internet | | 1.23102 | $0.000^{**}$ |
| Age | (Under 30) and (51 or older) | 1.44012 | $0.000^{**}$ |
| | (30 – 40) and (51 or older) | 1.51948 | $0.000^{**}$ |
| | (41 – 50) and (51 or older) | | |
| PDA | | | |
| Age | (41 – 50) and (51 or older) | 0.24375 | $0.035^{*}$ |
| Experience | (1 – 5) and (11 – 15) | -0.25736 | $0.016^{*}$ |
| | (6 – 10) and (11 – 15) | -0.26526 | $0.009^{**}$ |

*Note*. *P<0.05, **P<0.01

The ANOVA results depicted in Table 6.10 explain that the age of the academic staff is significantly different with the frequent use of computers, the Internet, and PDA (P=0.038, 0.000, 0.005, respectively). Besides, the experience of the academicians in the educational system is significantly different with the frequent use PDA (P=0.002) (Appendix J).

*Table 6.10: ANOVA Test for Frequent Use of ICT Services and Demographic Factors*

| Question | Age\Experience Groups | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| On average, how frequently do you use computer | Between Groups | 13.52\10.99 | 3 | 4.508\3.664 | 2.282\2.290 | .038*\ |
| | Within Groups | 655.08\657.62 | 411 | 1.594\1.600 | | .078 |
| | Total | 668.61\668.61 | 414 | | | |
| On average, how frequently do you use Internet | Between Groups | 134.31\10.81 | 3 | 44.771\3.604 | 25.804\1.771 | .000**\ |
| | Within Groups | 713.10\838.59 | 411 | 1.735\2.036 | | .152 |
| | Total | 847.41\847.41 | 414 | | | |
| On average, how frequently do you use Mobile Phone | Between Groups | 1.01\.87 | 3 | .338\.292 | 2.013\1.741 | .111\ |
| | Within Groups | 68.90\69.03 | 411 | .168\.168 | | .158 |
| | Total | 69.91\69.91 | 414 | | | |
| On average, how frequently do you use PDA | Between Groups | 4.59\5.22 | 3 | 1.532\1.743 | 4.318\4.933 | .005**\ |
| | Within Groups | 145.85\145.22 | 411 | .355\.353 | | .002** |
| | Total | 150.44\150.44 | 414 | | | |

*Note*. *P<0.05, **P<0.01

### 6.3.3 Test the Relationship between Demographics and Intention to Use ICT

In order to facilitate the investigation on the research question highlighting the influence of demographic characteristics on the adoption of ICT, this study aims to look into the issue from two angles. In the first part, the study investigates the association between the demographic characteristics and the ICT adopter, while in the second part it aims to examine the contribution of demographic variables as the independent variables in the adoption of ICT. According to Coakes and Steed (2003), correlation, can be performed between dichotomous or categorical variables (Phi Coefficient), which run under crosstabs analysis. In this connection, the relationships between ICT adopters and demographic characteristics involved in the current study were subjected to a non-parametric test for which the Pearson's chi-square test was utilized. The results are displayed in Table 6.11.

*Table 6.11: Pearson's Chi-square Test: ICT Adopters and Demographic Factors*

| **Relationship** | **Pearson's Chi-square** | **Asymp.Sig. (2-sided)** | **Result** |
|---|---|---|---|
| ICT Adopter and Gender | 33.396 | 0.042 | Sig* |
| ICT Adopter and Age | 97.053 | 0.004 | Sig* |
| ICT Adopter and educational degree | 24.392 | 0.279 | No |
| ICT Adopter and place of higher educational degree | 19.469 | 0.555 | No |
| ICT Adopter and major | 21.577 | 0.424 | No |
| ICT Adopter and teaching experience | 62.032 | 0.511 | No |

*Note*. *P<0.05

The findings show that gender and age of teaching staff have significant associations with their BI to adopt ICT, it means that these two demographic factors influence on the academicians to adopt or reject ICT in their teaching and learning process. In other words, the adoption and acceptance of educational technologies among academic staff in their teaching and learning process influences in their gender and age. Whereas there is no significant relationship between the academician's higher educational degree, place of obtaining higher educational degree, the major, and the experience in teaching system with their BI to adopt ICT in the educational system.

## 6.4 Analyzing and Ranking Educational Technologies Services

Some technological services that could be offered through universities were evaluated in order to understand to what extent these services are important to academicians. Accordingly, Table 6.12 presents specified data on the mean scores and standard deviation obtained from the sample of about six ICT services in educational system. Then the descriptive comparison was carried out and rankings were applied.

*Table 6.12: ICT Services Mean, Standard deviation and Ranking by Respondents*

| **Educational Technologies** | **Yes** | **%** | **No** | **%** |
|---|---|---|---|---|
| Computer Based Learning (CBL) | 278 | 67.0 | 137 | 33.0 |
| Web-Based Learning (WebCT) | 266 | 64.1 | 149 | 35.9 |
| Mobile Based Learning (MBL) | 186 | 44.8 | 229 | 55.2 |
| Online Assessment Tools | 181 | 43.6 | 234 | 56.4 |
| Class Recording, Virtual Class, Authoring tools and Learning Management system | 159 | 38.3 | 256 | 61.7 |
| Others | 0 | 0.0 | 415 | 100 |

Comparing the mean shows that services such as Computer-Based Learning and Web-Based Learning are considered the top two services in the ranking as the first and second services being adopted by academic staff in higher education institutions. In addition, the services such as Mobile-Based Learning and Online Assessment Tools are at the third and fourth rank, respectively. Finally, Class Recording, Virtual Class, Authoring tools and Learning Management System take the last rank in the adoption of ICT services in higher education institutions.

Analyzing ICT Promptness and Universities Difficulties

The majority of the participant (77.8%) reported that the technologies services in the educational system meet their expectations and they like using it. However, the remaining 22.2% decided that these technologies do not meet their expectations and they do not like using it. On the other hand, the distribution of the sample population shows that majority of them (79.8%) confirm that they would use ICT in the educational system in the future, while 16.4% do not intend to use it and 3.9% were uncertain about their future intentions. Consequently, 72.5% are willing to recommend others to use ICT in the educational system, while 19.3% of the respondents do not like to recommend others to use it and 8.2% of respondents are not sure whether to recommend others or not. Respondents have also identified some common problems encountered during their previous use of ICT educational services. Results presented in Table 6.13 indicate that most of the respondents agree on the reasons why they do not use technologies in the educational process. The most frequently reason is the lack of knowledge (29.2%), followed with that they are not necessary (28%), lack of technical understanding (25.1%), unsuitability for their requirements (23.1%), and lack of resources (16.9%).

*Table 6.13: The reasons for non-adoption of educational technologies*

| **Reasons for non-adoption** | **Yes** | **%** | **No** | **%** |
|---|---|---|---|---|
| Lack of Knowledge | 121 | 29.2 | 294 | 70.8 |
| Not Necessary | 116 | 28.0 | 299 | 72.0 |
| Lack of Technical Understanding | 104 | 25.1 | 311 | 74.9 |
| Not suit my requirements | 96 | 23.1 | 319 | 76.9 |
| Lack of resources | 70 | 16.9 | 345 | 83.1 |
| Others | 0 | 0.0 | 415 | 100 |

## 6.5 Hypotheses Testing Techniques

There are many statistical methods that can be applied in testing hypotheses. One of these methods is regression analysis technique. This technique is appropriate for testing the hypotheses. The processes of this technique are highlighted in the following sections.

### 6.5.1 Regression Analysis

The second step after having the factor analysis results is regression analysis, which is identified by Hair et al. (2006) as a simple and straightforward dependence technique that can provide predictions and explanations to the study. It can be used to analyze the relationship between a single dependent (Criterion Variable) and several independent variables (Tabachnick and Fidell, 1983). The use of multiple regression is in line with the objective of this study as Hair et al. (2006) mention that the objective of using regression analysis is to use the independent variables whose values are known to predict the single dependent variable. In order to study the relationship between adoption predictors and BI towards using educational technologies, this study utilizes multiple regression analysis. Specifically, the study statistically examined these predictors (independent variables) against the dependent variable. In addition, this study utilizes multiple regressions to test the hypotheses that link the predictors with the criterion variables. The following equation shows the form of multiple regressions for the variables used in this study.

$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\ldots\ldots..+\beta_kX_k+e$

The above equation, according to Malhotra (2004) is used to explain the results of multiple regression analysis, which is estimated by the following equation:

$Y^{\wedge}=a+b_1X_1+b_2X_2+b_3X_3+\ldots\ldots+b_kX_k$

Where Y is the responses on the criterion variable; $X_1$, $X_2$, $X_3$,..., $X_k$ are the predictor variables; ($\beta_0$, $\beta_1$, $\beta_2$, $\beta_3$,…, $\beta_k$) are the partial regression coefficients; e denotes the error or residual assumed to be randomly and normally distributed with equal variances at every predictor variable X (Malhotra, 2004). In detail, the coefficient represents the intercept, but the $b_s$ are the partial regression coefficients. For instance, $b_1$ denotes the change in the predicted value, $Y^{\wedge}$ per unit change in $X_1$ when the other independent variables have been, $X_2$ to $X_k$ are held constant (Malhotra, 2004).

### 6.5.2 Regression Indicators

This study used different types of multiple regression analyses, depending on the nature of the question the study wants to address. The two main types of regression analysis employed in this study are standard or simultaneous and stepwise. In this study, Y represents the criterion variables of BI, ATT, SN, or PBC in their equations, while the associated $X_1$, $X_2$, $X_3$…, $X_k$ are the independent or predictor variables. Using SPSS to carry out the regression operation provided some very important statistical tables like the model summary, ANOVA residual statistics and graphs.

R is the bivariate correlation between the observed values of the dependent variable and predicted values based on the regression equation, while, the (r) in lower case, is the partial regression coefficient in the coefficient table that gives the regression equation of the model. $R^2$ is the coefficient of multiple determinations. Adjusted $R^2$ denotes the goodness of fit of the model to the population taking into account sample size and the number of independents variables involved. Beta coefficient is the standardized regression coefficient that allows for direct comparisons between coefficients as to their relative explanatory power of the predictors. The coefficient table also provides the ***t*** value and *Sig* ***t*** value which indicate how the partial coefficients (slopes) differ significantly from zero. The partial *F* values are denoted as the partial *F*-test which is a statistical test for the additional contribution to predict accuracy of a variable above that of the variable already in the equation. *Durbin Watson* is the indictor of residual behavior examining the difference between the observed value and the value predicted by the regression equation. The *VIF* and *Tolerance* are indicator of the effect that the other independent variables have on the standard error of a regression coefficient. The study uses them as indictors of the collinearity or multicollinearity among the independent variables (Malhotra, 2004; Hair et al., 2006; Tabachnick and Fidell, 1983). The simple regression method (bivariate) is used with a single independent variable entered whereas in the regression equation this variable is responsible for explaining the variance in the predicted value. The following equation shows the form of regression model recommended: $Y= \beta_0+ \beta_1X_1+e$

This is estimated by the following equation: $Y^{\wedge}_{i} = a + bx_i$

Where $Y^{\wedge}$ is the predicted value of $Y_i$, and (a, and b) are estimators of $\beta_0$ and $\beta_1$ respectively. The hypothesis' technique associated with each variable of the research model, linking different salient beliefs as antecedents to direct predictor and direct predictor to BI, are discussed subsequently in the following sections.

### 6.5.3 Multiple Linear Regression Analysis for Testing Hypotheses

Preliminary analyses of multiple regression and principle component analysis were used and computed using SPSS to understand the initial associations between variables as well as to examine the research hypotheses. The research model then was developed and tested using the multivariate analysis techniques of simple regression and stepwise regression.

A stepwise regression was used as a cut-off to guide the research to the important independent variables that can contribute significantly to the prediction of the BI of the research sample to use educational technologies. Regression analysis is a powerful analytical tool designed to explore all types of dependence relationships (Hair et al., 2006). The objective of this study by using multiple regression analysis is in line with this technique which is to use the independent variables to predict the single dependent variable selected by the researcher (Hair et al., 2006; Malhotra, 2004). In order to use regression analysis for the best prediction of accuracy with regard to the population based on sample data obtained randomly, Malhotra (2004) and Hair et al. (2006) emphasize testing for the assumption of regression analysis which met with no violation, in which the assumptions to be examined are; outliers, multicollinearity and singularity, normality, linearity, homoscedasticity and independence of residuals. They can be assessed through regression analysis (Coakes and Steed, 2003).

### 6.5.4 Hypothesis-Testing Procedures

Overall, the hypothesis-testing sections are divided into two main parts. First the study considers a technique used to explore the relationships among variables followed by a technique used to explore the predictive ability of a set of independent variables on one continuous dependent measure. These two techniques are correlation and regression analysis. The next sub-section provides further explanations on each technique and its necessity for this study.

I. <u>Pearson's Correlation</u>

Pearson's bivariate correlation analysis (product-moment correlation) was performed to test the relationships between variables involved in the proposed regression model. According to Pallant (2005), this technique is used when researcher wants to know the strength and directions (positive or negative) of the relationship, as was also mentioned by Burns and Bush (2000). Besides, according to Coakes and Steed (2003), it is also referred to as zero-order correlation, which is the most common measure of linear relationships and provides coefficients with a range of possible values from -1 to +1. In fact, linearity is important in a practical sense because

Pearson's r only captures the linear relationships among variables (Tabachinck and Fidell, 2007).

Different authors interpret the correlation values differently (zero and ±1). For instance, Cohen and Cohen (1983) suggest using three categories of correlation interpretation; small when r value falls in the range ±0.10 to ±0.29, medium when r value falls between ±0.30 and ±0.49, and large when r value falls between ±0.50 and ± 1. On a contrary, Burns and Bush (2000) consider the correlation coefficient if r falls between ± 1 and ±0.81 to generally very high, and moderate if it falls between ±0.80 and ±0.61, while, when r value falls between ±0.60 and ±0.41 it typically indicates low correlation, and between ±0.40 and ±0.21 it is indicative of a very weak association. Meanwhile, correlation coefficients equal to or less than ±0.20 are uninteresting to IS, management, and marketing researchers.

This study adopts DOI, TPB, and DTPB and the guidelines suggested by Ajzen and Fishbein (1980). In social science, they reported that if r is greater than ±0.20 it is considered "satisfactory", while r value between ±0.30 to ±0.50 are moderate magnitude, and if value greater than ±0.50 are considered as strong relationships. In conducting multivariate analysis, Malhotra (2004) suggests that it is useful to examine the simple correlation between each pair of variables prior to performing the hypothesis testing by a method of regression because it also shows the direction of the variables' hypothesized format.

II. <u>Multiple Regression</u>

Pallant (2005) address that multiple regressions is a more sophisticated extension of correlation and used when the researcher wants to explore the predictive power of independent variables on the dependent variable. It is a useful method for determining the relationships between a dependent variable and predictor. It helps in investigating if some critical variables contribute to a prediction equation for a dependent variable with the effect of other predictors. It serves the purpose of testing research hypotheses. On the other hand, stepwise multiple regression is employed to test the hypotheses related to the influence of indirect and external variables on the dependent variables of the research model and then in turn, to answer the research questions. Mainly, the three groups of relationships the study has attempted to examine are as follow;

I. The relationships between the four direct predictors and the criterion variable purported in layer 1. (Proposition 1).

II. The two indirect relationships proposed in this study, which are; the attitudinal belief, and control belief. This study examines hypotheses of each belief separately to identify their relative predictors.

III. The relationships between demographic variables with BI to use ICT in the educational system.

In order to perform the study's hypotheses testing, Malhotra (2004) discusses that the test for the statistical significance of the linear relationship between the predictors and the dependent variable can be based on examining the alternative hypothesis ($H_1:\beta_1 \neq 0$). In this study, the t two-tailed test with n-2 is (415-2) = 413 degree of freedom use the t value which calculated by dividing the slope (b) with the standard errors ($SE_b$) as in the equation;

$t = b / SE_b$ (*Malhotra*, 2004)

The calculated value assigned to t is compared to the critical value if it is greater than the critical value with degree of freedom 413 and $\alpha = 0.05$. In this case, the null hypothesis of no relationship could be rejected. Then the researcher is required to identify the sign (+/-) of the standardized coefficient value (Beta) which determines whether the relationships examined are positive or negative. According to Bryman and Cramer (2001), standardized regression coefficients can be compared to determine which of the two or more independent variables are more important in relation to the dependent variable. In other words, the t value is used to assist in making the decisions on whether any variables should be dropped from the regression model equation. Furthermore, the standard error of the estimate is another measure which could be used to gauge the accuracy of the predication (Hair et al., 2006).

### 6.5.5 Pearson Correlation Analysis of Variables in the Study Model

This section presents the analyses of descriptive statistics of the variables utilized in the study's model that explains the academic staffs' BI to use ICT services in the educational system. The scores of the variables used in developing the proposed model are based on the process of summated items applied with each construct obtained by factor analysis (Appendix G). First, a Pearson product moment correlation matrix was computed in order to examine and understand the initial relationship between the different components of the TPB, DTPB, and DOI characteristics. The Pearson correlation analysis was computed to understand the initial direction of the relationships between pairs among variables prior to examining the research hypotheses. Appendix G, presents a summary of the correlation test findings applied on the variables of the study.

## 6.6 Results of Research Hypotheses

As specified previously in Chapter 1, the second research question for this study is; *"What are the prominent predictors of ICT adoption in higher education system that could affect academic staffs' behavioral intention?"*

### 6.6.1 Result of Hypothesis: Hypothesis1 (H1)

In line with TPB, RQ2 is answered by identifying how the direct factors of TPB, DTPB, and DOI namely, ATT, SN_WoM, MMC, and PBC do directly predict and explain the academic staffs' BI to use ICT in their teaching system.

Regarding to that, Table 6.14 outlines the results of the Pearson's correlation carried out on four psychological determinant of BI; ATT ($r=.791$, $P < .01$), SN_WoM ($r=.831$, $P < .01$), MMC ($r=.456$, $P<.01$) and PBC ($r = .745$, $P < .01$). The findings highlight that all variables are highly correlated, significant, and in the expected positive direction, except the MMC which has a moderate correlation. The findings also reveal that SN_WoM is the most highly correlated with the BI followed in order by the ATT, PBC, and then by MMC. The significant results obtained by the simple correlation analysis imply that the BI to use ICT could be a function of those psychological variables (Ajzen, 1991).

*Table 6.14: Mean, SD, Alpha and Zero-order Correlation (Main Psychological Variables Vs BI)*

| | | | Model's Main Variables | | | | |
|---|---|---|---|---|---|---|---|
| **Variables** | ***M*** | **SD** | **DV1** | **IV1** | **IV2** | **IV3** | **IV4** |
| DV1- BI | 4.96 | 1.47 | (0.83) | | | | |
| IV1- ATT | 4.46 | 1.36 | $^{**}.791$ | (0.73) | | | |
| IV2- SN_WOM | 4.59 | 2.10 | $^{**}.831$ | $^{**}.736$ | (0.98) | | |
| IV3-MMC | 5.64 | .958 | $^{**}.456$ | $^{**}.400$ | $^{**}.362$ | (0.75) | |
| IV4- PBC | 5.17 | 1.49 | $^{**}.745$ | $^{**}.570$ | $^{**}.642$ | $^{**}.385$ | (0.91) |

*Note*. **P<0.01

A multiple regression analysis was conducted to determine the independent relations as well as the contribution of each of these variables in predicting the BI as a criterion variable. The results of the analysis are displayed in Table 6.15. The relevant four hypotheses on the relationships between these variables; H1a, Hlb, H1c and H1d, are required to answer RQ2. The findings based on statistical assessments, which are presented in Table 6.15 reveal that;

I. The regression equation is significant ($F= 464.514$, $p< 0.001$) and the accuracy of the regression model is supported by the examination of the residuals.

II. The standardized coefficient Beta (β) for ATT are positive and significant, indicating that there is positive linear relationship between ATT and the BI to adopt educational ICT in the teaching system at $p< 0.001$. This supports the study's hypothesis (H1a) for being statistically true.

III. The standardized coefficients Beta (β) for SN_WoM is significant at $p<0.001$ and the beta value is positive, therefore, this result supports the hypothesis H1b, which means there is a significant and positive linear relationship between SN_WoM and BI to adopt ICT in the teaching system (H1b).

IV. The standardized coefficients Beta (β) for MMC is significant at $p<0.001$ and the beta value is positive, therefore, this result supports the hypothesis H1c in which there is a significant and positive linear relationship between MMC and BI to adopt ICT in the teaching system (H1c).

V. Similarly, the standardized coefficients Beta (β) for PBC is positive and significant at p<0.001, indicating that there is a positive relationship between the BI to use ICT in teaching system and PBC. Hence, the hypothesis (H1d) is supported.

*Table 6.15: Results of Multiple Linear Regression: Direct Predictors vs. BI*

| Predictor Variable | Unstandardized Coefficients | | Standardized Coefficients | t |
|---|---|---|---|---|
| | B | Std.Error | Beta | |
| IV1-ATT | 0.331 | 0.035 | 0.307 | 9.557* |
| IV2-SN_WoM | 0.274 | 0.024 | 0.392 | 11.575* |
| IV3-MMC | 0.124 | 0.036 | 0.081 | 3.445* |
| IV3-PBC | 0.282 | 0.028 | 0.287 | 10.128* |
| R: | 0.905 | | | |
| $R^2$ | 0.819 | | | |
| Adjusted $R^2$: | 0.817 | | | |

| | DF | Analysis of Variance | | F | Sig of F |
|---|---|---|---|---|---|
| | | Sum of Squares | Mean Square | | |
| Regression | 4 | 733.307 | 183.327 | 464.514 | 0.000 |
| Residual | 410 | 161.812 | 0.395 | 1 | |

*Note*. **P<.01, *P<.05

### 6.6.2 Result of Hypothesis: Hypothesis2 (H2)

Hypothesis 2 represents the question regarding the applicability of TPB’s Model and how well the four independent variables (ATT, SN-WoM, MMC, and PBC) explain the dependent variable (Bl). In order to test this hypothesis, Bryman and Cramer (2001) suggest that “*the use the coefficient of determination as a measure of how well the line of best fit represents the relationship between the two variables, and* *can also compute the multiple coefficient of determination ($R^2$) of the collective effect of all of the independent variables*".

With regards to that the findings in Table 6.15 support to the hypothesis H2 and show that;

I. The entire model of all the four variables (ATT, SN_WoM, MMC, and PBC) has a positive and significant effect on the BI to use ICT in the educational system.

II. Collectively, these variables have a predictive power of $R^2$= 82% in explaining the variance related to individual's BI towards the adoption of ICT. Meanwhile, the F-value of the model which is 464.514 is significant at p= 0.000< 0.01 level. Hence, this implies that only 18% of the variance in BI is not explained by the variables in the equation.

III. It is noted that SN_WoM variable have the most powerful significant predictor that explains 39% of the variance in the BI to adopt ICT followed by ATT 31%, PBC 29%, and MMC the least powerful of the predictors with 8%.

IV. Adjusted $R^2 = 0.817$ denotes the goodness of fit of the model because it is very close to the $R^2 = 0.819$ and F-value of 464.514 significant at $p=0.000<.001$ to the population, by taking into account the sample size and the number of independent variables involved.

### 6.6.3 Result of Hypothesis: Hypothesis3 (H3)

According to the proposed model, the salient beliefs mentioned by Hypothesis 3 involved two models; behavioral beliefs, and control beliefs (related to H4 and H5).

### 6.6.4 Result of Hypothesis: Hypothesis4 (H4)

The relationships between the behavioral beliefs of individuals on ICT (as measured by the Rogers' attribute) were investigated using Pearson's product-moment correlation coefficient. In accordance, preliminary analyses were performed to ensure no violation of the assumptions of linearity, normality, and homoscedasticity. Hence, the results of the Pearson's correlation coefficients on Rogers' (1995) five attributes with individual's ICT-use ATT and their intention are displayed in Table 6.16. With reference to Table 6.16 there is a strong, positive correlation between the academic staffs' BI to use ICT and the observability variable ($r= 0.729$, $p< 0.01$) and their ATT with observability ($r= 0.669$, $p< 0.01$), as well as, with respondents' BI and their perceptions on the ICT compatibility ($r =0.690$, $p< 0.01$), and their perception on ICT compatibility with ATT ($r= 0.636$, $p< 0.01$). Besides, the association between the respondents' ICT-use attitude and their perception of the relative advantage to use ICT is also positive ($r= 0.314$, $p< 0.01$), similarity with their ICT intention (BI) with the perception of the relative advantage (r= 0.377, P< 0.01). In addition, the variable trialability is considered significant with ATT (r= 0.382, p< 0.01), and (r= 0.496, p< 0.01) with BI. The last variable is complexity, the value of this variable with the ATT (r= -0.409) and with the BI to use it (r= -0.325). These findings draw the attention that an inverse relationship between ICT complexity and academic staffs' ATT and BI to use ICT exists. It suggests that the complexity construct is a very useful in addressing educational technologies adopters' unwillingness to use ICT when it is very complex.

*Table 6.16: M, SD, Alpha Reliability and Zero-order Correlation (ICT Attributes Vs ATT and BI)*

| **Variables** | ***M*** | **SD** | **IV1** | **IV2** | **IV3** | **IV4** | **IV5** | **DV1** | **DV1** |
|---|---|---|---|---|---|---|---|---|---|
| IV1- RA | 5.53 | 1.003 | (0.74) | | | | | | |
| IV2- COMPT | 4.35 | 1.950 | **0.300 | (0.92) | | | | | |
| IV3- COMPX | 2.88 | 1.158 | -0.164 | -0.261 | (0.69) | | | | |
| IV4- TRIAL | 2.40 | 1.095 | **0.227 | **0.345 | -0.231 | (0.71) | | | |
| IV5- OBSERV | 4.66 | 2.029 | **0.399 | **0.663 | -0.272 | **0.360 | (0.96) | | |
| DV1- ATT | 4.47 | 1.363 | **0.314 | **0.636 | -0.409 | **0.382 | **0.669 | (0.73) | |
| DV2- BI | 4.97 | 1.470 | **0.377 | **0.690 | -0.325 | **0.496 | **0.729 | **0.791 | (0.83) |

*Note*. * P<.05, ** P<.01

The model, which explains the significance of the formative relationship between the ICT attribute, is drawn from the stepwise multiple regression analysis. Along this line, multiple regression was applied to examine the perception and the influence of the five extracted attributes on the behavioral belief in accordance with Rogers' (1995) five attributes of innovation to explain the attitude towards educational technologies. The five sub-hypotheses H4a, H4b, H4c, H4d, and H4e are required to test the research hypothesis H4, in which the results of the analysis are displayed in Table 6.17.

*Table 6.17: Results of Multiple Linear Regression: ICT Attribute Vs Attitude*

| **Predictor Variable** | **Unstandardized Coefficients** | | **Standardized Coefficients** | **t** |
|---|---|---|---|---|
| | B | Std.Error | Beta | |
| OBSERV | 0.253 | 0.031 | 0.377 | 8.163* |
| COMPT | 0.206 | 0.031 | 0.294 | 6.637* |
| COMPX | -0.241 | 0.041 | -0.205 | -5.937 |
| TRIAL | 0.115 | 0.045 | 0.093 | 2.583* |
| RA | 0.028 | 0.049 | 0.021 | 0.584 |
| R: | 0.752 | | | |
| $R^2$ | 0.565 | | | |
| Adjusted $R^2$: | 0.559 | | | |

| | **DF** | **Analysis of Variance** | | **F** | **Sig of F** |
|---|---|---|---|---|---|
| | | Sum of Squares | Mean Square | | |
| Regression | 5 | 434.545 | 86.909 | 106.163 | 0.000 |
| Residual | 409 | 334.823 | 0.819 | 1 | |

*Note*. *P<.01

As seen in Table 6.17, the relevant statistical findings reveal that;

I. The regression equation is found significant (F= 106.163, p< 0.001) and the accuracy of the regression model is supported by the examination of the residuals.

II. The standardized coefficient values for relative advantage is β= 0.021 which is positive but insignificant at p< 0.01. Therefore, research hypothesis H4a is not supported. As a result, the null hypothesis H4a (there was no relationship between the individual's ATT and perceived relative advantage to use it of educational system) could be accepted.

III. The standardized coefficients $\beta = 0.294$ value for compatibility are positive and significant at $p < 0.01$. As a result, the null hypothesis H4b (there was no relationship between the individual's ICT-use attitude and perceived compatibility of educational system) could be rejected, and supports research hypothesis H4b.

IV. The standardized coefficient values for complexity is $\beta = -0.205$. It is insignificant at $p < 0.01$ with a negative sign. As a result, the null hypothesis could be accepted, indicating that (there was no relationship between the individual's ATT and perceived complexity of using it), which does not support the research hypothesis H4c.

V. The standardized coefficients $\beta = 0.093$ value for trialability is positive and significant at $p < 0.01$, and therefore, the research hypothesis H4d is supported.

VI. The standardized coefficients $\beta = 0.377$ value for observability is positive and significant at $p < 0.01$. Therefore, the research hypothesis H4e is supported.

Concerning hypothesis H4, the inspection of beta values for the five independent variables are positive except for complexity, which is negative. In response to this, Table 6.17 also exhibits that the entire model, combining the five variables, has a significant influence on the ATT, therefore, the findings partially support hypothesis H4.

### 6.6.5 Result of Hypothesis: Hypothesis5 (H5)

Ajzen (1991) addresses that "*the more resources and opportunities individuals believe they possess, and the fewer obstacles or impediments they anticipate, the greater should be their perceived control over the behavior*". With regards to the perception on control, Table 6.18 displays the relationships between the individual's control beliefs of ICT (as measured by FC and SE) investigated in this study using Pearson's correlation. Preliminary analyses were conducted to ensure no violation of the assumptions of linearity, normality, and homoscedasticity.

*Table 6.18: Mean, SD, Alpha Reliability and Zero-order Correlation (Control Belief Vs PBC and BI)*

| Variables | *M* | SD | BI | PBC | SE | TFC | RFC | GFC |
|---|---|---|---|---|---|---|---|---|
| DV1-BI | 4.96 | 1.47 | (0.83) | | | | | |
| DV2- PBC | 5.174 | 1.498 | .745** | (0.91) | | | | |
| IV1- SE | 5.720 | 1.168 | .625** | .700** | (0.90) | | | |
| IV2-TFC | 4.947 | 1.930 | .805** | .679** | .599** | (0.95) | | |
| IV3- RFC | 4.914 | 1.758 | .746** | .687** | .631** | .850** | (0.94) | |
| IV4-GFC | 5.730 | 0.857 | .675** | .545** | .543** | .552** | .550** | (0.67) |

*Note*. ** P<.01

As seen in the Table 6.18, there is a strong, positive correlation between the academic staffs' SE with respect to ICT-use and their BI and their PBC ($r= 0.745$ (BI), $r= 0.700$ (PBC), at $p< 0.01$). Concerning the three variables of FC, it is revealed that there is a strong, positive relationship between BI and PBC with all FC as follows, TFC ($r= 0.805$ (BI), $r= 0.679$ (PBC), $p< 0.01$); RFC ($r= 0.746$ (BI), $r= 0.687$ (PBC), $p< 0.01$); and GFC ($r= 0.675$ (BI), $r= 0.545$ (PBC), $p<0.01$). On the other hand, Table 6.19 shows the control belief result obtained by conducting multiple regression analysis.

*Table 6.19: Results of multiple Regression: Control Belief Vs PBC*

| **Predictor Variable** | **Unstandardized Coefficients** | | **Standardized Coefficients** | **t** |
|---|---|---|---|---|
| | B | Std.Error | Beta | |
| IV1-SE | 0.496 | 0.054 | 0.386 | 9.256* |
| IV2-TFC | 0.175 | 0.046 | 0.226 | 3.786* |
| IV3-RFC | 0.165 | 0.052 | 0.193 | 3.165* |
| IV4-GFC | 0.182 | 0.068 | 0.104 | 2.671* |
| R: | 0.783 | | | |
| $R^2$ | 0.614 | | | |
| Adjusted $R^2$: | 0.610 | | | |

| | **DF** | **Analysis of Variance** | | **F** | **Sig of F** |
|---|---|---|---|---|---|
| | | Sum of Squares | Mean Square | | |
| Regression | 4 | 570.398 | 142.600 | 162.812 | 0.000 |
| Residual | 410 | 359.101 | 0.876 | 1 | |

*Note*. **P<.001, *P<.05

The standardized coefficients (β) values for SE, TFC, RFC, and GFC are positive and all of them are significant. Therefore, there are significant relationship between PBC and the academic staffs' perception on SE and TFC, RFC, and GFC, to use ICT in the educational system. Thus, the results support all hypotheses on SE and FC (H5a, H5b, H5c, and H5d). Based on the findings in this section, Table 6.20 provides a summary of the entire results of the hypotheses testing.

*Table 6.20: Summary of Hypotheses Testing*

| Techniques | (DV) | | (IV) | Statistic Test | | | |
|---|---|---|---|---|---|---|---|
| | | $H_i$ | | T | Sig. | Beta | Results |
| M R + FA | BI | $H_{1a}$ | ATT | 9.557 | .000 | 0.307 | Supported*** |
| | (H1, H2) | $H_{1b}$ | SN_WoM | 11.575 | .000 | 0.392 | Supported*** |
| | | $H_{1c}$ | MMC | 3.445 | .001 | 0.081 | Supported*** |
| | | $H_{1d}$ | PBC | 10.128 | .000 | 0.287 | Supported*** |
| M R + FA | H3 | H3 | Behavioral Beliefs | | | | Supported |
| | | H4 | Control Beliefs | | | | Supported |
| FA + MR | ATT | $H_{4a}$ | RA | 0.584 | .056 | 0.021 | Rejected |
| | H4 | $H_{4b}$ | COMPT | 6.637 | .000 | 0.294 | Supported*** |
| | | $H_{4c}$ | COMPX | -5.937 | .000 | -0.205 | Rejected*** |
| | | $H_{4d}$ | TRIAL | 2.583 | .010 | 0.093 | Supported** |
| | | $H_{4e}$ | OBSERV | 8.163 | .000 | 0.377 | Supported*** |
| MR + FA | PBC | $H_{5a}$ | SE | 9.256 | .000 | 0.386 | Supported*** |
| | H5 | $H_{5b}$ | TFC | 3.786 | .000 | 0.226 | Supported*** |
| | | $H_{5c}$ | RFC | 3.165 | .002 | 0.193 | Supported** |
| | | $H_{5d}$ | GFC | 2.671 | .008 | 0.104 | Supported** |

*Note*. ***P <0.001, **P<0.01, *P<0.05.

### 6.7 Study's Model of Direct and Extended Determinants

An exploration of the influences of the proposed extended model of direct predictors (ATT, SN_WoM, MMC and PBC) on predicting the intention to use ICT is one of this study's aims. Multiple regressions and the stepwise method were employed in this part of the analysis where the four direct variables of BI are entered. Table 6.21

shows the findings of the best regression model accounting for the direct predictors of BI to use ICT.

*Table 6.21: Extended TPB's Model of Direct Determinants*

| **Model** | **Independent Variable** | **B** | **Beta** | **t** | **F** | **p** |
|---|---|---|---|---|---|---|
| | | | | | 923.867 | .000 |
| 1 | Constant | 2.291 | | 23.696 | | .000 |
| | IV1- SN_Wom | 0.582 | 0.831 | 30.395 | | .000 |
| | | | | | 677.602 | .000 |
| 2 | Constant | 1.209 | | 9.616 | | .000 |
| | IV1- SN_Wom | 0.421 | 0.601 | 19.372 | | .000 |
| | IV2- PBC | 0.352 | 0.359 | 11.573 | | .000 |
| | | | | | 599.549 | .000 |
| | Constant | 0.573 | | 4.457 | | .003 |
| 3 | IV1- SN_Wom | 0.277 | 0.395 | 11.528 | | .000 |
| | IV2- PBC | 0.299 | 0.305 | 10.789 | | .000 |
| | IV3- ATT | 0.352 | 0.327 | 10.205 | | .000 |
| | | | | | 464.514 | .718 |
| | Constant | 0.070 | | 0.362 | | .000 |
| 4 | IV1- SN_Wom | 0.274 | 0.392 | 11.575 | | .000 |
| | IV2- ATT | 0.331 | 0.307 | 9.557 | | .000 |
| | IV3- PBC | 0.282 | 0.287 | 10.128 | | .000 |
| | IV4-MMC | 0.124 | 0.081 | 3.445 | | .001 |

**Table Summary**

| Model | R | $R^2$ | Adj. $R^2$ | F | p |
|---|---|---|---|---|---|
| 1 | 0.831 | 0.691 | 0.690 | 923.867 | .000 |
| 2 | 0.876 | 0.767 | 0.766 | 677.602 | .000 |
| 3 | 0.902 | 0.814 | 0.813 | 599.549 | .000 |
| 4 | 0.905 | 0.819 | 0.817 | 464.514 | .001 |

*Note*. DV- BI, P<0.01

In the findings, model 4 which includes the determinants of the BI in the proposed model (ATT, SN_WoM, MMC, and PBC) with the new SN variables reveal that the variations in all of the direct determinates collectively explain significant ($R^2$=0.82) variance in BI. It is depicted in the equation (model four) that a significant F value (464.514) at $p < 0.01$ level exists. In fact, there is 99.9 percent of confidence in explaining the dependent variable. This is an indicator of the applicability of the extended TPB's model in predicting BI in the context of the use of ICT in educational system in Jordanian universities.

## 6.8 Study's Model Development

Stepwise regression was used in this study because it is useful to identify the predictors that account for the most of the variation in the criterion variable (Malhotra, 2004). Furthermore, it was used as a cut-off to guide the research to the important independent variables that can contribute significantly to the prediction of the dependent variable such as BI to use ICT in the educational system based on the study's sample. In other words, to obtain the best predictive model in equated regression the ability of the stepwise method to add and delete makes it the preferred method among most researchers (Hair et al., 2006). The best model of direct predictors, belief on ICT attributes, normative belief, control belief, are shown in Table 6.22 in which all the results having been checked to ensure no violation to the regression assumption in the developed model.

In this study, the regression analysis technique is helpful to assist the study in obtaining the best model that has the greatest values of $R^2$. Malhotra (2004) highlights that the stepwise procedure sometimes has problems, such as an important variable may never be included, or less important variables may enter the equation. Thereupon, another approach to stepwise regression like the one backward elimination was also employed and according to Hair et al. (2006) this procedure, "*starts with regression equation including all the independent variables and then deletes independent variables that do not contribute significantly*". In this study, the stepwise regression analysis, for the extended direct predictors (ATT, SN_WoM, MMC and, PBC), and indirect predictors (comprising the beliefs on direct predictors) was performed separately to each group as highlighted in the research framework.

### 6.8.1 Behavioral Intention

Table 6.22 displays that there are four significant formative variables at $P < 0.01$ related to respondents' ICT-use BI whereby they can collectively explain 82 percent of the variance in their BI of ICT-use. The findings of multiple regressions that were carried out on the direct determinant of ICT use in the educational system provide the following regression equations;

(1) BI = 2.291 + 0.582 (SN_WoM) + e

(2) BI = 1.209+ 0.421 (SN_WoM) + 0.352 (PBC) + e

(3) BI = 0.573 + 0.277 (SN_WoM) + 0.299 (PBC) + 0.352 (ATT) + e

(4) BI = .070 + 0.274 (SN_WoM) + 0.282(PBC) + 0.331 (ATT) + 0.124 (MMC) + e

Among all, the equation provided by model four is the most adequate to consider because all entered variables meet the criteria of generalizability to the population.

### 6.8.2 Attitude towards Technology

Table 6.22 also explains that there are four significant formative attributes related to the respondents' ICT-use ATT to meet the criteria of stepwise regression. The results of the behavioral beliefs' model based on the teaching staffs' perception of ICT attributes provides the following regression equations;

(1) (ATT) = 2.368 + 0.450 (OBSERV) + e

(2) (ATT) = 2.038 + 0.297 (OBSERV) + 0.239 (COMPT) + e

(3) (ATT) = 2.992 + 0.271 (OBSERV) + 0.217 (COMPT) + -0.256 (COMPX) + e

(4) (ATT) =2.78+0.258 (OBSERV) +0.206(COMPT) +-0.242(COMPX) +0.117 (TRIAL) + e

### 6.8.3 Control Belief

Control belief components of SE and FC were treated as independent variables and regressed with the dependent variable PBC. Referring to Table 6.22, it provides the simple regression for (SE, TFC, GFC, and RFC) as independent variables for the criterion variable PBC, indicating that 61% of the variance in PBC can be explained by the variance of the individual's SE and FC variables. An examination of the four independent variables (entered into the regression equation as formative predictors for the PBC) provides four regression equation models as follows;

(1) PBC= 0.035+ 0.899 (SE) + e

(2) PBC = 0.261 + 0.587 (SE) + 0.314 (TFC) + e

(3) PBC = 0.268 + 0.536(SE) + 0.194(TFC) + 0.179 (RFC) + e

(4) PBC = -0.382 + 0.496(SE) + 0.175(TFC) + 0.165 (RFC) + 0.182 (GFC) + e

*Table 6.22: Regression Result: Predicting Overall Behavioral Intention by Psychological Determinants*

| **Independent Variable** | **B** | **t** | **$R^2$** | **F** | **p** |
|---|---|---|---|---|---|
| DV1- BI | | | | | |
| | | | 0.819 | 464.514 | .718 |
| Constant | 0.070 | 0.362 | | | .000 |
| IV1- SN_WoM | 0.274 | 11.575 | | | .000 |
| IV2- PBC | 0.282 | 10.128 | | | .000 |
| IV3- ATT | 0.331 | 9.557 | | | .000 |
| IV4-MMC | 0.124 | 3.445 | | | .001 |
| | Summary Table | | | | |
| Model | R | $R^2$ | Adj. $R^2$ | F | p |
| 1 | 0.831 | 0.691 | 0.690 | 923.867 | .000 |
| 2 | 0.876 | 0.767 | 0.766 | 677.602 | .000 |
| 3 | 0.902 | 0.814 | 0.813 | 599.549 | .000 |
| 4 | 0.905 | 0.819 | 0.817 | 464.514 | .000 |
| Independent Variable | B | t | $R^2$ | F | p |
| DV2- ATT | | | | | |
| Constant | 2.780 | 13.423 | 0.564 | 132.832 | .000 |
| IV1- OBSERV | 0.258 | 8.608 | | | .000 |
| IV2- COMPT | 0.206 | 6.665 | | | .000 |
| IV3- COMPX | -0.242 | -5.975 | | | .000 |
| IV4- TRIAL | 0.117 | 2.643 | | | .009 |
| | Summary Table | | | | |
| Model | R | $R^2$ | Adj. $R^2$ | F | p |
| 1 | 0.669 | 0.448 | 0.447 | 335.180 | .000 |
| 2 | 0.717 | 0.514 | 0.511 | 217.602 | .000 |
| 3 | 0.746 | 0.557 | 0.554 | 172.271 | .000 |
| 4 | 0.751 | 0.564 | 0.560 | 132.832 | .000 |
| Independent Variable | B | t | $R^2$ | F | p |
| DV3- PBC | | | | | |
| | | | .614 | 162.812 | .256 |
| Constant | -0.382 | -1.138 | | | .000 |
| IV1- SE | 0.496 | 9.256 | | | .000 |
| IV2- TFC | 0.175 | 3.786 | | | .000 |
| IV3- GFC | 0.165 | 3.165 | | | .002 |
| IV4- RFC | 0.182 | 2.671 | | | .008 |
| | Summary Table | | | | |
| Model | R | $R^2$ | Adj. $R^2$ | F | p |
| 1 | 0.700 | 0.491 | 0.489 | 397.740 | .000 |
| 2 | 0.772 | 0.696 | 0.594 | 303.499 | .000 |
| 3 | 0.779 | 0.607 | 0.604 | 211.548 | .000 |
| 4 | 0.783 | 0.614 | 0.610 | 162.812 | .000 |

*Note*. $P<0.05$

## 6.9 Concluding Comments

This chapter discusses the findings of the analysis. The findings include descriptive analyses of the academic staffs' demographic factors and comparison with the use of common technologies services and their influences on academicians' BI to use ICT in the educational system. The chapter also explains the results of hypotheses testing and defines the variables in the proposed model. The findings reveal that all direct predictors (ATT, SN_WOM, MMC, and PBC) have positive effects on the academic staffs' BI to use ICT in their teaching and learning process. Finally, the chapter argues with the findings that derive a new model of the study from the adoption theories and variables that were used in the proposed model. Next chapter concludes the thesis by summarizing the research questions and objectives, explaining the implications, limitations and addressing the suggestions for the future studies in the fields of IS adoption and especially education technologies.

CHAPTER Seven

# CONCLUSION

## 7.1 Introduction

The last chapter aims at summarizing the findings of the study that focuses on identifying the factors that influence the academic staffs' BI to adopt and use ICT in the educational system. The chapter starts by explaining how the research questions and objectives have been answered and achieved based on the findings. Next, this chapter concludes the findings of the study related to the factors that significantly influence on the academicians to adopt and use ICT in their teaching and learning process. It continues with a discussion on the implications by highlighting on the theoretical, methodological, and practical implication in relation to the study's findings. Further, the chapter outlines the limitations of the study, and some suggestions and directions for future research.

## 7.2 Discussion on Research Questions and Research Objectives

This study posed three main research questions together with the research objectives to help solve the research problem. In order to answer the research questions and achieve the objectives, statistical tests were applied in hypotheses testing. The following sections discuss the results of the study in relation to the research questions and objectives.

### 7.2.1 Demographic Factors

The first research question is concerned with the influences of academic staffs' demographic factors such as gender, age, educational level, major, and experience, to the university's teaching staff in relation to ICT adoption in teaching and learning process. It is associated with RQ1, in which the question refers to

"*What are the differences related to the demographic characteristics that could affect the university's teaching staff in predicting ICT adoption in the educational system?"*

This question concerns the academic staffs' demographic characteristics and their relationships with the use of common technologies and their BI to use ICT in the teaching and learning process. Whereas, the equivalent objective relevant to this research question is,

*RO1: To determine the relationships between the academic staffs' demographic characteristics with the use of common technologies that affects them to adopt ICT in teaching and learning process.*

To answer RQ1 and achieve the related research objective, the study has conducted a comparison between the demographic factors and common technologies which are considered as important issues to influence the adoption and use of educational technologies. Independent sample t-test was done to identify the relationship between demographic factors such as gender, higher education degree, place of obtaining the degree, and the major, with the common technologies such as computers, Internet, mobile phones, and PDA. As displayed in Table 6.5 the results reveal that there is a statistically significant relationship between the academic staffs' higher education degree and major with the use of computers and mobile phones. Also, there is a statistically significant relationship between the academicians' major and the using of Internet, while no relationship is found between the demographic factors with the use of PDA. Also, the results revealed that there is no relationship between the demographic factors and the frequently used of these common technologies as shown in Table 6.6.

Besides, ANOVA test was used to compare between age and experience with the use of ICT services as shown in Table 6.7. It is found that there are significant differences between the use of computers and the age groups under 30 years old, and between 41 and 50 years old; and between 41 and 50, and 51 years old or older. About the Internet usage, there are also significant differences based on the age groups (under 30 years old and between 41 and 50 years old; and 51 years old or older with (between 30 years old and 40 years old; and between 41 years old and 50 years old, respectively)). However, there is no significant difference between the experience and the use of computers and Internet.

Consequently, the results show that there are statistically significant differences in the use of mobile phones and teaching staffs' experience group (between 1 year to 5 years and between 6 years to 10 years), while no statistically significant differences between the age and the use of mobile phones is found. Besides, there are statistically significant differences in the use of PDA and age groups (between 41 years old and 50 years old, and between 51 or older years old) and experience groups (between 11 years to 15 years and (between 1 year to 5 years, and 6 years to 10 years, respectively)). In a nutshell, age is significantly different with computer, Internet and PDA, while experience is significantly different with computers, mobile phones and PDA (Table 6.8).

On the other hand, As shown in Table 6.9 there are statistically significant between frequently use of Internet and age groups (51 years old or older and (under 30 years old, between 30 years old to 40 years old, and between 41 years old to 50 years old, respectively)). It is similar with frequently use of PDA with age group (between 40 years old to 50 years old and 51 years old or older) and with experience groups (from 11 years to 15 years and (between 1 year to 5 years, and between 6 years to 10 years, respectively)). As a result, age is significantly different with frequently use of computers, Internet, and PDA, while experience is significantly different with frequently use of PDA (Table 6.10).

Further, to determine the relationship between academic staffs' demographic characteristics and their BI to ICT in the educational system, the correlation was used between dichotomous or categorical variables (Phi Coefficient), as shown in Table 6.11. In this connection, the relationships involved in the current study were subjected to a non-parametric test for which the Pearson's chi-square test was utilized. The findings show that gender and age of university's teaching staffs have significant associations with their BI to ICT adoption. In other words, there are significant differences between the academic staffs' BI and their gender and age, while there are no significant differences with other demographic characteristics.

### 7.2.2 Prominent Predictor of ICT Adoption

The second research question ponders on the prominent factors (direct and indirect) that influence academic staffs' BI to adopt ICT in their teaching and learning process. RQ2 as is "*What are the prominent predictors of ICT adoption in higher education system that could affect academics staffs' behavioral intention?"*

This question focuses on exploring the direct and indirect factors that influence academic staffs' BI to adopt ICT in their teaching and learning process.

The equivalent research objectives to this research question are:

*RO2: To determine the prominent predictors that influences the successful adoption of information technology education by academicians in Jordanian public universities.*

*RO3: To develop an ICT adoption model to promote the adoption and usage of ICT in teaching and learning process to universities academic staff.*

To answer RQ2 and achieve the objectives, the study has identified factors that influence the academic staffs' BI to adopt and use ICT in the Jordanian higher educational system. The factors were derived from the previous literature and adoption theories. The study adopts, DOI, TPB, and DTPB to conclude for the suitable factors and propose the model. There are four direct factors derived from these theories and explored by the results of factor analysis. These factors are (i) ATT, (ii) SN_WoM, (iii) MMC, and (iv) PBC, which are considered as the independent factors to the BI, determined as the dependant factor.

Multiple regressions were conducted to identify the relationship between the dependent and independent factors. The study finds that there are supported significant relationships between BI and the four direct determinants (ATT, SN_WoM, MMC, and PBC). Thus, according to the Table 6.14, the rank of the direct prominent determinants of BI to adopt ICT in the educational system, are SN_WoM, ATT, PBC, and MMC. This study has extended a model of the direct predictors that merged SN field from three factors into two direct factors to the BI. Logically, merge these two factors is considered normal, because the W-o-M factor is a part of SN field. So, the respondents of the study feel that these two factors related to the same factor. Therefore, the result of factor analysis merges these two factors into one factor (Table 5.15). Although the extended model shows the differences in the SN predictor, it takes the highest important variable to the prediction of BI. These results have led to the suggestion that the BI to use ICT in the educational system is under greater SN_WoM, attitudinal, control aspect than media aspect. However, the technologies in the Jordanian higher educational institutions are relatively new, but, there were some academic staff who used it during their study or during their work in a university, so, the effect of SN-WoM is considered high because these academic staff are influenced by their colleagues to adopt and use the educational technologies in their teaching and learning process. On the other hand, the media needs to be more powerful to encourage the adoption and usage of ICT in the higher educational institutions. The media in the Arab world, however, is not playing a critical role in the higher education institutions to adopt and use ICT in the educational system.

With regards to the indirect factors which are used in this study and derived from the behavioral beliefs and control beliefs to use ICT in the educational system. As expected, the results of the PFA shown in Table 5.13 reveal that all the factors that Rogers (1995) defines in the DOI appear as separated factors. The behavioral belief factors are relative advantage, compatibility, complexity, trialability, and observability. Concerning the findings of these factors on the academic staff in the Jordanian higher institutions (Table 6.16), the findings are in contrast with previous studies of ICT adoption, in which this study find that observability is one of the best predictors, and has a significant influence on the academic staffs' BI. Different cultures between the Arab world and developed world with the prestige to the academicians in the Arab world are considered critical reasons to this result. The compatibility is ranked second; which show that it has a significant positive relationship with ICT adoption. In the previous studies on diffusion, some researchers found that compatibility has a relatively lower magnitude in predicting the rate of adoption than the relative advantage and complexity attributes (Rogers, 1983; Liao et al., 1999). On the contrary, Gerrard and Cunningham (2003), Black, Lockett, Winklhofer, and Ennew (2001), and Lassar et al. (2005) claim a higher magnitude of significant positive relationship.

Consequently, complexity attribute shows that it has negative relationship with the ATT and with the BI to use it. This is in agreement with past ICT diffusion studies, which found that the ease of use of an innovation is an important motivator and a predictor of its rate of adoption. So, the complexity of using ICT is a motivator to reject using these technologies. Tan and Teo (2000) studied the construct from the complexity side and they found that the complexity has a negative relationship with the adoption intentions. Apparently, the complexity of an innovation (contrary meaning to ease of use) is hypothesized by Rogers (1995) to be a negative association with its rate of adoption. The attribute of ease of use could be an important motivator or inhibitor (complexity) to its rate of adoption.

In respect to trialability, findings of this study reveal that trialability has a significant positive relationship with the BI towards ICT adoption. Since there is minimum focus on research on this area in developing countries, past research in this area considered this relationship from developing countries, this construct of trialability could be more important to non-western and developing countries than it is to develop ones where individuals might be more exposed to similar technologies of the educational institutions system familiar usage of ICT. In the respect of trialability needs to be investigated in a similar context and could be applied pioneer adopters in developing countries. Finally, relative advantage attribute have a lower rank in the influences of academic staffs' intention to use ICT in their teaching and learning process.

There are many reasons for the results of the study in the behavioral belief attributes to use ICT in the higher education institutions. As shown the results are contrast with many studies were conducted in developed countries in the field of IS adoption. For clarification, Arabic culture is different from other cultures in developed nations and other developing countries, which is considered as one of the critical reason for these results. On the other hand, the study conducted on Jordanian higher education institutions which have a special case in the developing countries in general and Arab world in particular. Jordan is considered a poor country of natural resources and the educational system is considered in a high level by comparing it with other Arabian countries. Unfortunately, the income for academic staff is considered in the low level by comparing with other Arab countries, especially the Gulf countries. So, many academic staff wants to find new opportunities outside the country to improve their standard of living. Regards to the relative advantage, which is defined as "*the degree to which a technology or any new innovation is perceived as better than the old technology or any alternative methods available*" (Rogers, 1995), the results reflect a kind of the resistance to change to the new technology or new system.

However, it is important to recognize that resistance is natural and inevitable; therefore, the change agent must expect it (Luftman et al., 2004)

In relation to, the findings of the control belief factors that derived from PBC by Taylor and Todd (1995) also reveal having a significant relationship with the intention to use educational technologies. The results are consistent with the previous studies in that they argued that there are four factors indicated for the PBC (SE, TFC, RFC, and GFC). The findings in Table 6.18 showed that the SE and controllability factors, which are represented by three factors TFC, RFC, and GFC, contribute significantly to the variation of intention. The study's findings on SE and the FC factors are positively related to the BI.

In relation to RO3, the research model was presented from factors derived from previous literatures and related to the adoption theories that were used in the study. However, the model is considered novel in the Arab world especially in the field of adoption of ICT in the higher education institutions. Consequently, the factors' constructs were tested by the reliability and validity in the pilot study as well as in the main study using Cronbach's alpha and factor analysis. Multiple regression techniques were used to measure the significant factors that influence on the academic staffs' BI to use ICT in their teaching system. Figure 7.1 presents the model in details with the values of Cronbach's alpha for each variable and the correlation values between variables directly and indirectly.

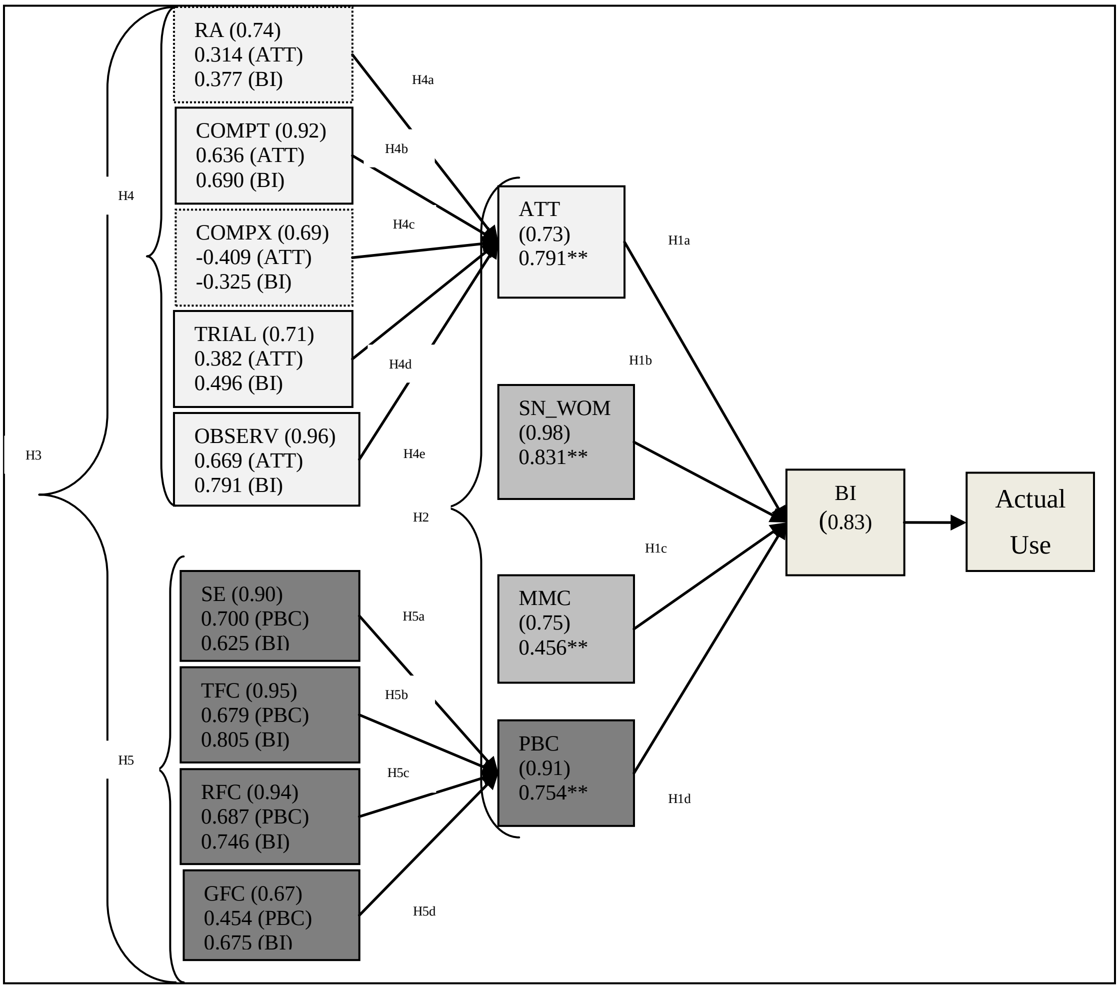



*Figure 7.1: ICT Adoption Model*

As a summary, the findings of this study contribute to theoretical modelling by modifying the IS adoption theories in relation to a new application area that may be give new insights into the theory. It is also proposed that this study improves a successful adoption of the particular services (ICT) that are supported by new technologies by deepening the knowledge about factors inhibiting or facilitating their adoption for developing nation in general, and for the Arab countries in particular, as these countries share a similar culture, religion, and speak the same language.

### 7.2.3 ICT Utilization

The last research question of the study (RQ3) was concerned on the current status of the use of ICT among academic staff in the Jordanian public universities.

RQ3: *"What is the status of utilizing ICT in Jordanian public universities by academic staff in the educational system?"*

The equivalent research objective to this research question is

RO4: To explore the current status of ICT adoption in the teaching and learning process among universities academic staff.

The RQ3 and their objective concern about the existing practice of ICT in the Jordanian public universities in the educational system. The study used descriptive analysis such as frequency and percentage to show the current ICT practice in the educational system. This also includes the ICT services the academic staff prefers to use most, their preferences in using ICT services, and their recommendation to others. Comparing the percentages in Table 6.12, the findings reveal that the services such as Computer-Based Learning and Web-Based Learning are considered the top two services, and then followed with the services such as Mobile-Based Learning and Online Assessment Tools. Finally, Class Recording, Virtual Class, Authoring tools and Learning Management System are ranked low. On the other hand, majority of the participants reported that the technologies services in the educational system meet their expectations and they like using it. In addition, 79.8% of them would use

ICT in the educational system in the future; while 16.4% do not intend to use it and 3.9% were uncertain about their future intentions. In fact, 72.5% of the respondents are willing to recommend others to use ICT in the educational system, while 19.3% do not like to recommend others to use it, and 8.2% are not sure whether to recommend others or not.

In relation to reasons that hinder academic staff to use ICT in their teaching and learning process, the results show that the academic staff has identified some common problems encountered during their previous use of ICT educational services. Results presented in Table 6.13 indicate that most of the respondents agreed on the reasons why they do not use technologies in the educational process. Most of the respondents have lack of knowledge and perceive that technologies are not necessary. Besides, they have limited technical understanding, follow with not suitable their requirements, and lastly, it is because of lack of resources. As a conclusion result, Table 7.1 presents the research objectives, the tools that used to achieve these objectives, the deliverables or outcomes of each objective by using the statistical tool, and the research question related to each objective.

*Table 7.1: Research Conclusion*

| Research Objective | Tools (SPSS V16) | Deliverables | RQ |
|---|---|---|---|
| RO1: To determine the relationships between the academic staffs' demographic characteristics with the use of common technologies that affects them to adopt ICT in teaching and learning process. | T-Test<br>Demographic factors<br>Gender, Higher education degree, Place of obtaining the degree, Major<br>ANOVA<br>Age, Experience.<br><br>Pearson's Chi-Square<br>BI | Computer, Mobile: Higher education degree, Major.<br>Internet: Major.<br>PDA: No significant relationship.<br><br>Computer, Internet: Age<br>Mobile: Experience.<br>PDA: Age, Experience.<br>ICT Adopter: Gender, Age. | RQ1 |
| RO2: To determine the prominent predictors that influences the successful adoption of information technology education by academicians in Jordanian public universities. | Multiple Regression<br>Pearson's Correlation Analysis<br>A Stepwise Regression | Direct Factor:<br>(SN_WOM, ATT, PBC, MMC).<br>Indirect Factors:<br>ATT (OBSERV, COMPT, COMPX, TRIAL, RA).<br>PBC (SE, TFC, RFC, GFC). | RQ2 |
| RO3: To develop an ICT adoption model to promote the adoption and usage of ICT in teaching and learning process by universities academic staff. | Adoption Theories<br>Factor Analysis<br>Results of Regression | A novel model with the influential factors that affected the academic staffs' BI to adopt ICT in their educational system. | RQ2 |
| RO4: To explore the current status of ICT adoption in the teaching and learning process among universities academic staff. | Frequency<br>Percentage | ICT Utilization<br>Computer Based Learning (CBL).<br>Web-Based Learning (WebCT).<br>Mobile Based Learning (MBL).<br>Online Assessment Tools<br>Class Recording, Virtual Class, Authoring tools and LMS.<br>Difficulties<br>Lack of Knowledge.<br>Not Necessary.<br>Lack of Technical Understanding.<br>Not suit my requirements.<br>Lack of resources. | RQ3 |

## 7.3 Research Implications

Theoretical Implication

The adoption's model that combines the three independent variables (ATT, SN, and PBC) to explain the intention to use innovation performs well by exceeding the 40% in the explaining the intention that was achieved by several other theoretical models in the fields of IS as discussed in the literature review in section 3.3. Evidence of efficacy was drawn from Armitage and Conner's (2001) meta-analytic review of 185 independent studies, in which they demonstrated that TPB has accounted for 27% to 39% of the variance in BI.

This study use three adoption theories in proposing a new model related to the area of the study. The theories are DOI (Rogers, 1995), TPB (Ajzen, 1991), and DTPB (Taylor and Todd, 1995). Rogers' five attributes explain the educational technology characteristics which affect academic staffs' ATT. As the study expects, the results of the PFA shown in Table 5.13 reveal that all the factors that Rogers (1995) defines in DOI appear as separated factors. The factors ordered by the strength of correlation with the ATT are observability, compatibility, complexity, trialability and relative advantage. The results of SN predictor exhibit dissimilarities with Ajzen's theory.

The findings of PFA as shown in Table 5.15 reveal that only two factors out of three predetermined variables related to the SN of TPB theory were statistically extracted, and then entered into regression analysis to examine their influence as valid predictors over the BI. Results of the Multiple Linear Regression demonstrate that there are two normative beliefs components found related to the BI which are SN_WoM and MMC. Theoretically, this result is worth noted because it is considered new in the literature review especially in the IS aspect. All of the items measuring loaded together with those measuring SN. This means the three factors SN, W-o-M, and MMC were extracted into two factors SN_WoM and MMC and these factors were considered as independent variables to the BI as dependant variable.

In social science, according to Ajzen (1980) a significant correlation between each pair of variables achieves a moderate magnitude of association. In addition, f-value indicates that the model obtained is highly significant in explaining normative beliefs. Furthermore, in the formative model of normative belief to BI, it was noted that the SN_WoM (Beta = 0.392, significant at $p < 0.01$) is the best and most significant predictor of the BI. In contrast, the findings obtained by the normative belief to BI revealed that MMC (Beta = 0.081, significant at $p<0.01$).

The SN_WoM and MMC met the criteria of generalizability, therefore, both variables could be considered as prominent and important which contribute in a formative manner to an academician’s BI. In addition, the findings on the norms referred that the “mass media norm” provides evidence of its role in forming the direct norms towards the use of ICT. Although the “mass media norm” when compared to the norms of personal interaction contributes less power in explaining

BI, the findings are still valuable for this study and are very important for focus in the future studies.

The last predictor of the proposed model is control belief, in which the results of this factor are consistent with Taylor and Todd's (1995a) decomposed into two dimensions; SE and FC. The FC construct was broken down into three other dimensions, which include TFC, RFC, and GFC. The findings of the regression show that there is a significant relationship between SE, TFC, RFC, and GFC with the PBC and BI.

Methodological Implication

The study concerns on the adoption of ICT in the teaching and learning process among academic staff in the Jordanian higher education institutions. Therefore, the study proposes a suitable model to guide answering the research questions and specifying the critical success factors of the study. Also, the study follows a scientific way to achieve the research objectives and answers the research questions. The methodology of the study contains many phases to achieve the goals. The review of the literatures related to the adoption theories in the fields of IS, especially in the educational system to identify the theories and factors suitable to the area and environment of this study and build a research model. After that, the data collection starts with designing and testing the questionnaires.

In this study, the data were collected using quantitative technique by distributing the questionnaire to the randomly sample academic staff in the Jordanian public universities. To validate the questionnaire, a pilot study was conducted. The study uses Cronbach's alpha and factor analysis techniques to test the reliability and validity of the items in the construct. Finally, the study analyzes the data and presents the findings using multiple regression analysis to test the relationship between dependent and independent factors and testing the research hypotheses.

Practical Implication

Practically, the study gives benefits to the higher education system and the universities in Jordan to develop and improve the teaching and learning process by using ICT services in the teaching system. The research proposes a new model that describes a concrete set of factors that higher education policy makers and universities' managers have to concern about to facilitate academic staff to adopt and use ICT in their teaching and learning process. Furthermore, it suggests that policy makers and universities mangers should pay particular concern on maximizing the SN attributes such as personal referents and media channels which are proven empirically as influencing and contributing to improving academic staffs' BI to use such technologies in the educational system. The external behavioral beliefs, namely relative advantage, compatibility, complexity, trialability, and observability represent specific valuable factors on which universities managers and IS practitioners should focus their attention on and putting efforts. These five factors may be used as tools to reform and shape academic staffs' ATT. The external normative beliefs sourced by both media and personal referents represent valuable factors in which universities' mangers should focus their attention on and putting efforts to utilize both referents channels of communication with the academicians when they want to convey the effective messages to their current and potential academicians who adopt ICT in their educational system. Both the external SE and FC represent two distinct factors which have a relative impact on PBC. Public policy and officials could support ICT adoption by introducing mechanisms for influencing the proposed academic staffs' SE and FC.

On the other hand, the study also gives the higher education leaders a full image about the current status of ICT usage in the teaching system. Moreover, it determines the influential and non-influential factors on the academic staffs' BI to use ICT in their teaching and learning process. The importance of these factors is to help the decision and policy makers to determine which factors need support and which need treatment to encourage the academicians to adopt ICT in the teaching system. Also the study determine the current status of using ICT in the higher education system by presenting the most ICT tools used by academic staff and determine the difficulties that hider them to reject or not use the educational technologies.

## 7.4 Limitations of the Study

This study represents a first (and admittedly approximate) description of the adoption of ICT in the higher educational institution in developing countries especially Jordan, where ICT is still in its infancy stage and there is a lack of information on its use at the time of the study. The major IS literatures are mostly from well developed countries such as USA, UK, Canada, and Australia. The existing literatures certainly are not directly applicable in explaining ICT adoption in Jordan especially with the huge differences between the two settings in regard to the adoption rate and the cultural differences.

Other limitation is concerned with the factors affecting BI to use ICT in the higher educational system among academic staff. The study identifies significant factors affecting the adoption on ICT in the higher education system that derived from three theories (DOI, TPB, and DTPB). However, there is a possibility that there might exist some other factors but are not included in this study. The identification of additional factors to explain the intention to use ICT may improve, expand, and make this research more valuable. For instance, the research could be expanded to address factors of security and trust issues or might identify the impact of cultural factors; also the prestige factor of the academicians might influence. The non preparation of the academicians psychological and informational about the new method educational technologies needs could be due to the habituation factor move from old style to the new style.

Data collection process is another limitation to the study. There are limitations about the distribution the questionnaire to the target samples due to the geographical structure of Jordan. The country is divided into three areas: the north, middle, and south; in which seven universities are located in the north and middle. There is no problem exists in these universities as they are located in easily accessible places. But, there are three universities in the south, which is considered very far and difficult to access. In addition, the differences between the universities from the number of academic staff and the level of facilities that the university offers in general and especially in ICT services have also created some limitations in the study.

## 7.5 Suggestions for Future Research

The field of using ICT in the educational system is considered relatively new so the future research should concentrate on the situation before the arrival or adoption of the Internet and other media of telecommunication for educational institutions rather than the effects of educational technologies. This study firmly believes and encourages adapting the formative items in a different context to do an appropriate belief elicitation to extract potentially more salient factors. Also, this study attempts to present the perceptions of academic staff for ICT in the educational system, the factors which could be creating barriers, and the factors that can encourage them to proceed to ICT activities remain uninvestigated. More researches are required on the effect of cultural and habituation factors on the diffusion and the adoption of ICT in developing countries. This study concerns on the factors that influence the BI to use

ICT in Jordanian higher education institution among academic staff, so, it is important for the future research to add some factors that are not included in this study. Some of these factors are security and trust issues related to transforming the teaching system from the "chalk and blackboard" which is concerned on lecturing and preparing examination in the classroom to a new system by using ICT and Internet. In addition, the differences in cultural aspect between developed and developing countries especially the Arab world needs to be clear in these kinds of studies. Finally, research in the field of ICT from developing countries is very sparse and comparative studies among homogenous countries are required to understand the common set of ICT determinants. The framework, can be examined in other IS adoption research disciplines also applied to different environments with different populations for comparative purposes and the improvement of the model.

## 7.6 Summary

ICT plays an important role in modern institutions by facilitating and improving the teaching and learning process to escort the information age. Using technologies in the educational system provides the manpower to achieve this high technology advantage. To become a competitive institution, a university or any higher education institution must enhance teaching and training processes related to the advancement of ICT and the new innovation of technologies. Universities in developing countries as well as in developed countries try to move in parallel with the rapid advancement of ICT by increasing the adoption of ICT as tools to develop and improve teaching and learning process and to become more flexible by reducing some difficulties in education process. Therefore, this study concerns in the adoption and usage of ICT in the higher education institutions by exploring the factors that affect academic staff in Jordanian public universities to adopt and use the educational technologies in their teaching and learning process.

The importance of higher education sector in Jordan as one of the more influential sector to develop the country encourage the government and private sectors to construct new universities and institutions to achieve economic prosperity by developing the human resources which is considered the main resources in the country. The MoHESR in Jordan reports that there are 26 educational institutions in Jordan, in which 10 are public universities, and 16 are private. The universities occupy 8038 academic staff, in which 5308 of them are from public universities and 2730 from private institutions. Even though Jordan is a poor country from the natural resources such as water, oil, and gas, the country gives a high priority to the development of human resources as the main resource to expand the national economy. Hence, the challenges for the country include to increase the quality of education in universities and to support the scientific research to face the lack of resources for the development of the national economy.

Consequently, the study explores the factors that influence adoption and utilization of ICT in the teaching and learning process among teaching staff in Jordanian public universities. The study uses three adoption theories to propose a model, the DOI (Rogers, 1995), TPB (Ajzen, 1991), and DTPB (Taylor and Todd, 1995). Besides, there are four main factors used in the model which are the BI to use or reject the technologies among academic staff in Jordanian higher education institutions; this factor is considered the main dependent factor of the study. The other three are their ATT in the teaching and learning process among academicians, SN that influence them to use or reject these technological facilities, and finally the PBC that influence them to use or reject the ICT in their teaching and learning process.

A sample of 500 academic staff was randomly obtained by means of a self-administrated survey. A usable response rate of 83% was achieved which contains 415 participants to the study conducted a series of data analyses of variables measurement for reliability and validity tests, and evaluation of regression models in both direct and indirect levels of predictors. The findings of multivariate test show that the direct predicators of SN with W-o-M, ATT, PBC, and MMC have positively affected on the BI to use ICT in the higher educational system among academic staff. The study also found a significant relationship between academic staffs' perception of technology characteristics such as (observability, compatibility, complexity, and trialability) and their ATT in the educational system. Similarly, there are significant relationship between academic staffs' control beliefs perception such as (SE, TFC, RFC, and GFC) to encourage the usage of ICT in the educational system and their behavioral control to use it.

The study is considered a novel in the less advantage developing countries, particularly Jordan and the Arab world, which have the same culture, language, and religion. It makes a significant contribution to theory and academic understanding of the adoption in areas of IS, and specifically ICT usage in higher education institutions, in Jordanian context. As a summary, understanding the behavioral aspect of adoption is important to both researchers and industry players. The findings of the current research contributes to theoretical modelling by expanding the IS adoption theories in relation to a new application area that may be give new insights into the theory. It is also proposed that this study improves a successful adoption of the particular services (ICT) that are supported by new technology by deepening knowledge about factors which inhibit or facilitate adoption for developing nation and the Arab countries, as these countries share a similar culture, religion, and speak the same language. The study will be the authority to all universities want to adopt and utilize ICT in their education and learning processes in Jordan and all Arab countries especially when the results of this study appears in the universities as a case study to become successful story and exemplary to all universities.

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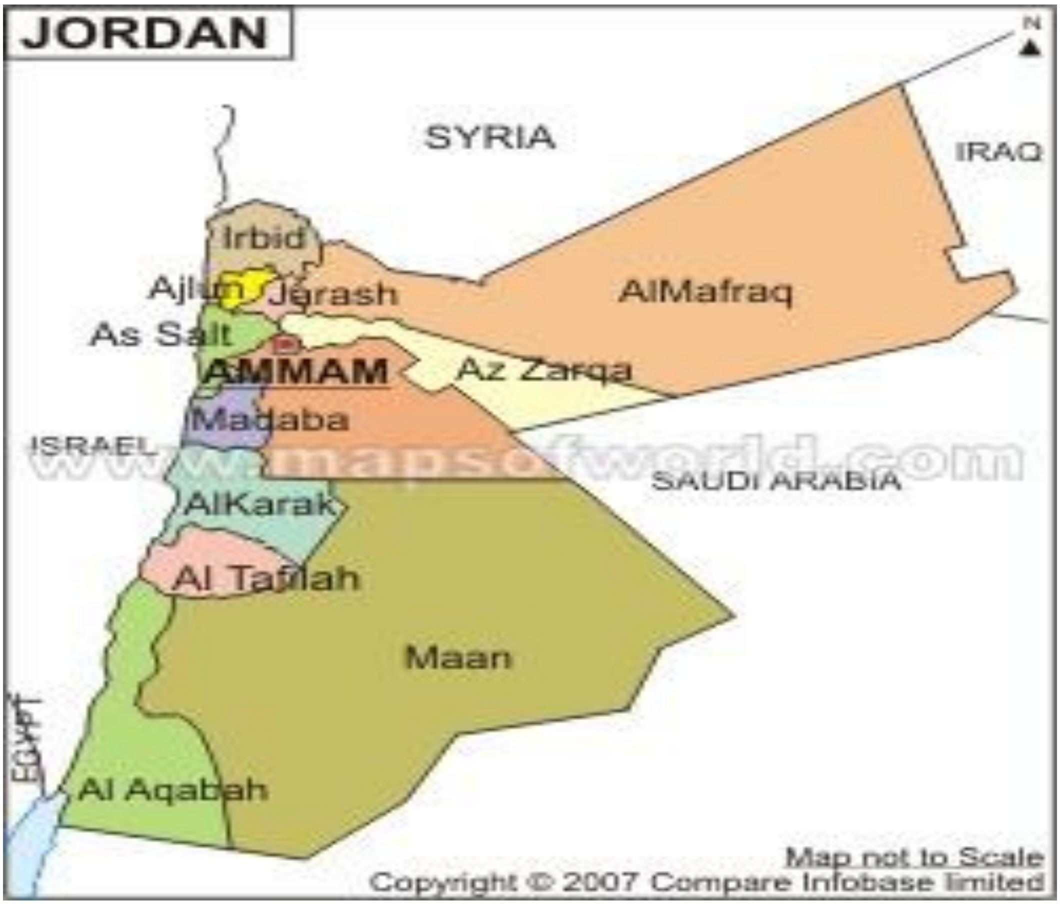
# Appendix A
# Map of Jordan




*Jordanian Public Universities by Cities*

| City | University |
|---|---|
| Amman | The University of Jordan<br>German Jordanian University |
| Az Zarqa | The Hashemite University |
| Alblaqa’ | AL-Balqa' Applied University |
| Irbid | Yarmouk University<br>Jordan University of Science & Technology |
| Al-Mafraq | AL al - Bayt University |
| Al-Karak | Mu'tah University |
| Al-Tafihah | Tafila Technical University |
| Ma’an | AL-Hussein Bin Talal University |

# Appendix B

# Research Questionnaire (English Version)

ADOPTION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN TEACHING AND LEARNING ENVIRONMENT IN JORDANIAN HIGHER EDUCATION INSTITUTIONS

Questionnaire

***Briefly about the study:***

This study focuses on the adoption and utilization of information and communication technologies among academic staff in the Jordanian public institutions. Information and Communication Technology (ICT) now plays an important role in modern institutions by facilitating and improving the education and learning process to convoy the information age. Adoption of ICT among lecturers and management in universities is very critical in ensuring an effective teaching and learning process to students. With these concerns, this study intends to focus on the adoption of ICT in Jordanian public universities among the teaching staff by studying the factors influences the adoption of ICT in their teaching and learning process.

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***Dear Academic staff:***

The purpose of this survey is to examine your perceptions about using ICT in the education and learning process in the university. This survey is designed to obtain information that will assist to understanding how an academic like you can become an effective adopter in the using ICT in their teaching and learning process. Hence, your honest opinion and success of this survey depends on your participation and candid responses. We would therefore greatly appreciate your assistance in answering the questionnaire. Please be assured that your responses will be kept strictly confidential. The strict ethic guidelines of University Utara Malaysia (UUM) will ensure anonymity is maintained at all time. Hence, no names are required. Individual participants will not be identified in the analysis as only aggregated results will be analyzed and presented.

The present survey is part of my study for PhD degree that tries to determine the factors that influences the adoption of ICT in the educational system in Jordanian institutions. Please read each questions carefully and answer it to the best of your ability. There are no correct or incorrect responses; we are merely interested in your personal point of view. This survey is designed for all academic staff in the Jordanian governmental universities.

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Thank you for your time and consideration. It is only with your generous help this study can be successful.

Sincerely Yours,

***Mohammad Khasawneh.***
***PhD Candidate, University Utara Malaysia.***
***Mobile#1:- +962-77-6 140 950 (Jordan).***
***Mobile#2:- +60-12- 55 47 592 (Malaysia).***
***Email: m_khasa@yahoo.com***

***Dear Participant,***

**Instructions:**

Do not worry about projecting a good image and the numbers alongside the statements used in this survey stand for the following responses:

1= Strongly Disagree,
2= Quite Disagree
3= Slightly Disagree
4= Neither Disagree nor Agree,
5= Slightly Agree
6= Quite Agree, and
7= Strongly Agree

Many questions in this survey make use of rating scales with 7 places; you are to tick [√] across the number that best describes your opinion. For example, if you were asked to rate "The Education system in Jordan is Ongoing" on such a scale, the 7 places should be interpreted as follows:

If you think the education system in Jordan is extremely ongoing, then you would tick √ alongside the number 7, as follows;

| Question's Statement | St. Disagree | | ◄ | ········· | ► | St. Agree |
|---|---|---|---|---|---|---|
| The education system in Jordan is ongoing | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | | √ |

**But**

If you think the education system in Jordan is not ongoing, then you would tick √ alongside the number 1, as follows;

| Question's Statement | St. Disagree | | ◄ | ········· | ► | St. Agree |
|---|---|---|---|---|---|---|
| The education system in Jordan is ongoing | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | √ | | | | | | |

In making your ratings, please remember the following points

1. This survey contains six sections (A-F), and each section contains number of statements.
2. Please answer each of the statement related to the questions by ticking [√] alongside the number that best describes your answer.
3. Some of the questions may appear to be similar, but they do address somewhat different issues please read each question carefully.
4. Be sure to answer all items – do not omit any.
5. Never tick more than one number on a single scale.

## ***Section A: Demographic Factors***

1. **What is your gender?**

[ ] Male [ ] Female

2. **Please, check the category that best describe your age,**

[ ] Under 30 [ ] 30 – 40

[ ] 41 – 50 [ ] 51 or older

3. **Please, check your higher education degree,**

[ ] Bachelor [ ] Master [ ] PhD

4. **Please, check the place of your receiving higher degree,**

[ ] In home (Jordan) [ ] Abroad

5. **Please, check your major,**

[ ] Scientific [ ] Humanities

6. **Please, check how many years your experience in the higher education institutions completes,**

[ ] 1 – 5 [ ] 6 – 10

[ ] 11 – 15 [ ] over 15

## ***Section B: Level of Readiness:***

1. **Did your University have any ICT Services in the Educational System?**

[ ] Yes [ ] No

2. **How long you have been using these technologies or services?**

| Technologies or Services | Never used | 1-3 Years | 3-5 Years | 5-7 Years | 7-9 Years | 10 Years and above |
|---|---|---|---|---|---|---|
| Computer | | | | | | |
| Internet | | | | | | |
| Mobile Phone | | | | | | |
| PDA( Personal Digital | | | | | | |

3. **On average, how frequently do you use these technologies or services?**

| Technologies or Services | Never used | Less than once a month | Once a month | A few times a month | A few times a week | Several times a day |
|---|---|---|---|---|---|---|
| Computer | | | | | | |
| Internet | | | | | | |
| Mobile Phone | | | | | | |
| PDA | | | | | | |

*4.* **Please indicate the activities you do use:** (*Please tick as many as apply)*

[ ] Computer-Based Learning

[ ] Web-Based Learning (WebCT)

[ ] Mobile-Based Learning

[ ] Class Recording, Virtual Class and Authoring tools and Learning Management systems

[ ] Online Assessment Tools

[ ] Other (Please specify……………………………….....)

5. **How much you like using information technology education in your educational system?**

[ ] Very much [ ] Quite a lot

[ ] Not much [ ] Not at all

6. **Will you use the information technology education in your educational system in the near future?**

[ ] Yes [ ] No [ ] Don't Know

7. **Would you recommend the others to use information technology education in their educational system?**

[ ] Yes [ ] No [ ] Don't Know

8. **Please indicate the reason that you do not use the ICT in their educational system? *(**Please tick as many as apply**)***

[ ] Not Necessary [ ] Lack of resources

[ ] Lack of Knowledge [ ] Lack of technical understanding

[ ] Not suit my requirements [ ] Other (*Please Specify* ………)

| | ***Section C: Behavioral Intention and Adoption*** | St. Disagree ↔ St. Agree | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | In my opinion, using ICT in the teaching system is a good idea | | | | | | | |
| 2. | I think it is a wise idea for me to use ICT in the teaching system | | | | | | | |
| 3. | I like the idea of using the ICT in the teaching system | | | | | | | |
| 4. | Using ICT in the teaching system would be pleasant experience | | | | | | | |
| 5. | Given the chance, I predict that I would use ICT in the teaching system in the future | | | | | | | |
| 6. | I will strongly recommended others to use ICT in the teaching system | | | | | | | |
| 7. | My favorable intention would be to use technologies in the education system rather than traditional way in the teaching system | | | | | | | |
| 8. | I plan to use ICT in the teaching and learning system | | | | | | | |

| | ***Section D: Technology Characteristics*** | St. Disagree ↔ St. Agree | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | If I were to use ICT in the teaching system, it would enable me to accomplish my tasks more quickly | | | | | | | |
| 2. | If I were to use ICT in the teaching system, the quality of my work would improve | | | | | | | |
| 3. | If I were to use ICT in the teaching system, it would enhance my effectiveness on my job | | | | | | | |
| 4. | If I were to use ICT in the teaching system, it would make my job easier | | | | | | | |
| 5. | Using ICT in the education system gives me greater control over my work | | | | | | | |
| 6. | If I were to use ICT in the teaching system, it would be compatible with most aspect of my work | | | | | | | |
| 7. | If I were to use ICT in the teaching system, it would fit my work style | | | | | | | |
| 8. | If I were to use ICT in the teaching system, it would fit well with the way I like to work | | | | | | | |

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 9. | Training and learning to using ICT in the teaching system would be easy for me | | | | | | | |
| 10 | Overall, if I were to use ICT in the teaching system, it would be easy to use | | | | | | | |
| 11 | It would be easy for me to become skilful at using ICT in the teaching system | | | | | | | |
| 12 | Using ICT in the education system requires a lot of mental effort | | | | | | | |
| 13 | Before deciding on whether or not to use ICT in the teaching system, I want to be able to use it on a trial basis | | | | | | | |
| 14 | Before deciding on whether or not to use ICT in the teaching system, I want to be able to properly try it out | | | | | | | |
| 15 | I want to be permitted to use ICT in the teaching system, on a trial basis long enough to see what it can do | | | | | | | |
| 16 | I will use ICT in the teaching system, when it is used by many | | | | | | | |
| 17 | I will use ICT in the teaching system, when I have seen others using it | | | | | | | |
| 18 | I will use ICT in the teaching system as soon as I got to know about it | | | | | | | |
| 19 | I will use ICT in the education technology if it become popular | | | | | | | |
| 20 | I will wait until other academicians start use it | | | | | | | |
| 21 | I will use ICT in the teaching system, when other academicians have successful experience of using it | | | | | | | |
| 22 | If the using of ICT in the teaching system is unknown to me, I will not use it | | | | | | | |

| ***Section E: Subjective Norms*** | | St. Disagree ↔ St. Agree | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | Most people who are important to me would think that I should use ICT in the educational system | | | | | | | |
| 2. | The people who influence my decisions would think that I should use ICT in the educational system | | | | | | | |
| 3. | Most people who are important to me would think that I should try out the technologies in the educational system | | | | | | | |

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 4. | The people who influence my decisions would think that I should try out the technologies in the educational system | | | | | | | |
| 5. | My referents (peers, colleagues, friends, family) would think that I should use ICT in the educational system | | | | | | | |
| 6. | My referents (peers, colleagues, friends, family) would think that I should try out ICT in the educational system | | | | | | | |
| 7. | Generally speaking, I want to do what my referent thinks I should do | | | | | | | |
| 8. | My opinion leaders would think that I should use ICT in the educational system | | | | | | | |
| 9. | My opinion leaders would think that I should try out ICT in the educational system | | | | | | | |
| 10 | Generally speaking, I want to do what my opinion leaders think I should do | | | | | | | |
| 11 | The media are full of report, articles, and news suggesting that using ICT in the educational system is a good idea | | | | | | | |
| 12 | The media and advertising consistently recommend using ICT in the educational system | | | | | | | |
| 13 | In my profession, it is advisable to use ICT in the educational system | | | | | | | |
| 14 | I read/saw news report that using ICT in the educational system was a good way to manage the teaching and learning process | | | | | | | |
| 15 | I want to do what the media think I should do | | | | | | | |

| ***Section F: Perceived Behavioral Control*** | | St. Disagree ↔ St. Agree | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | I would be able to use ICT in the educational system | | | | | | | |
| 2. | I have the resources necessary to make use of ICT in the teaching system | | | | | | | |
| 3. | I have the knowledge necessary to make use of ICT in the education system | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4. | I have the ability to make use of ICT in the education system | | | | | | | |
| 5. | Using ICT in the teaching system would be entirely within my control | | | | | | | |
| 6. | I would feel comfortable using ICT in the education system on my own | | | | | | | |
| 7. | For me, feeling comfortable using ICT in the education system on my own is important | | | | | | | |
| 8. | If I wanted to, I could easily operate (application, software) for using it in the teaching system from the university (portal, website) on my own is important | | | | | | | |
| 9. | For me, being able to use the (application, software) for teaching system form university (portal, website) on my own is important | | | | | | | |
| 10 | I would be able to use the (application, software) for the educational system even if there was no one around to show me how to use it | | | | | | | |
| 11 | For me, being able to use the (application, software) for teaching system even if there is no one around to show me how to use it is important | | | | | | | |
| 12 | I have the computers, Internet access and applications which I need to use it in using ICT in the educational system | | | | | | | |
| 13 | For me, availability of the computers, internet access and applications to use ICT in the educational system is important | | | | | | | |
| 14 | Educational technology application "software" might not be compatible with the current style of my work. | | | | | | | |
| 15 | For me, the application (software) which are using in the educational system is important to be compatible with the current work style. | | | | | | | |
| 16 | I am concerned about the applications (software) security which are used in the educational system | | | | | | | |
| 17 | For me, advances in Internet security, which provide a safer of using ICT in the educational system are important | | | | | | | |
| 18 | A reliable internet connection is available when I want to use ICT in the educational system | | | | | | | |
| 19 | For me, reliability of internet connection services is very important to use ICT in the educational system | | | | | | | |
| 20 | There will be not enough computers and other ICT tools to use it in the educational system | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21 | For me, having computers and ICT tools is important | | | | | | | |
| 22 | There will be no good infrastructure and network to use ICT in the educational system | | | | | | | |
| 23 | For me, the good is infrastructure which facilitate to use ICT in the educational system very important | | | | | | | |
| 24 | There is a lack of the training courses to using ICT in the educational system | | | | | | | |
| 25 | For me, the training courses is very important to use ICT in the educational system | | | | | | | |
| 26 | The government gives support for using ICT in the educational system (Government | | | | | | | |
| 27 | For me, government support for using technologies in the educational system is very important | | | | | | | |
| 28 | The Jordanian government endorses using ICT in the educational system | | | | | | | |
| 29 | For me, the government endorsing educational technologies is important to use ICT in the educational system | | | | | | | |
| 30 | The government promotes the use of ICT in the educational system | | | | | | | |
| 31 | For me, the government promotes of using ICT in the educational system is important | | | | | | | |

## Appendix C

## Research Questionnaire (Arabic Version)

***Email: m_khasa@yahoo.com***

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## APPENDIX C-1: Frequencies and Percentages for each Question in the Questionnaire

***Section A: Demographic Factors***

1. **What is your gender?**

[297/ 71.6] Male [118/ 28.4] Female

2. **Please, check the category that best describe your age,**

[53/ 12.5] Under 30 [126/ 30.4] 30 – 40

[160/ 38.6] 41 – 50 [77/ 18.6] 51 or older

3. **Please, check your higher education degree,**

[0/ 0] Bachelor [175/ 42.2] Master [240/ 57.8] PhD

4. **Please, check the place of your receiving higher degree,**

[158/ 38.1] In home (Jordan) [257/ 61.9] Abroad

5. **Please, check your major,**

[225/ 54.2] Scientific [190/ 45.8] Humanities

6. **Please, check how many years your experience in the higher education institutions completes,**

[138/ 33.3] 1 – 5 [157/ 37.8] 6 – 10

[93/ 22.4] 11 – 15 [27/ 6.5] over 15

***Section B: Level of Readiness:***

1. **Did your University have any ICT Services in the Educational System?**

[415/ 100] Yes [0/ 0] No

2. **How long you have been using these technologies or services?**

| Technologies or Services | Never used | 1-3 Years | 3-5 Years | 5-7 Years | 7-9 Years | 10 Years and above |
|---|---|---|---|---|---|---|
| Computer | 26/ 6.3 | 186/ 44.8 | 109/ 26.3 | 53/ 12.8 | 13/ 3.1 | 28/ 6.7 |
| Internet | 44/ 10.6 | 231/ 55.7 | 112/ 27.0 | 9/ 2.2 | 19/ 4.6 | 0/ 0 |
| Mobile Phone | 0/ 0 | 67/ 16.1 | 251/ 60.5 | 39/ 9.4 | 44/ 10.6 | 14/ 3.4 |
| PDA( *Personal Digital Assistant*) | 400/ 96.4 | 15/ 3.6 | 0/ 0 | 0/ 0 | 0/ 0 | 0/ 0 |

3. **On average, how frequently do you use these technologies or services?**

| Technologies or Services | Never used | Less than once a month | Once a month | A few times a month | A few times a week | Several times a day |
|---|---|---|---|---|---|---|
| Computer | 26/ 6.3 | 0/ 0 | 11/ 2.7 | 75/ 18.1 | 161/ 38.8 | 142/ 34.2 |
| Internet | 44/ 10.6 | 0/ 0 | 3/ 0.7 | 70/ 16.9 | 188/ 45.3 | 110/ 26.5 |
| Mobile Phone | 0/ 0 | 0/ 0 | 0/ 0 | 0/ 0 | 89/ 21.4 | 326/ 78.6 |
| PDA( *Personal Digital Assistant*) | 400/ 96.4 | 0/ 0 | 0/ 0 | 12/ 2.9 | 3/ 0.7 | 0/ 0 |

*4.* **Please indicate the activities you do use:** (*Please tick as many as apply)*

[Yes= 278/ 67.0; No= 137/ 33.0] Computer-Based Learning
[Yes= 266/ 64.1; No= 149/ 35.9] Web-Based Learning (WebCT)
[Yes= 186/ 44.8; No= 229/ 55.2] Mobile-Based Learning
[Yes= 159/ 38.3; No= 266/ 61.7] Class Recording, Virtual Class and Authoring tools and LMSs
[Yes= 181/ 43.6; No=234/ 56.4] Online Assessment Tools
[Yes= 0/ 0; No= 415/ 100.0] Other (Please specify…………………....)

5. **How much you like using information technology education in your educational system?**

[54/ 13.0] Very much [269/ 64.8] Quite a lot

[64/ 15.4] Not much [28/ 6.7] Not at all

6. **Will you use the information technology education in your educational system in the near future?**

[331/ 79.8] Yes [68/ 16.4] No [16/ 3.9] Don't Know

7. **Would you recommend the others to use information technology education in their educational system?**

[301/ 72.5] Yes [80/ 19.3] No [34/ 8.2] Don't Know

8. **Please indicate the reason that you do not use the ICT in their educational system? *(****Please tick as many as apply****)***

[Yes= 116/ 28.0; No= 299/ 72.0] Not Necessary

[Yes=70/ 16.9; No= 345/ 83.1] Lack of resources

[Yes= 121 / 29.2; No= 294/ 70.8] Lack of Knowledge

[Yes= 104/ 25.1; No= 311/ 74.9] Lack of technical understanding

[Yes= 96/ 23.1; No= 319/ 76.9] Not suit my requirements

[Yes= 0/ 0; No= 415/ 100] Other (*Please Specify* ………)

| Q.NO | St. Disagree | ◄ | ······· | ······· | ······· | ► | St. agree |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | **Frequency / Percentage** | | | | | | |
| ***Section C: Behavioral Intention and Adoption*** | | | | | | | |
| 1. | 76/ 18.3 | 199/ 40.0 | 7/ 2.9 | 12/ 2.9 | 41/ 9.9 | 39/ 9.4 | 41/ 9.9 |
| 2. | 12/ 2.9 | 61/ 14.7 | 24/ 5.8 | 23/ 5.5 | 87/ 21.0 | 144/ 34.7 | 64/ 15.4 |
| 3. | 12/ 4.1 | 55/ 13.3 | 29/ 7.0 | 37/ 8.9 | 64/ 15.4 | 119/ 28.7 | 94/ 22.7 |
| 4. | 12/ 2.9 | 52/ 12.5 | 16/ 3.9 | 57/ 13.7 | 91/ 21.9 | 112/ 27.0 | 75/18.1 |
| 5. | 19/ 4.6 | 66/ 15.9 | 21/ 5.1 | 23/ 5.5 | 70/ 16.9 | 126/ 30.4 | 90/ 21.7 |
| 6. | 14/ 3.4 | 44/ 10.6 | 14/ 3.4 | 38/ 9.2 | 104/ 25.1 | 141/ 34.0 | 60/ 14.5 |
| 7. | 17/ 4.1 | 57/ 13.7 | 29/ 7.0 | 23/ 5.5 | 90/ 21.7 | 114/ 27.5 | 85/ 20.5 |
| 8. | 21/ 5.1 | 53/ 12.8 | 23/ 5.5 | 36/ 8.7 | 69/ 16.6 | 97/ 23.4 | 116/ 28.0 |
| ***Section D: Technology Characteristics*** | | | | | | | |
| 1. | 0/ 0 | 12/ 2.9 | 23/ 5.5 | 41/ 9.9 | 102/ 24.6 | 149/ 35.9 | 88/ 21.2 |
| 2. | 0/ 0 | 11/ 2.7 | 12/ 2.9 | 45/ 10.8 | 104/ 25.1 | 152/ 36.6 | 91/ 21.9 |
| 3. | 12/ 2.9 | 23/ 5.5 | 16/ 3.9 | 29/ 7.0 | 79/ 19.0 | 128/ 30.8 | 128/ 30.8 |
| 4. | 15/ 3.6 | 28/ 6.7 | 10/ 2.4 | 18/ 4.3 | 86/ 20.7 | 110/ 26.5 | 148/ 35.7 |
| 5. | 12/ 2.9 | 14/ 3.4 | 7/ 1.7 | 38/ 9.2 | 80/ 19.3 | 152/ 36.6 | 112/ 27.0 |
| 6. | 24/ 5.8 | 113/ 27.2 | 29/ 7.0 | 27/ 6.5 | 73/ 17.6 | 81/ 19.5 | 68/ 16.4 |
| 7. | 26/ 6.3 | 111/ 26.7 | 36/ 8.7 | 13/ 3.1 | 50/ 12.0 | 98/ 23.6 | 81/ 19.5 |
| 8. | 41/ 9.9 | 98/ 23.6 | 30/ 7.2 | 12/ 2.9 | 33/ 8.0 | 117/ 28.2 | 84/ 20.2 |
| 9. | 133/ 32.0 | 130/ 31.3 | 79/ 19.0 | 43/ 10.4 | 7/ 1.7 | 8/ 1.9 | 15/ 3.6 |
| 10. | 108/ 26.0 | 144/ 34.7 | 85/ 20.5 | 45/ 10.8 | 11/ 2.7 | 11/ 2.7 | 11/ 2.7 |
| 11. | 99/ 23.9 | 179/ 43.1 | 74/ 17.8 | 29/ 7.0 | 18/ 4.3 | 8/ 1.9 | 8/ 1.9 |
| 12. | 66/ 15.9 | 59/ 14.2 | 30/ 7.2 | 23/ 5.5 | 80/ 19.3 | 94/ 22.7 | 63/ 15.2 |
| 13. | 142/ 34.2 | 129/ 31.1 | 58/ 14.0 | 53/ 12.8 | 23/ 5.5 | 5/ 1.2 | 5/ 1.2 |
| 14. | 119/ 28.7 | 139/ 33.5 | 76/ 18.3 | 47/ 11.3 | 17/ 4.1 | 6/ 1.4 | 11/ 2.7 |
| 15. | 125/ 30.1 | 104/ 25.1 | 109/ 26.3 | 48/ 11.6 | 16/ 3.9 | 7/ 1.7 | 6/ 1.4 |
| 16. | 100/ 24.2 | 124/ 29.9 | 106/ 25.5 | 34/ 8.2 | 20/ 4.8 | 18/ 4.3 | 13/ 3.1 |
| 17. | 71/ 17.1 | 23/ 5.5 | 24/ 5.8 | 11/ 2.7 | 74/ 17.8 | 145/ 34.9 | 67/ 16.1 |
| 18. | 109/ 26.3 | 40/ 9.6 | 28/ 6.7 | 21/ 5.1 | 52/ 12.5 | 58/ 14.0 | 107/ 25.8 |
| 19. | 78/ 18.8 | 24/ 5.8 | 18/ 4.3 | 20/ 4.8 | 65/ 15.7 | 112/ 27.0 | 98/ 23.6 |
| 20. | 80/ 19.3 | 19/ 4.6 | 19/ 4.6 | 12/ 2.9 | 80/ 19.3 | 125/ 30.1 | 80/ 19.3 |
| 21. | 79/ 19.0 | 23/ 5.5 | 15/ 3.6 | 28/ 6.7 | 54/ 13.0 | 138/ 33.3 | 78/ 18.8 |
| 22. | 92/ 22.2 | 48/ 11.6 | 31/ 7.5 | 17/ 4.1 | 47/ 11.3 | 94/ 22.7 | 86/ 20.7 |
| ***Section E: Subjective Norms*** | | | | | | | |
| 1. | 82/ 19.8 | 20/ 4.8 | 17/ 4.1 | 19/ 4.6 | 53/ 12.8 | 110/ 26.5 | 114/ 27.5 |
| 2. | 83/ 20.0 | 18/ 4.3 | 16/ 3.9 | 9/ 2.2 | 75/ 18.1 | 147/ 35.4 | 67/ 16.1 |
| 3. | 93/ 22.4 | 15/ 3.6 | 8/ 1.9 | 8/ 1.9 | 53/ 12.8 | 108/ 26.0 | 130/ 31.3 |
| 4. | 83/ 20.0 | 15/ 3.6 | 20/ 4.8 | 24/ 5.8 | 68/ 16.4 | 118/ 28.4 | 87/ 21.0 |
| 5. | 85/ 20.5 | 13/ 3.1 | 17/ 4.1 | 10/ 2.4 | 82/ 19.8 | 107/ 25.8 | 101/ 24.3 |
| 6. | 100/ 24.1 | 24/ 5,8 | 9/ 2.2 | 8/ 1.9 | 85/ 20.5 | 120/ 28.9 | 69/ 16.6 |
| 7. | 101/ 24.3 | 19/ 4.6 | 14/ 3.4 | 10/ 2.4 | 46/ 11.1 | 83/ 20.0 | 142/ 34.2 |
| 8. | 97/ 23.4 | 31/ 7.5 | 15/ 3.6 | 19/ 4.6 | 56/ 13.5 | 104/ 25.1 | 93/ 22.4 |
| 9. | 106/ 25.5 | 21/ 5.1 | 14/ 3.4 | 16/ 3.9 | 57/ 13.7 | 105/ 25.0 | 96/ 23.1 |
| 10. | 112/ 27.0 | 13/ 3.1 | 17/ 4.1 | 19/ 4.6 | 55/ 13.3 | 108/ 26.0 | 91/ 21.9 |
| 11. | 7/ 1.7 | 9/ 2.2 | 2/ 0.5 | 57/ 13.7 | 109/ 26.3 | 133/ 32.0 | 98/ 23.6 |
| 12. | 8/ 1.9 | 7/ 1.7 | 0/ 0 | 26/ 6.3 | 108/ 26.0 | 159/ 38.3 | 107/ 25.8 |
| 13. | 3/ 0.7 | 6/ 1.4 | 4/ 1.0 | 53/ 12.8 | 111/ 26.7 | 164/ 39.5 | 74/ 17.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 14. | 12/ 2.9 | 6/ 1.4 | 0/ 0 | 23/ 5.5 | 110/ 26.5 | 160/ 38.6 | 104/ 25.1 |
| 15. | 10/ 2.4 | 7/ 1.7 | 3/ 0.7 | 38/ 9.2 | 102/ 24.6 | 128/ 30.8 | 127/ 30.6 |
| ***Section F: Perceived Behavioral Control*** | | | | | | | |
| 1. | 34/ 8.2 | 26/ 6.3 | 6/ 1.4 | 27/ 6.5 | 110/ 26.5 | 101/ 24.3 | 111/ 26.7 |
| 2. | 37/ 8.9 | 30/ 7.2 | 10/ 2.4 | 15/ 3.6 | 69/ 16.6 | 181/ 43.6 | 73/ 17.6 |
| 3. | 26/ 6.3 | 37/ 8.9 | 4/ 1.0 | 37/ 8.9 | 97/ 23.4 | 143/34.5 | 71/ 17.1 |
| 4. | 27/ 6.5 | 26/ 6.3 | 5/ 1.2 | 19/ 4.6 | 76/ 18.3 | 186/ 44.8 | 76/ 18.3 |
| 5. | 35/ 8.4 | 18/ 4.3 | 10/ 2.4 | 28/ 6.7 | 83/ 20.0 | 149/ 35.9 | 92/ 22.2 |
| 6. | 16/ 3.9 | 12/ 2.9 | 0/ 0 | 27/ 6.5 | 73/ 17.6 | 165/ 39.8 | 122/ 29.4 |
| 7. | 24/ 5.8 | 9/ 2.2 | 1/ .2 | 22/ 5.3 | 87/ 21.0 | 141/ 34.0 | 131/ 31.6 |
| 8. | 18/ 4.3 | 14/ 3.4 | 0/ 0 | 9/ 2.2 | 60/ 14.5 | 168/ 40.5 | 146/ 35.2 |
| 9. | 12/ 2.9 | 5/ 1.2 | 0/ 0 | 32/ 7.7 | 106/ 25.5 | 158/ 38.1 | 102/ 34.6 |
| 10. | 19/ 4.6 | 8/ 1.9 | 8/ 1.9 | 3/ 0.7 | 99/ 23.9 | 133/ 32.0 | 145/ 34.9 |
| 11. | 14/ 3.4 | 7/ 1.7 | 11/ 2.7 | 17/ 4.1 | 59/ 14.2 | 150/ 36.1 | 157/ 37.8 |
| 12. | 68/ 16.4 | 7/ 1.7 | 14/ 3.4 | 11/ 2.7 | 86/ 20.7 | 156/ 37.6 | 73/ 17.6 |
| 13. | 68/ 16.4 | 15/ 3.6 | 13/ 3.1 | 12/ 2.9 | 81/ 19.5 | 146/ 35.2 | 80/ 19.3 |
| 14. | 101/ 24.3 | 19/ 4.6 | 27/ 6.5 | 48/ 11/6 | 85/ 20.5 | 86/ 20.7 | 49/ 11.8 |
| 15. | 115/ 27.7 | 12/ 2.9 | 11/ 2.7 | 15/ 3.6 | 47/ 11.3 | 111/ 26.7 | 104/ 25.1 |
| 16. | 71/ 17.1 | 11/ 2.7 | 18/ 4.3 | 13/ 3.1 | 40/ 9.6 | 148/ 35.7 | 114/ 27.5 |
| 17. | 72/ 17.3 | 9/ 2.2 | 14/ 3.4 | 3/ 0.7 | 61/ 14.7 | 123/ 29.6 | 133/ 32.0 |
| 18. | 84/ 20.2 | 2/ 0.5 | 16/ 3.9 | 9/ 2.2 | 98/ 23.6 | 112/ 27.0 | 94/ 22.7 |
| 19. | 78/ 18.8 | 1/ 0.2 | 12/ 2.9 | 19/ 4.6 | 60/ 14.5 | 122/ 29.4 | 123/ 29.6 |
| 20. | 79/ 19.0 | 3/ 0.7 | 13/ 3.1 | 9/ 2.2 | 56/ 13.5 | 184/ 44.3 | 71/ 17.1 |
| 21. | 63/ 15.2 | 3/ 0.7 | 9/ 2.2 | 14/ 3.4 | 96/ 23.1 | 158/ 38.1 | 72/ 17.3 |
| 22. | 64/ 15.4 | 3/ 0.7 | 20/ 4.8 | 139/ 33.5 | 85/ 20.5 | 85/ 20.5 | 19/ 4.6 |
| 23. | 66/ 15.9 | 6/ 1.4 | 10/ 2.4 | 16/ 3.9 | 66/ 15.9 | 103/ 24.8 | 148/ 35.7 |
| 24. | 68/ 16.4 | 3/ 0.7 | 13/ 3.1 | 22/ 5.3 | 72/ 17.3 | 129/ 31.1 | 108/ 26.0 |
| 25. | 60/ 14.5 | 4/ 1.0 | 13/ 3.1 | 24/ 5.8 | 78/ 18.8 | 132/ 31.8 | 104/ 25.1 |
| 26. | 0/ 0 | 2/ 0.5 | 7/ 1.7 | 52/ 12.5 | 90/ 21.7 | 139/ 33.5 | 125/ 30.1 |
| 27. | 0/ 0 | 3/ 0.7 | 9/ 2.2 | 77/ 18.6 | 96/ 23.1 | 118/ 28.4 | 112/ 27.0 |
| 28. | 0/ 0 | 0/ 0 | 11/ 2.7 | 36/ 8.7 | 102/ 24.6 | 148/ 35.7 | 118/ 28.4 |
| 29. | 0/ 0 | 3/ 0.7 | 15/ 3.6 | 67/ 16.1 | 108/ 26.0 | 142/ 34.2 | 80/ 19.3 |
| 30. | 0/ 0 | 3/ 0.7 | 11/ 2.7 | 38/ 9.2 | 110/ 26.5 | 152/ 36.6 | 101/ 24.3 |
| 31. | 0/ 0 | 5/ 1.2 | 12/ 2.9 | 56/ 13.5 | 86/ 20.7 | 118/ 28.4 | 138/ 33.3 |

## Appendix D
## Formal Letters: UUM and MoHESR

**UNIVERSITI UTARA MALAYSIA**
06010 UUM Sintok, Kedah Darul Aman, Malaysia. Tel: 604 - 928 4000

23 January 2011

TO WHOM IT MAY CONCERN

**PERMISSION FOR DATA COLLECTION PROCESS**

With reference to the above subject, we are glad to inform you that Mr. Mohammad Mansour Al-Khasawneh, who is currently enrolled as a PhD student in University Utara Malaysia (UUM), is doing a research under my supervision. The title of the research is ***"Adoption of Information and Communication Technology in Jordanian Higher Education Institutions".***

In order for him to complete the research, he needs to get an approval to conduct some data collection. It is a big honor to us if your organization can provide all the assistance to Mr. Al-Khasawneh and facilitate all types of questionnaires, interviews and researches he needs in order to fulfill the objectives of the research.

We really appreciate for your cooperation and if you need further information, please do not hesitate to contact me.

Thank you.

Your sincerely

(ASSOC. PROF. DR. HUDA IBRAHIM)
Chair
Internationalization and Quality
Information Technology Programme
UUM College of Arts and Sciences

MSC MALAYSIA Status Institution

بسم الله الرحمن الرحيم

وزارة التعليم العالي والبحث العلمي

الرقم ٥/٣/١٦٨٤
التاريخ ٣ ربيع الأول ١٤٣٢هـ
الموافق ٦/٢/٢٠١١م

الأستاذ الدكتور رئيس الجامعة الأردنية
الأستاذ الدكتور رئيس جامعة اليرموك
الأستاذ الدكتور رئيس جامعة مؤتة
الأستاذ الدكتور رئيس جامعة العلوم والتكنولوجيا
الأستاذ الدكتور رئيس الجامعة الهاشمية
الأستاذ الدكتور رئيس جامعة آل البيت
الأستاذ الدكتور رئيس جامعة البلقاء التطبيقية
الأستاذ الدكتور رئيس جامعة الحسين بن طلال
الأستاذ الدكتور رئيس جامعة الطفيلة التقنية
الأستاذ الدكتور رئيس الجامعة الألمانية الأردنية

تحية طيبة ، وبعد ،،،

أرفق طياً صورة عن الاستدعاء المقدم من السيد " محمد منصور خصاونه" والمتضمن طلبه تسهيل مهمته بتوزيع الاستبيانات والمقابلات الخاصة بدراسته.

للتفضل باتخاذ ما يلزم من إجراءات لتسهيل مهمته البحثية.

وتفضلوا بقبول فائق الاحترام

ع/وزير التعليم العالي والبحث العلمي

الدكتور مصطفى العدوان

الأمين العام

نسخة إلى
مساعد عطوفة الأمين العام للشؤون الفنية
مدير مديرية مؤسسة التعليم العالي
رئيس قسم المتابعة والتوثيق
الملف العام ( مع الرفق )
أمل ٢٠١١/٢/٦

المملكة الأردنية الهاشمية
هاتف: ٥٣٤٧٦٧١ ٦ ٩٦٢+ فاكس: ٥٣٤٩٠٧٩ ٦ ٩٦٢+ ص.ب: ٣٥٢٦٢ عمان ١١١٨٠ الأردن. الموقع الإلكتروني: www.mohe.gov.jo

بسم الله الرحمن الرحيم

وزارة التعليم العالي والبحث العلمي

الرقم ٥/٣/١٦٨٥
التاريخ ٣ ربيع الأول ١٤٣٢هـ
الموافق ٦/٢/٢٠١١م

## To Whom It May Concern

Subject: Mohd Khasawneh's PhD Research

With reference to the above subject, we are glad to inform you that we are ready to offer all necessary help to Mr. Mohd Khasawneh in carrying out his study in adoption of ICT in higher education institutions', as far as Jordanian universities are concerned.

We will facilitate all types of questionnaires, interviews and researches he will need in order to fulfill the goals out of such important study.

/Minister of Higher Education
And Scientific Research

مساعد الأمين العام للشؤون الفنية
المهندس منذر بطاينة

المملكة الأردنية الهاشمية
وزارة التعليم العالي والبحث العلمي
الديوان

المملكة الأردنية الهاشمية
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# Appendix E

# Academic Staff in the Jordanian Universities by Academic Rank for the Year 2010 / 2011

| Universities \ Academic Rank | | Grand Total | Full Prof. | Associate Prof. | Assistant Prof. | Instructor | Lecturer | Teach. & Res. Ass. |
|---|---|---|---|---|---|---|---|---|
| Grand Total * | T | 8038 | 1253 | 1491 | 3266 | 910 | 715 | 403 |
| | F | 1740 | 71 | 123 | 581 | 415 | 335 | 215 |
| The University of Jordan | T | 1394 | 346 | 278 | 376 | 68 | 185 | 141 |
| | F | 362 | 23 | 35 | 88 | 41 | 87 | 88 |
| Yarmouk University | T | 764 | 206 | 195 | 169 | 130 | 10 | 54 |
| | F | 122 | 11 | 9 | 22 | 53 | 6 | 21 |
| Mu'tah University | T | 528 | 137 | 168 | 155 | 61 | 0 | 7 |
| | F | 57 | 6 | 7 | 14 | 26 | 0 | 4 |
| Jordan Uni. of Science & Technology | T | 814 | 150 | 191 | 298 | 8 | 118 | 49 |
| | F | 165 | 8 | 13 | 48 | 3 | 70 | 23 |
| The Hashemite University | T | 508 | 36 | 93 | 242 | 20 | 77 | 40 |
| | F | 130 | 1 | 13 | 51 | 10 | 28 | 27 |
| AL al - Bayt University | T | 318 | 34 | 55 | 170 | 43 | 3 | 13 |
| | F | 48 | 0 | 2 | 20 | 16 | 2 | 8 |
| AL-Balqa' Applied University | T | 404 | 19 | 76 | 147 | 74 | 74 | 14 |
| | F | 70 | 2 | 1 | 12 | 33 | 20 | 2 |
| AL-Hussein Bin Talal University | T | 238 | 9 | 25 | 146 | 55 | 0 | 3 |
| | F | 26 | 0 | 1 | 14 | 11 | 0 | 0 |
| Tafila Technical University | T | 182 | 7 | 15 | 66 | 6 | 71 | 17 |
| | F | 25 | 0 | 0 | 4 | 1 | 20 | 0 |
| German Jordanian University | T | 158 | 20 | 11 | 44 | 5 | 52 | 26 |
| | F | 76 | 1 | 1 | 19 | 5 | 34 | 16 |
| Amman Arab Univ. for Graduate Stu. | T | 102 | 49 | 24 | 29 | 0 | 0 | 0 |
| | F | 11 | 3 | 3 | 5 | 0 | 0 | 0 |
| Middle East Uni. for Graduate Stu. | T | 125 | 29 | 26 | 53 | 13 | 4 | 0 |
| | F | 16 | 1 | 1 | 6 | 8 | 0 | 0 |
| Jadara University | T | 91 | 21 | 16 | 44 | 10 | 0 | 0 |
| | F | 12 | 2 | 2 | 6 | 2 | 0 | 0 |
| Al - Ahliyya Amman University | T | 276 | 25 | 39 | 153 | 59 | 0 | 0 |
| | F | 80 | 1 | 8 | 39 | 32 | 0 | 0 |
| Applied Science Uni. (Private) | T | 308 | 22 | 47 | 158 | 29 | 52 | 0 |
| | F | 72 | 1 | 3 | 29 | 10 | 29 | 0 |
| Philadelphia University | T | 294 | 23 | 51 | 157 | 63 | 0 | 0 |
| | F | 67 | 3 | 1 | 27 | 36 | 0 | 0 |
| Al - Isra Private University | T | 250 | 18 | 34 | 144 | 54 | 0 | 0 |
| | F | 51 | 0 | 4 | 24 | 23 | 0 | 0 |
| University of Petra | T | 307 | 19 | 35 | 154 | 59 | 7 | 33 |
| | F | 123 | 1 | 7 | 46 | 41 | 4 | 24 |
| Al-Zaytoonah Private Uni. of Jordan | T | 305 | 30 | 47 | 163 | 28 | 37 | 0 |
| | F | 96 | 6 | 5 | 49 | 14 | 22 | 0 |
| Zarqa Private University | T | 232 | 12 | 18 | 152 | 50 | 0 | 0 |
| | F | 43 | 0 | 3 | 23 | 17 | 0 | 0 |
| Irbid National University | T | 115 | 6 | 12 | 73 | 24 | 0 | 0 |
| | F | 20 | 1 | 3 | 10 | 6 | 0 | 0 |
| Jerash Private University | T | 162 | 17 | 20 | 94 | 31 | 0 | 0 |
| | F | 26 | 0 | 0 | 8 | 18 | 0 | 0 |
| Princess Sumaya Uni. for Tech. | T | 64 | 14 | 14 | 30 | 1 | 5 | 0 |
| | F | 8 | 0 | 1 | 3 | 1 | 3 | 0 |
| Jordan Academy of Music | T | 19 | 2 | 1 | 5 | 11 | 0 | 0 |
| | F | 4 | 0 | 0 | 0 | 4 | 0 | 0 |
| Educational Sciences Faculty | T | 51 | 1 | 0 | 42 | 8 | 0 | 0 |
| | F | 17 | 0 | 0 | 13 | 4 | 0 | 0 |
| Jordan Applied University | T | 29 | 1 | 0 | 2 | 0 | 20 | 6 |
| | F | 13 | 0 | 0 | 1 | 0 | 10 | 2 |

***(7243) Jordanian, (693) Arabic, (102) Foreign**

# Appendix F

# Distribution and Test of Normality

| Descriptive Statistics | | | | | | | |
|---|---|---|---|---|---|---|---|
| | N | Mean | Std. Deviation | Skewness | | Kurtosis | |
| Construct | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Std. Error |
| BI_SUM | 415 | 4.9651 | 1.47042 | -.829 | .120 | -.732 | .239 |
| ATT_SUM | 415 | 4.4651 | 1.36322 | -.456 | .120 | -.869 | .239 |
| SN_WoM_SUM | 415 | 4.5949 | 2.10075 | -.807 | .120 | -1.203 | .239 |
| MMC_SUM | 415 | 5.6404 | .95807 | -2.408 | .120 | 7.653 | .239 |
| PBC_SUM | 415 | 5.1749 | 1.49839 | -1.524 | .120 | .913 | .239 |
| RA_SUM | 415 | 5.5292 | 1.00323 | -1.707 | .120 | 2.118 | .239 |
| Compt_SUM | 415 | 4.3494 | 1.94993 | -.272 | .120 | -1.738 | .239 |
| CompX_SUM | 415 | 2.8789 | 1.15781 | .491 | .120 | -.518 | .239 |
| Trial_SUM | 415 | 2.4040 | 1.09522 | 1.301 | .120 | 1.948 | .239 |
| Observ_SUM | 415 | 4.6651 | 2.02934 | -.896 | .120 | -1.008 | .239 |
| SE_SUM | 415 | 5.7205 | 1.16801 | -2.372 | .120 | 4.924 | .239 |
| TFC_SUM | 415 | 4.9475 | 1.93079 | -1.189 | .120 | -.575 | .239 |
| RFC_SUM | 415 | 4.9147 | 1.75877 | -1.474 | .120 | .536 | .239 |
| GFC_SUM | 415 | 5.7309 | .85700 | -.936 | .120 | .648 | .239 |
| Valid N (listwise) | 415 | | | | | | |

# Appendix G

## *M*, SD, Alpha Reliability and Zero-Order Correlation

| Variables | *M* | *S.D* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* | *12* | *13* | *14* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1-BI** | 4.96 | 1.47 | (0.83) | | | | | | | | | | | | | |
| **2-Att** | 4.46 | 1.36 | .791 | (0.73) | | | | | | | | | | | | |
| **3-SN** | 4.59 | 2.10 | .831 | .736 | (0.98) | | | | | | | | | | | |
| **4-MMC** | 5.64 | .958 | .456 | .400 | .362 | (0.75) | | | | | | | | | | |
| **5-PBC** | 5.17 | 1.49 | .745 | .570 | .642 | .385 | (0.91) | | | | | | | | | |
| **6-RA** | 5.53 | 1.00 | .377 | .314 | .402 | .426 | .480 | (0.74) | | | | | | | | |
| **7-Compt** | 4.35 | 1.95 | .690 | .636 | .717 | .340 | .457 | .300 | (0.92) | | | | | | | |
| **8-Compx** | 2.88 | 1.16 | -.325 | -.407 | -.291 | -.293 | -.379 | -.164 | -.261 | (0.69) | | | | | | |
| **9-Trial** | 2.40 | 1.09 | .496 | .382 | .365 | .286 | .324 | .227 | .345 | -.231 | (0.71) | | | | | |
| **10-Observ** | 4.66 | 2.03 | .729 | .669 | .946 | .400 | .618 | .399 | .663 | -.272 | .360 | (0.96) | | | | |
| **11-SE** | 5.72 | 1.16 | .625 | .457 | .543 | .466 | .700 | .446 | .412 | -.322 | .239 | .524 | (0.90) | | | |
| **12-TFC** | 4.94 | 1.93 | .805 | .697 | .853 | .433 | .679 | .420 | .544 | -.312 | .348 | .837 | .599 | (0.95) | | |
| **13-RFC** | 4.91 | 1.75 | .746 | .632 | .767 | .423 | .687 | .455 | .496 | -.312 | .315 | .743 | .631 | .850 | (0.94) | |
| **14-GFC** | 5.73 | .857 | .675 | .527 | .490 | .714 | .545 | .358 | .442 | -.344 | .449 | .526 | .543 | .552 | .550 | 0.67 |

All Results are significant at P<0.01 level (2-tailed)

# Appendix H

# Reliability Test

## *H-1: Behavioral Intention*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .825 | 4 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| BI_Q1 | 14.9398 | 19.839 | .661 | .775 |
| BI_Q2 | 14.8434 | 23.065 | .569 | .814 |
| BI_Q3 | 14.9470 | 19.925 | .698 | .757 |
| BI_Q4 | 14.8506 | 19.548 | .678 | .766 |

## *H-2: Attitude Toward Technology*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .733 | 4 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| ATT_Q1 | 14.8024 | 19.178 | .367 | .770 |
| ATT_Q2 | 12.9325 | 18.078 | .581 | .640 |
| ATT_Q3 | 12.9108 | 16.777 | .630 | .607 |
| ATT_Q4 | 12.9349 | 18.834 | .545 | .662 |

## *H-3: Subjective Norms*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .957 | 4 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| SN_Q1 | 14.1133 | 40.033 | .904 | .940 |
| SN_Q2 | 14.2169 | 41.228 | .908 | .940 |
| SN_Q3 | 14.0410 | 38.754 | .917 | .937 |
| SN_Q4 | 14.2241 | 42.121 | .850 | .956 |

## *H-4: Perceived Behavioral Control*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .905 | 5 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| PBC_Q1 | 20.7060 | 37.459 | .693 | .899 |
| PBC_Q2 | 20.7446 | 34.770 | .836 | .867 |
| PBC_Q3 | 20.8145 | 36.533 | .799 | .876 |
| PBC_Q4 | 20.5783 | 37.515 | .772 | .882 |
| PBC_Q5 | 20.6554 | 37.613 | .712 | .894 |

## *H-5: Behavioral Beliefs*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .807 | 22 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| RA_Q1 | 83.5952 | 295.459 | .360 | .801 |
| RA_Q2 | 83.5229 | 303.115 | .193 | .806 |
| RA_Q3 | 83.5855 | 288.572 | .399 | .798 |
| RA_Q4 | 83.5422 | 292.283 | .309 | .802 |
| RA_Q5 | 83.5181 | 288.622 | .447 | .797 |
| Compt_Q1 | 84.8120 | 266.945 | .631 | .784 |
| Compt_Q2 | 84.7133 | 263.471 | .653 | .782 |
| Compt_Q3 | 84.6723 | 261.274 | .657 | .781 |
| CompX_Q1 | 86.6964 | 324.734 | -.273 | .825 |
| CompX_Q2 | 86.6024 | 322.965 | -.246 | .823 |
| CompX_Q3 | 86.6988 | 323.834 | -.277 | .823 |
| CompX_Q4 | 84.8145 | 296.804 | .153 | .812 |
| Trial_Q1 | 86.7542 | 294.471 | .342 | .801 |
| Trial_Q2 | 86.6458 | 294.901 | .320 | .802 |
| Trial_Q3 | 86.6337 | 294.624 | .347 | .801 |
| Observ_Q1 | 86.4289 | 291.560 | .358 | .800 |
| Observ_Q2 | 84.4024 | 257.710 | .748 | .776 |
| Observ_Q3 | 84.9518 | 302.611 | .048 | .821 |
| Observ_Q4 | 84.4000 | 256.110 | .728 | .776 |
| Observ_Q5 | 84.4241 | 253.733 | .785 | .773 |
| Observ_Q6 | 84.4410 | 255.629 | .750 | .775 |
| Observ_Q7 | 84.8651 | 291.421 | .198 | .811 |

## ***H-5a: Relative Advantage***

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .742 | 5 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| RA_Q1 | 22.1590 | 19.327 | .390 | .735 |
| RA_Q2 | 22.0867 | 19.471 | .412 | .729 |
| RA_Q3 | 22.1494 | 15.620 | .566 | .672 |
| RA_Q4 | 22.1060 | 14.733 | .607 | .655 |
| RA_Q5 | 22.0819 | 16.563 | .560 | .676 |

## ***H-5b: Compatibility***

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .919 | 3 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| Compt_Q1 | 8.7783 | 16.598 | .828 | .892 |
| Compt_Q2 | 8.6795 | 15.663 | .850 | .873 |
| Compt_Q3 | 8.6386 | 15.202 | .835 | .886 |

## ***H-5c: Complexity***

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .690 | 4 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| CompX_Q1 | 9.1301 | 13.287 | .563 | .573 |
| CompX_Q2 | 9.0361 | 13.677 | .552 | .584 |
| CompX_Q3 | 9.1325 | 14.260 | .548 | .593 |
| CompX_Q4 | 7.2482 | 12.028 | .337 | .767 |

## ***H-5d: Trialability***

Reliability Statistics

| Cronbach's Alpha | N of Items |
|---|---|
| .709 | 3 |

Item-Total Statistics

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| Trial_Q1 | 4.8843 | 5.566 | .517 | .632 |
| Trial_Q2 | 4.7759 | 5.387 | .519 | .630 |
| Trial_Q3 | 4.7639 | 5.533 | .546 | .597 |

## *H-5e: Observability*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .788 | 7 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| Observ_Q1 | 27.0072 | 86.920 | .354 | .788 (FA) |
| Observ_Q2 | 24.9807 | 67.149 | .807 | .703 |
| Observ_Q3 | 25.5301 | 89.849 | .079 | .848 |
| Observ_Q4 | 24.9783 | 65.910 | .795 | .703 |
| Observ_Q5 | 25.0024 | 65.717 | .824 | .698 |
| Observ_Q6 | 25.0193 | 65.990 | .809 | .701 |
| Observ_Q7 | 25.4434 | 87.064 | .158 | .831 |

## *H-5e1: Observability*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .956 | 4 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| Observ_Q2 | 13.9807 | 38.347 | .891 | .942 |
| Observ_Q4 | 13.9783 | 37.678 | .861 | .951 |
| Observ_Q5 | 14.0024 | 37.080 | .917 | .934 |
| Observ_Q6 | 14.0193 | 37.347 | .897 | .940 |

## *H-6: Normative Beliefs*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .950 | 15 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| SN_Q1 | 69.2916 | 441.676 | .882 | .942 |
| SN_Q2 | 69.3952 | 444.814 | .893 | .942 |
| SN_Q3 | 69.2193 | 436.321 | .907 | .942 |
| SN_Q4 | 69.4024 | 446.801 | .856 | .943 |
| WoM_Q1 | 69.3181 | 444.068 | .875 | .943 |
| WoM_Q2 | 69.6217 | 440.675 | .894 | .942 |
| WoM_Q3 | 69.3614 | 433.864 | .895 | .942 |
| WoM_Q4 | 69.6217 | 439.859 | .874 | .943 |
| WoM_Q5 | 69.6072 | 439.157 | .867 | .943 |
| WoM_Q6 | 69.6458 | 437.524 | .885 | .942 |
| MMC_Q1 | 68.5301 | 516.540 | .216 | .955 |
| MMC_Q2 | 68.3349 | 506.832 | .415 | .952 |
| MMC_Q3 | 68.5108 | 514.328 | .300 | .953 |
| MMC_Q4 | 68.3711 | 508.852 | .356 | .953 |
| MMC_Q5 | 68.3759 | 508.124 | .349 | .953 |

## H-6a: Word-of-Mouth

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .967 | 6 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| WoM_Q1 | 22.3590 | 122.665 | .823 | .968 |
| WoM_Q2 | 22.6627 | 118.625 | .899 | .960 |
| WoM_Q3 | 22.4024 | 114.323 | .915 | .959 |
| WoM_Q4 | 22.6627 | 116.973 | .905 | .960 |
| WoM_Q5 | 22.6482 | 116.374 | .903 | .960 |
| WoM_Q6 | 22.6867 | 115.650 | .919 | .958 |

## H-6b: Mass-Media Channels

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .691 | 5 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| MMC_Q1 | 22.5807 | 11.394 | .473 | .629 |
| MMC_Q2 | 22.3855 | 11.078 | .573 | .587 |
| MMC_Q3 | 22.5614 | 14.686 | .137 | .752 |
| MMC_Q4 | 22.4217 | 10.737 | .578 | .581 |
| MMC_Q5 | 22.4265 | 11.033 | .491 | .621 |

## H-6b1:Mass-Media  Channels

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .752 | 4 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| MMC_Q1 | 17.0482 | 9.500 | .453 | .746 |
| MMC_Q2 | 16.8530 | 9.092 | .574 | .681 |
| MMC_Q4 | 16.8892 | 8.592 | .610 | .659 |
| MMC_Q5 | 16.8940 | 8.593 | .560 | .688 |

## *H-7: Control Beliefs*

| Cronbach's Alpha | N of Items |
|---|---|
| .958 | 31 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| PBC_Q1 | 156.8554 | 1241.351 | .634 | .957 |
| PBC_Q2 | 156.8940 | 1227.907 | .737 | .956 |
| PBC_Q3 | 156.9639 | 1237.499 | .703 | .957 |
| PBC_Q4 | 156.7277 | 1241.822 | .687 | .957 |
| PBC_Q5 | 156.8048 | 1235.215 | .704 | .956 |
| SE_Q1 | 156.3446 | 1262.313 | .601 | .957 |
| SE_Q2 | 156.4072 | 1252.295 | .645 | .957 |
| SE_Q3 | 156.2120 | 1257.979 | .626 | .957 |
| SE_Q4 | 156.3807 | 1280.884 | .476 | .958 |
| SE_Q5 | 156.2916 | 1254.260 | .662 | .957 |
| SE_Q6 | 156.1855 | 1253.823 | .694 | .957 |
| TFC_Q1 | 157.0964 | 1213.677 | .773 | .956 |
| TFC_Q2 | 157.1422 | 1203.799 | .825 | .955 |
| TFC_Q3 | 157.9373 | 1303.078 | .117 | .962 |
| TFC_Q4 | 157.5398 | 1300.867 | .108 | .963 |
| TFC_Q5 | 157.0000 | 1196.053 | .838 | .955 |
| TFC_Q6 | 156.9205 | 1194.122 | .847 | .955 |
| TFC_Q7 | 157.2241 | 1195.237 | .848 | .955 |
| TFC_Q8 | 157.0000 | 1198.266 | .819 | .955 |
| RFC_Q1 | 157.1060 | 1200.834 | .829 | .955 |
| RFC_Q2 | 157.0024 | 1211.674 | .824 | .955 |
| RFC_Q3 | 157.7976 | 1234.819 | .740 | .956 |
| RFC_Q4 | 156.8289 | 1199.108 | .835 | .955 |
| RFC_Q5 | 156.9855 | 1205.555 | .812 | .956 |
| RFC_Q6 | 156.9325 | 1213.174 | .789 | .956 |
| GFC_Q1 | 156.2602 | 1293.705 | .391 | .958 |
| GFC_Q2 | 156.4506 | 1291.934 | .383 | .959 |
| GFC_Q3 | 156.2386 | 1284.351 | .542 | .958 |
| GFC_Q4 | 156.5518 | 1281.915 | .527 | .958 |
| GFC_Q5 | 156.3373 | 1290.079 | .450 | .958 |
| GFC_Q6 | 156.3036 | 1282.110 | .487 | .958 |

## *H-7a:Self Efficacy*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .896 | 6 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| SE_Q1 | 28.6434 | 35.544 | .673 | .885 |
| SE_Q2 | 28.7060 | 33.377 | .743 | .874 |
| SE_Q3 | 28.5108 | 34.299 | .731 | .876 |
| SE_Q4 | 28.6795 | 37.445 | .650 | .888 |
| SE_Q5 | 28.5904 | 34.378 | .726 | .877 |
| SE_Q6 | 28.4843 | 33.849 | .802 | .865 |

## *H-7b: Technology Facilitating Conditions*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .874 | 8 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| TFC_Q1 | 33.4048 | 118.614 | .819 | .840 |
| TFC_Q2 | 33.4506 | 116.123 | .859 | .835 |
| TFC_Q3 | 34.2458 | 147.297 | .127 | .908 |
| TFC_Q4 | 33.8482 | 145.583 | .119 | .915 |
| TFC_Q5 | 33.3084 | 114.982 | .838 | .836 |
| TFC_Q6 | 33.2289 | 113.554 | .869 | .832 |
| TFC_Q7 | 33.5325 | 114.448 | .857 | .834 |
| TFC_Q8 | 33.3084 | 116.948 | .785 | .842 |

## *H-7b1: Technology Facilitating Conditions*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .960 | 6 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| TFC_Q1 | 24.8337 | 96.405 | .857 | .954 (FA) |
| TFC_Q2 | 24.8795 | 94.232 | .895 | .950 |
| TFC_Q5 | 24.7373 | 93.199 | .872 | .952 |
| TFC_Q6 | 24.6578 | 91.728 | .910 | .948 |
| TFC_Q7 | 24.9614 | 92.656 | .893 | .950 |
| TFC_Q8 | 24.7373 | 95.276 | .810 | .959 |

## *H-7b2: Technology Facilitating Conditions*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .952 | 5 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| TFC_Q1 | 19.8096 | 62.039 | .859 | .942 |
| TFC_Q2 | 19.8554 | 60.525 | .890 | .937 |
| TFC_Q6 | 19.6337 | 58.754 | .896 | .936 |
| TFC_Q7 | 19.9373 | 59.334 | .885 | .938 |
| TFC_Q8 | 19.7133 | 61.162 | .808 | .951 |

## *H-7c: Resource Facilitating Conditions*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .943 | 6 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| RFC_Q1 | 24.5735 | 77.332 | .770 | .941(FA) |
| RFC_Q2 | 24.4699 | 76.825 | .877 | .927 |
| RFC_Q3 | 25.2651 | 83.094 | .783 | .939 |
| RFC_Q4 | 24.2964 | 73.547 | .886 | .926 |
| RFC_Q5 | 24.4530 | 75.804 | .840 | .932 |
| RFC_Q6 | 24.4000 | 77.255 | .833 | .932 |

## *H-7c1: Resource Facilitating Conditions*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .941 | 5 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| RFC_Q2 | 19.5518 | 49.789 | .879 | .920 |
| RFC_Q3 | 20.3470 | 54.932 | .780 | .938 |
| RFC_Q4 | 19.3783 | 47.535 | .870 | .921 |
| RFC_Q5 | 19.5349 | 48.848 | .844 | .926 |
| RFC_Q6 | 19.4819 | 50.033 | .837 | .927 |

## *H-7d: Government Facilitating Conditions*

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .709 | 6 |

**Item-Total Statistics**

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| GFC_Q1 | 28.2386 | 14.100 | .370 | .691(FA) |
| GFC_Q2 | 28.4289 | 13.197 | .441 | .670(FA) |
| GFC_Q3 | 28.2169 | 13.257 | .531 | .644 |
| GFC_Q4 | 28.5301 | 13.549 | .425 | .675(FA) |
| GFC_Q5 | 28.3157 | 13.613 | .456 | .665 |
| GFC_Q6 | 28.2819 | 13.106 | .431 | .674 |

## *H-7d1: Government Facilitating Conditions*

Reliability Statistics

| Cronbach's Alpha | N of Items |
|---|---|
| .669 | 3 |

Item-Total Statistics

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| GFC_Q3 | 11.4072 | 3.759 | .443 | .621 |
| GFC_Q5 | 11.5060 | 3.550 | .480 | .575 |
| GFC_Q6 | 11.4723 | 2.965 | .526 | .512 |

## *H-8: Subjective Norms with Personal Factors*

Reliability Statistics

| Cronbach's Alpha | N of Items |
|---|---|
| .979 | 10 |

Item-Total Statistics

| Items | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| SN_Q1 | 41.1976 | 359.695 | .891 | .976 |
| SN_Q2 | 41.3012 | 362.892 | .898 | .976 |
| SN_Q3 | 41.1253 | 354.366 | .922 | .975 |
| SN_Q4 | 41.3084 | 364.011 | .869 | .977 |
| WoM_Q1 | 41.2241 | 362.218 | .879 | .977 |
| WoM_Q2 | 41.5277 | 357.892 | .915 | .976 |
| WoM_Q3 | 41.2675 | 351.940 | .912 | .976 |
| WoM_Q4 | 41.5277 | 357.660 | .888 | .976 |
| WoM_Q5 | 41.5133 | 356.961 | .882 | .977 |
| WoM_Q6 | 41.5518 | 355.523 | .899 | .976 |

# Appendix I

# Factor Analysis

## *I-1: Behavioral Intention*

**KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .801 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 586.521 |
| | df | 6 |
| | Sig. | .000 |

**Communalities**

| Items | Initial | Extraction |
|---|---|---|
| BI_Q1 | 1.000 | .668 |
| BI_Q2 | 1.000 | .556 |
| BI_Q3 | 1.000 | .712 |
| BI_Q4 | 1.000 | .689 |

Extraction Method: Principal

**Total Variance Explained**

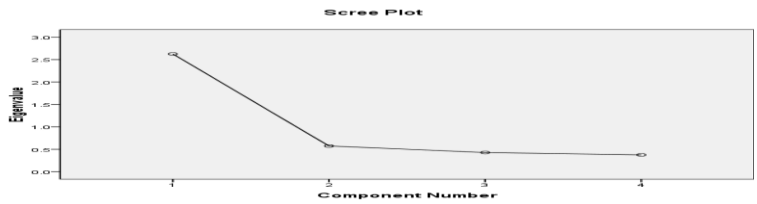
| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.625 | 65.628 | 65.628 | 2.625 | 65.628 | 65.628 |
| 2 | .573 | 14.330 | 79.958 | | | |
| 3 | .427 | 10.686 | 90.644 | | | |
| 4 | .374 | 9.356 | 100.000 | | | |

Extraction Method: Principal Component Analysis.

**Component Matrix**

| Items | Component 1 |
|---|---|
| BI_Q1 | .817 |
| BI_Q2 | .746 |
| BI_Q3 | .844 |
| BI_Q4 | .830 |

Extraction Method: Principal Component Analysis.
1 component extracted.




## *I-2: Direct Predicator*

**KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .925 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 4210.271 |
| | df | 78 |
| | Sig. | .000 |

**Communalities**

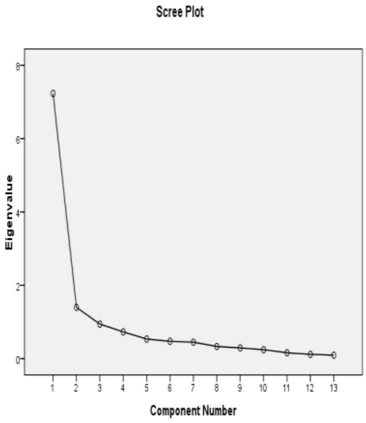
| Items | Initial | Extraction |
|---|---|---|
| Att_Q1 | 1.000 | .693 |
| Att_Q2 | 1.000 | .582 |
| Att_Q3 | 1.000 | .624 |
| Att_Q4 | 1.000 | .547 |
| SN_Q1 | 1.000 | .873 |
| SN_Q2 | 1.000 | .901 |
| SN_Q3 | 1.000 | .894 |
| SN_Q4 | 1.000 | .822 |
| PBC_Q1 | 1.000 | .660 |
| PBC_Q2 | 1.000 | .814 |
| PBC_Q3 | 1.000 | .769 |
| PBC_Q4 | 1.000 | .732 |
| PBC_Q5 | 1.000 | .658 |

Extraction Method: Principal Component Analysis.

**Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 7.229 | 55.611 | 55.611 | 7.229 | 55.611 | 55.611 |
| 2 | 1.398 | 10.755 | 66.366 | 1.398 | 10.755 | 66.366 |
| 3 | .941 | 7.242 | 73.608 | .941 | 7.242 | 73.608 |
| 4 | .730 | 5.613 | 79.220 | | | |
| 5 | .535 | 4.119 | 83.339 | | | |
| 6 | .473 | 3.639 | 86.978 | | | |
| 7 | .450 | 3.461 | 90.439 | | | |
| 8 | .332 | 2.550 | 92.989 | | | |
| 9 | .293 | 2.254 | 95.243 | | | |
| 10 | .245 | 1.887 | 97.131 | | | |
| 11 | .161 | 1.238 | 98.368 | | | |
| 12 | .118 | .909 | 99.277 | | | |
| 13 | .094 | .723 | 100.000 | | | |

Extraction Method: Principal Component Analysis.




**Component Matrix**

| Items | Component 1 | 2 | 3 |
|---|---|---|---|
| Att_Q1 | .385 | -.274 | .685 |
| Att_Q2 | .709 | -.249 | .131 |
| Att_Q3 | .729 | -.192 | .233 |
| Att_Q4 | .605 | -.110 | .412 |
| SN_Q1 | .861 | -.288 | -.221 |
| SN_Q2 | .860 | -.320 | -.243 |
| SN_Q3 | .860 | -.299 | -.253 |
| SN_Q4 | .820 | -.308 | -.234 |
| PBC_Q1 | .670 | .457 | .045 |
| PBC_Q2 | .801 | .415 | -.028 |
| PBC_Q3 | .774 | .412 | -.005 |
| PBC_Q4 | .751 | .411 | .001 |
| PBC_Q5 | .730 | .350 | .039 |

Extraction Method: Principal Component Analysis.
3 components extracted

## *I-2a: Direct Predicator*

**KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .947 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 9638.562 |
| | df | 276 |
| | Sig. | .000 |

| Items | Initial | Extraction | Items | Initial | Extraction |
|---|---|---|---|---|---|
| Att_Q1 | .174 | .149 | MMC_Q1 | .474 | .539 |
| Att_Q2 | .640 | .510 | MMC_Q2 | .452 | .455 |
| Att_Q3 | .675 | .571 | MMC_Q3 | .202 | .139 |
| Att_Q4 | .607 | .670 | MMC_Q4 | .433 | .531 |
| SN_Q1 | .841 | .833 | MMC_Q5 | .436 | .523 |
| SN_Q2 | .884 | .857 | PBC_Q1 | .541 | .548 |
| SN_Q3 | .895 | .876 | PBC_Q2 | .748 | .804 |
| SN_Q4 | .809 | .782 | PBC_Q3 | .681 | .730 |
| WoM_Q1 | .840 | .804 | PBC_Q4 | .647 | .683 |
| WoM_Q2 | .908 | .864 | PBC_Q5 | .592 | .574 |
| WoM_Q3 | .876 | .850 | | | |
| WoM_Q4 | .860 | .825 | | | |
| WoM_Q5 | .853 | .807 | | | |
| WoM_Q6 | .905 | .896 | | | |

**Communalities**
Extraction Method: Principal Axis Factoring

| Factor | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings(a) |
|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total |
| 1 | 12.343 | 51.430 | 51.430 | 12.095 | 50.395 | 50.395 | 11.447 |
| 2 | 2.087 | 8.694 | 60.124 | 1.708 | 7.115 | 57.510 | 3.218 |
| 3 | 1.623 | 6.761 | 66.884 | 1.251 | 5.213 | 62.723 | 8.445 |
| 4 | 1.203 | 5.011 | 71.895 | .765 | 3.185 | 65.909 | 2.399 |
| 5 | .887 | 3.694 | 75.589 | | | | |
| 6 | .821 | 3.420 | 79.009 | | | | |
| 7 | .632 | 2.633 | 81.642 | | | | |
| 8 | .584 | 2.431 | 84.073 | | | | |
| 9 | .511 | 2.131 | 86.204 | | | | |
| 10 | .459 | 1.913 | 88.117 | | | | |
| 11 | .430 | 1.790 | 89.907 | | | | |
| 12 | .423 | 1.763 | 91.669 | | | | |
| 13 | .335 | 1.395 | 93.064 | | | | |
| 14 | .293 | 1.223 | 94.286 | | | | |
| 15 | .268 | 1.115 | 95.402 | | | | |
| 16 | .239 | .996 | 96.398 | | | | |
| 17 | .160 | .667 | 97.065 | | | | |
| 18 | .141 | .587 | 97.652 | | | | |
| 19 | .133 | .553 | 98.206 | | | | |
| 20 | .110 | .459 | 98.665 | | | | |
| 21 | .097 | .404 | 99.069 | | | | |
| 22 | .089 | .369 | 99.438 | | | | |
| 23 | .069 | .289 | 99.727 | | | | |
| 24 | .065 | .273 | 100.000 | | | | |

**Total Variance Explained**
Extraction Method: Principal Axis Factoring.
a When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

**Factor Matrix**

| Items | Factor | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| WoM_Q6 | .902 | -.207 | | .186 |
| SN_Q3 | .898 | -.205 | | -.161 |
| WoM_Q2 | .891 | -.253 | | |
| WoM_Q3 | .891 | -.229 | | |
| SN_Q2 | .888 | -.167 | | -.187 |
| WoM_Q4 | .887 | -.171 | | |
| SN_Q1 | .882 | -.156 | | -.175 |
| WoM_Q5 | .877 | -.178 | | |
| WoM_Q1 | .857 | -.184 | .110 | -.151 |
| SN_Q4 | .848 | -.205 | | -.142 |
| PBC_Q2 | .726 | .385 | -.355 | |
| Att_Q3 | .711 | | | .255 |
| Att_Q2 | .697 | | | .140 |
| PBC_Q3 | .690 | .304 | -.401 | |
| PBC_Q4 | .658 | .249 | -.434 | |
| PBC_Q5 | .643 | .272 | -.292 | |
| Att_Q4 | .614 | .185 | .217 | .461 |
| PBC_Q1 | .579 | .365 | -.281 | |
| MMC_Q2 | .440 | .432 | .260 | |
| Att_Q1 | .357 | | | .119 |
| MMC_Q3 | .328 | | | .173 |
| MMC_Q1 | .255 | .474 | .421 | .269 |
| MMC_Q4 | .366 | .432 | .399 | -.225 |
| MMC_Q5 | .362 | .414 | .335 | -.329 |

Extraction Method: Principal Axis Factoring.

a. 4 factors extracted. 8 iterations required.

**Pattern Matrix**

| Items | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---|---|---|---|---|
| WoM_Q2 | .961 | | | |
| SN_Q3 | .928 | | | -.134 |
| WoM_Q3 | .924 | | | |
| WoM_Q1 | .908 | .116 | | -.102 |
| SN_Q2 | .903 | .122 | | -.142 |
| WoM_Q6 | .881 | | | .219 |
| SN_Q4 | .877 | | | -.124 |
| SN_Q1 | .863 | | | -.142 |
| WoM_Q4 | .840 | | | .111 |
| WoM_Q5 | .839 | | | |
| Att_Q2 | .569 | | -.105 | .180 |
| Att_Q3 | .507 | | -.178 | .290 |
| Att_Q1 | .276 | | | .167 |
| MMC_Q4 | | .701 | | |
| MMC_Q5 | | .694 | | -.119 |
| MMC_Q2 | | .541 | -.170 | .108 |
| PBC_Q2 | | | -.882 | |
| PBC_Q3 | | | -.860 | |
| PBC_Q4 | | | -.844 | |
| PBC_Q1 | | | -.748 | |
| PBC_Q5 | | | -.704 | |
| Att_Q4 | .294 | .104 | | .598 |
| MMC_Q1 | -.125 | .492 | | .506 |
| MMC_Q3 | .179 | | -.131 | .190 |

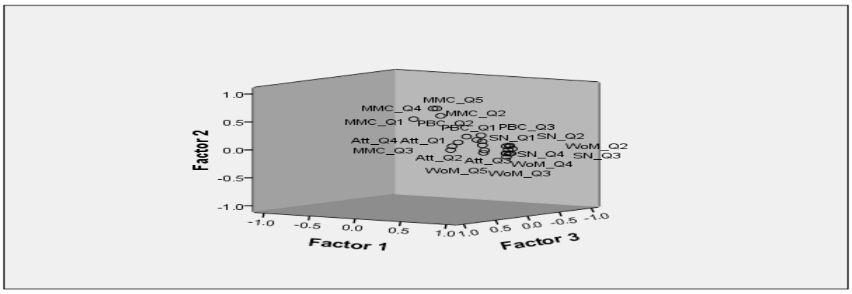
Extraction Method:
Principal Axis Factoring.
Rotation Method:
Oblimin with Kaiser Normalization.
a. Rotation converged in 10 iterations.

**Structure Matrix**

| Items | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| WoM_Q2 | .929 | .254 | -.594 | .251 |
| SN_Q3 | .926 | .313 | -.629 | .153 |
| WoM_Q6 | .922 | .217 | -.622 | .455 |
| WoM_Q3 | .921 | .250 | -.605 | .302 |
| SN_Q2 | .910 | .360 | -.622 | .148 |
| WoM_Q4 | .901 | .252 | -.635 | .361 |
| SN_Q1 | .898 | .336 | -.640 | .145 |
| WoM_Q5 | .893 | .244 | -.629 | .338 |
| WoM_Q1 | .886 | .344 | -.574 | .172 |
| SN_Q4 | .876 | .276 | -.598 | .145 |
| Att_Q3 | .687 | .191 | -.569 | .468 |
| Att_Q2 | .687 | .223 | -.528 | .369 |
| Att_Q1 | .345 | .160 | -.257 | .258 |
| MMC_Q3 | .306 | | -.285 | .267 |
| MMC_Q4 | .283 | .725 | -.283 | .176 |
| MMC_Q5 | .283 | .710 | -.301 | |
| MMC_Q2 | .342 | .632 | -.406 | .279 |
| PBC_Q2 | .589 | .364 | -.893 | .223 |
| PBC_Q3 | .571 | .262 | -.853 | .199 |
| PBC_Q4 | .550 | .193 | -.821 | .168 |
| PBC_Q5 | .540 | .284 | -.755 | .203 |
| PBC_Q1 | .455 | .309 | -.734 | .247 |
| Att_Q4 | .550 | .341 | -.476 | .726 |
| MMC_Q1 | .152 | .556 | -.204 | .568 |

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin
with Kaiser Normalization.

**Factor Plot in Rotated Factor Space**




## *I-3: Behavioral Beliefs*

**KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .870 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 4760.976 |
| | df | 231 |
| | Sig. | .000 |

**Total Variance Explained**

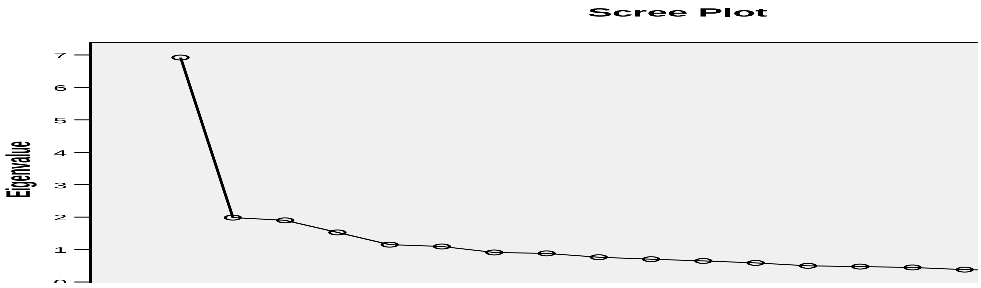
| Factor | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings (a) |
|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total |
| 1 | 6.921 | 31.459 | 31.459 | 6.645 | 30.205 | 30.205 | 3.923 |
| 2 | 1.985 | 9.024 | 40.483 | 1.491 | 6.779 | 36.983 | 2.811 |
| 3 | 1.901 | 8.642 | 49.125 | 1.445 | 6.566 | 43.550 | 2.665 |
| 4 | 1.529 | 6.950 | 56.075 | 1.025 | 4.660 | 48.210 | 2.775 |
| 5 | 1.152 | 5.235 | 61.310 | .879 | 3.995 | 52.205 | 4.592 |
| 6 | 1.095 | 4.978 | 66.289 | .414 | 1.880 | 54.085 | 1.507 |
| 7 | .911 | 4.140 | 70.428 | | | | |
| 8 | .882 | 4.010 | 74.438 | | | | |
| 9 | .764 | 3.474 | 77.912 | | | | |
| 10 | .703 | 3.194 | 81.107 | | | | |
| 11 | .650 | 2.954 | 84.061 | | | | |
| 12 | .589 | 2.675 | 86.736 | | | | |
| 13 | .499 | 2.268 | 89.004 | | | | |
| 14 | .476 | 2.162 | 91.166 | | | | |
| 15 | .448 | 2.037 | 93.202 | | | | |
| 16 | .381 | 1.734 | 94.936 | | | | |
| 17 | .352 | 1.600 | 96.536 | | | | |
| 18 | .192 | .872 | 97.409 | | | | |
| 19 | .184 | .837 | 98.246 | | | | |
| 20 | .167 | .757 | 99.003 | | | | |
| 21 | .133 | .603 | 99.606 | | | | |
| 22 | .087 | .394 | 100.000 | | | | |

Extraction Method: Principal Axis Factoring.
a When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

**Communalities**

| Items | Initial | Extraction |
|---|---|---|
| RA_Q1 | .234 | .240 |
| RA_Q2 | .252 | .264 |
| RA_Q3 | .468 | .554 |
| RA_Q4 | .461 | .572 |
| RA_Q5 | .509 | .538 |
| Compt_Q1 | .740 | .839 |
| Compt_Q2 | .754 | .809 |
| Compt_Q3 | .748 | .784 |
| CompX_Q1 | .473 | .654 |
| CompX_Q2 | .431 | .505 |
| CompX_Q3 | .441 | .535 |
| CompX_Q4 | .274 | .349 |
| Trial_Q1 | .349 | .489 |
| Trial_Q2 | .335 | .432 |
| Trial_Q3 | .365 | .534 |
| Observ_Q1 | .206 | .252 |
| Observ_Q2 | .812 | .853 |
| Observ_Q3 | .064 | .043 |
| Observ_Q4 | .777 | .800 |
| Observ_Q5 | .863 | .885 |
| Observ_Q6 | .859 | .879 |
| Observ_Q7 | .096 | .087 |

Extraction Method: Principal Axis Factoring.




**Factor Matrix (a)**

| | Factor | | | | | |
|---|---|---|---|---|---|---|
| Items | 1 | 2 | 3 | 4 | 5 | 6 |
| Observ_Q5 | .879 | | | | | |
| Observ_Q6 | .847 | | | | | |
| bserv_Q2 | .843 | | | | | |
| Observ_Q4 | .836 | | | | | |
| Compt_Q3 | .780 | | | | -.327 | |
| Compt_Q2 | .773 | | | | -.374 | |
| Compt_Q1 | .709 | | | | -.453 | |
| RA_Q3 | .487 | .456 | | | | |
| RA_Q1 | .377 | | | | | |
| Observ_Q1 | .357 | | | | | |
| Observ_Q7 | | | | | | |
| RA_Q4 | .319 | .672 | | | | |
| RA_Q5 | .468 | .524 | | | | |
| RA_Q2 | | .457 | | | | |
| CompX_Q1 | -.483 | | .531 | | | |
| CompX_Q4 | | | .529 | | | |
| CompX_Q2 | -.442 | | .504 | | | |
| CompX_Q3 | -.475 | | .491 | | | |
| Trial_Q3 | .412 | | | .506 | | |
| Trial_Q1 | .402 | | | .492 | | |
| Trial_Q2 | .377 | | | .483 | | |
| Observ_Q3 | | | | | | |

Extraction Method: Principal Axis Factoring.
a 6 factors extracted. 11 iterations required

**Pattern Matrix(a)**

| | Factor | | | | | |
|---|---|---|---|---|---|---|
| Items | 1 | 2 | 3 | 4 | 5 | 6 |
| Observ_Q2 | .731 | | | | | |
| Observ_Q6 | .693 | | | | | -.325 |
| Observ_Q5 | .690 | | | | | |
| Observ_Q4 | .675 | | | | | |
| Observ_Q3 | | | | | | |
| RA_Q4 | | .773 | | | | |
| RA_Q3 | | .650 | | | | |
| RA_Q5 | | .619 | | | | |
| RA_Q2 | | .514 | | | | |
| RA_Q1 | | .358 | | | | |
| CompX_Q1 | | | .767 | | | |
| CompX_Q3 | | | .681 | | | |
| CompX_Q2 | | | .617 | | | |
| CompX_Q4 | | | .489 | | | -.314 |
| Trial_Q3 | | | | .706 | | |
| Trial_Q1 | | | | .644 | | |
| Trial_Q2 | | | | .643 | | |
| Compt_Q1 | | | | | -.917 | |
| Compt_Q2 | | | | | -.820 | |
| Compt_Q3 | | | | | -.759 | |
| Observ_Q1 | | | | | | -.406 |
| Observ_Q7 | | | | | | |

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
a Rotation converged in 19 iterations.

**Structure Matrix**

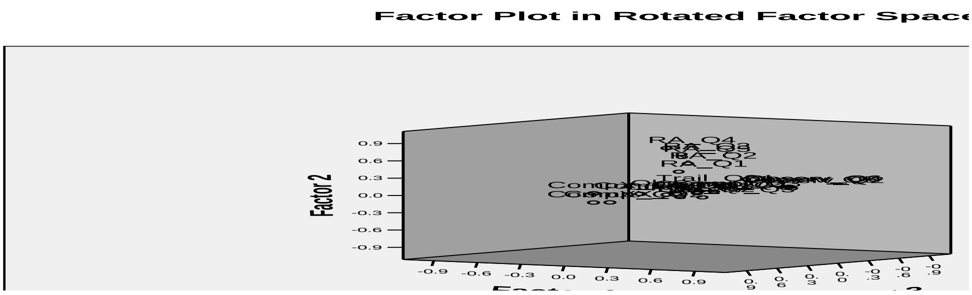
| | Factor | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Observ_Q2 | .861 | .343 | | .364 | -.577 | -.331 |
| Observ_Q5 | .851 | .366 | -.304 | .401 | -.624 | -.379 |
| Observ_Q6 | .828 | .374 | | .323 | -.567 | -.477 |
| Observ_Q4 | .820 | .351 | -.355 | .382 | -.574 | |
| Observ_Q3 | | | | | | |
| RA_Q4 | | .750 | | | | |
| RA_Q3 | | .683 | | | -.356 | |
| RA_Q5 | | .681 | | | | -.387 |
| RA_Q2 | | .487 | | | | |
| RA_Q1 | | .432 | | | | |
| CompX_Q1 | | | .775 | | .301 | |
| CompX_Q3 | | | .707 | | | |
| CompX_Q2 | | | .681 | | .321 | |
| CompX_Q4 | | | .450 | | | -.353 |
| Trial_Q3 | | | | .706 | | |
| Trial_Q1 | | | | .674 | | -.308 |
| Trial_Q2 | | | | .651 | | |
| Compt_Q1 | .392 | | | .389 | -.910 | |
| Compt_Q2 | .479 | | -.313 | .343 | -.892 | |
| Compt_Q3 | .549 | | -.327 | .324 | -.862 | |
| Observ_Q1 | | | | | | -.457 |
| Observ_Q7 | | | | | | |

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.

**Factor Correlation Matrix**

| Factor | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1 | 1.000 | .152 | -.181 | .220 | -.451 | -.132 |
| 2 | .152 | 1.000 | -.179 | .229 | -.224 | -.214 |
| 3 | -.181 | -.179 | 1.000 | -.274 | .269 | -.001 |
| 4 | .220 | .229 | -.274 | 1.000 | -.359 | -.198 |
| 5 | -.451 | -.224 | .269 | -.359 | 1.000 | .259 |
| 6 | -.132 | -.214 | -.001 | -.198 | .259 | 1.000 |

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.



## *I-4: Normative Beliefs*

**KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .942 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 6746.957 |
| | df | 105 |
| | Sig. | .000 |

**Communalities**

| Items | Initial | Extraction |
|---|---|---|
| SN_Q1 | .830 | .845 |
| SN_Q2 | .873 | .886 |
| SN_Q3 | .889 | .902 |
| SN_Q4 | .798 | .778 |
| WoM_Q1 | .831 | .819 |
| WoM_Q2 | .894 | .857 |
| WoM_Q3 | .866 | .860 |
| WoM_Q4 | .852 | .851 |
| WoM_Q5 | .843 | .826 |
| WoM_Q6 | .876 | .931 |
| MMC_Q1 | .274 | .316 |
| MMC_Q2 | .420 | .497 |
| MMC_Q3 | .153 | .109 |
| MMC_Q4 | .426 | .547 |
| MMC_Q5 | .429 | .494 |

Extraction Method: Principal Axis Factoring.

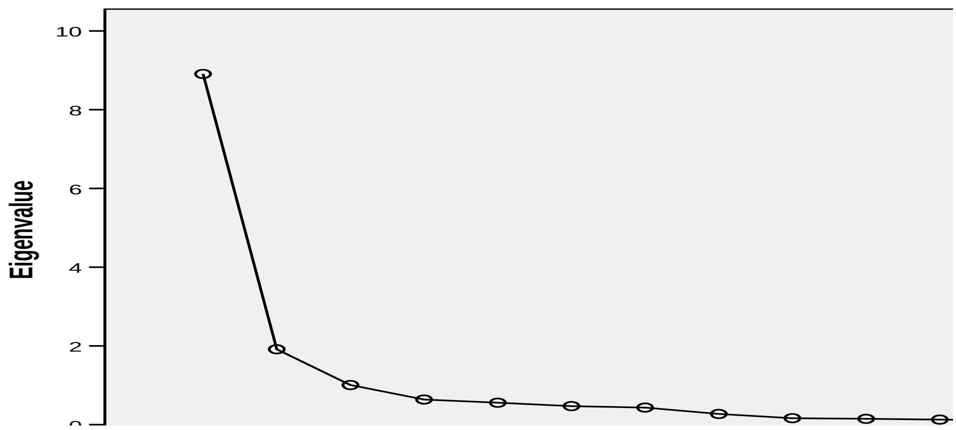
**Total Variance Explained**

| Factor | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings (a) |
|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total |
| 1 | 8.907 | 59.383 | 59.383 | 8.735 | 58.234 | 58.234 | 8.652 |
| 2 | 1.914 | 12.757 | 72.140 | 1.410 | 9.398 | 67.632 | 3.093 |
| 3 | 1.006 | 6.710 | 78.850 | .375 | 2.503 | 70.134 | .388 |
| 4 | .638 | 4.253 | 83.103 | | | | |
| 5 | .557 | 3.714 | 86.816 | | | | |
| 6 | .470 | 3.135 | 89.951 | | | | |
| 7 | .433 | 2.886 | 92.837 | | | | |
| 8 | .271 | 1.809 | 94.646 | | | | |
| 9 | .163 | 1.090 | 95.735 | | | | |
| 10 | .148 | .989 | 96.724 | | | | |
| 11 | .128 | .851 | 97.576 | | | | |
| 12 | .114 | .762 | 98.338 | | | | |
| 13 | .099 | .662 | 98.999 | | | | |
| 14 | .081 | .537 | 99.536 | | | | |
| 15 | .070 | .464 | 100.000 | | | | |

Extraction Method: Principal Axis Factoring.
a When factors are correlated, sums of squared loadings cannot be added to obtain a total variance

.

**Scree Plot**



**Factor Matrix(a)**

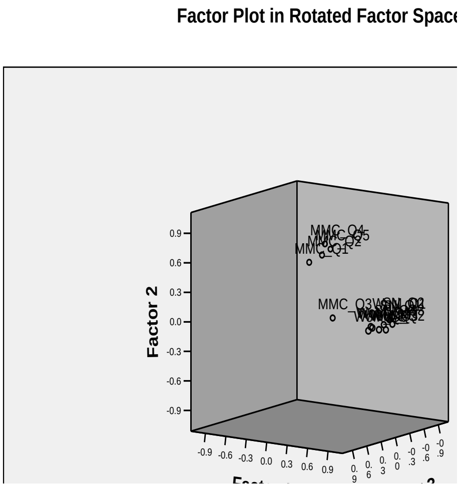
| Items | Factor | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| SN_Q3 | .931 | | |
| WoM_Q2 | .916 | | |
| WoM_Q3 | .915 | | |
| SN_Q2 | .915 | | |
| WoM_Q6 | .912 | | |
| SN_Q1 | .903 | | |
| WoM_Q4 | .896 | | |
| WoM_Q1 | .892 | | |
| WoM_Q5 | .887 | | |
| SN_Q4 | .874 | | |
| MMC_Q3 | .302 | | |
| MMC_Q4 | .358 | .645 | |
| MMC_Q5 | .354 | .593 | |
| MMC_Q2 | .413 | .557 | |
| MMC_Q1 | | .497 | |

Extraction Method: Principal Axis Factoring.
a 3 factors extracted. 7 iterations required.

**Pattern Matrix(a)**

| Items | Factor | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| SN_Q3 | .943 | | |
| WoM_Q2 | .942 | | |
| WoM_Q3 | .928 | | |
| WoM_Q6 | .911 | | |
| SN_Q2 | .901 | | |
| SN_Q1 | .895 | | |
| WoM_Q5 | .886 | | |
| WoM_Q4 | .885 | | |
| SN_Q4 | .882 | | |
| WoM_Q1 | .874 | | |
| MMC_Q3 | | | |
| MMC_Q4 | | .731 | |
| MMC_Q5 | | .670 | |
| MMC_Q2 | | .654 | |
| MMC_Q1 | | .568 | |

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
a Rotation converged in 4 iterations.




**Structure Matrix**

| Items | Factor | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| SN_Q3 | .933 | .357 | |
| WoM_Q2 | .924 | .321 | |
| WoM_Q3 | .924 | .336 | |
| WoM_Q6 | .923 | .350 | .326 |
| SN_Q2 | .911 | .398 | |
| WoM_Q4 | .902 | .364 | |
| SN_Q1 | .901 | .381 | |
| WoM_Q5 | .895 | .347 | |
| WoM_Q1 | .888 | .392 | |
| SN_Q4 | .878 | .338 | |
| MMC_Q3 | .302 | | |
| MMC_Q4 | | .733 | |
| MMC_Q2 | .353 | .693 | |
| MMC_Q5 | | .682 | |
| MMC_Q1 | | .545 | |

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.

## *I-5: Control Beliefs*

**KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .948 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 10868.621 |
| | df | 465 |
| | Sig. | .000 |

**Total Variance Explained**

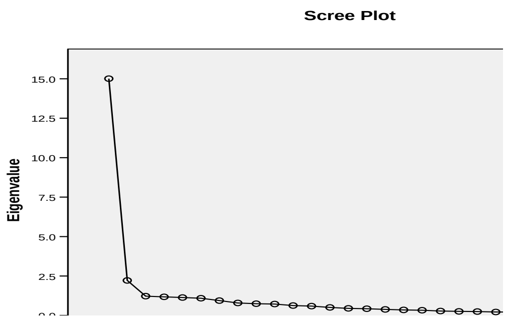
| Factor | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings (a) |
|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total |
| 1 | 15.008 | 48.412 | 48.412 | 14.723 | 47.492 | 47.492 | 8.868 |
| 2 | 2.220 | 7.162 | 55.574 | 1.907 | 6.153 | 53.645 | 8.488 |
| 3 | 1.224 | 3.950 | 59.524 | .876 | 2.824 | 56.469 | 10.803 |
| 4 | 1.180 | 3.807 | 63.330 | .694 | 2.238 | 58.707 | 3.443 |
| 5 | 1.137 | 3.668 | 66.999 | .570 | 1.838 | 60.545 | 5.689 |
| 6 | 1.093 | 3.525 | 70.524 | .512 | 1.653 | 62.198 | 9.761 |
| 7 | .944 | 3.044 | 73.568 | | | | |
| 8 | .792 | 2.555 | 76.122 | | | | |
| 9 | .745 | 2.405 | 78.527 | | | | |
| 10 | .725 | 2.338 | 80.865 | | | | |
| 11 | .628 | 2.026 | 82.891 | | | | |
| 12 | .594 | 1.917 | 84.808 | | | | |
| 13 | .510 | 1.646 | 86.454 | | | | |
| 14 | .450 | 1.451 | 87.905 | | | | |
| 15 | .426 | 1.374 | 89.279 | | | | |
| 16 | .384 | 1.239 | 90.518 | | | | |
| 17 | .351 | 1.134 | 91.652 | | | | |
| 18 | .331 | 1.069 | 92.721 | | | | |
| 19 | .281 | .908 | 93.628 | | | | |
| 20 | .260 | .838 | 94.466 | | | | |
| 21 | .247 | .797 | 95.263 | | | | |
| 22 | .221 | .713 | 95.977 | | | | |
| 23 | .217 | .700 | 96.677 | | | | |
| 24 | .198 | .640 | 97.316 | | | | |
| 25 | .160 | .517 | 97.834 | | | | |
| 26 | .146 | .472 | 98.305 | | | | |
| 27 | .127 | .410 | 98.716 | | | | |
| 28 | .113 | .365 | 99.081 | | | | |
| 29 | .109 | .351 | 99.431 | | | | |
| 30 | .096 | .309 | 99.741 | | | | |
| 31 | .080 | .259 | 100.00 | | | | |

Extraction Method: Principal Axis Factoring.
a When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

**Communalities**

| Items | Initial | Extraction |
|---|---|---|
| PBC_Q1 | .590 | .565 |
| PBC_Q2 | .743 | .814 |
| PBC_Q3 | .686 | .733 |
| PBC_Q4 | .666 | .672 |
| PBC_Q5 | .665 | .626 |
| SE_Q1 | .554 | .562 |
| SE_Q2 | .657 | .639 |
| SE_Q3 | .696 | .656 |
| SE_Q4 | .511 | .499 |
| SE_Q5 | .676 | .611 |
| SE_Q6 | .730 | .764 |
| TFC_Q1 | .828 | .784 |
| TFC_Q2 | .863 | .825 |
| TFC_Q3 | .130 | .040 |
| TFC_Q4 | .169 | .023 |
| TFC_Q5 | .830 | .802 |
| TFC_Q6 | .851 | .854 |
| TFC_Q7 | .844 | .841 |
| TFC_Q8 | .826 | .753 |
| RFC_Q1 | .862 | .846 |
| RFC_Q2 | .825 | .840 |
| RFC_Q3 | .700 | .669 |
| RFC_Q4 | .837 | .828 |
| RFC_Q5 | .779 | .785 |
| RFC_Q6 | .779 | .764 |
| GFC_Q1 | .308 | .226 |
| GFC_Q2 | .392 | .594 |
| GFC_Q3 | .468 | .423 |
| GFC_Q4 | .414 | .347 |
| GFC_Q5 | .486 | .448 |
| GFC_Q6 | .431 | .447 |

Extraction Method: Principal Axis Factoring



**Factor Matrix (a)**

| Items | Factor | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| TFC_Q6 | .860 | | | | | |
| TFC_Q7 | .860 | | | | | |
| RFC_Q4 | .850 | | | | | |
| TFC_Q5 | .848 | | | | | |
| RFC_Q1 | .842 | | | | | |
| RFC_Q2 | .838 | | | | | |
| TFC_Q2 | .837 | | | | | |
| TFC_Q8 | .829 | | | | | |
| RFC_Q5 | .827 | | | | | |
| RFC_Q6 | .807 | | | | | |
| TFC_Q1 | .787 | -.371 | | | | |
| PBC_Q2 | .760 | | -.409 | | | |
| RFC_Q3 | .751 | | | | | |
| PBC_Q3 | .729 | | -.395 | | | |
| PBC_Q5 | .727 | | | | | |
| SE_Q6 | .722 | .404 | | | | |
| PBC_Q4 | .706 | | -.383 | | | |
| SE_Q5 | .680 | .356 | | | | |
| SE_Q2 | .672 | .375 | | | | |
| SE_Q3 | .656 | .389 | | | | |
| PBC_Q1 | .656 | | | | | |
| SE_Q1 | .620 | .335 | | | | |
| GFC_Q3 | .555 | | | | | |
| GFC_Q4 | .540 | | | | | |
| GFC_Q6 | .504 | | | | .378 | |
| SE_Q4 | .500 | .397 | | | | |
| GFC_Q5 | .473 | | | | .327 | |
| GFC_Q1 | .398 | | | | | |
| TFC_Q3 | | | | | | |
| TFC_Q4 | | | | | | |
| GFC_Q2 | .396 | | | .570 | | |

Extraction Method: Principal Axis Factoring.
a 6 factors extracted. 26 iterations required.

**Pattern Matrix(a)**

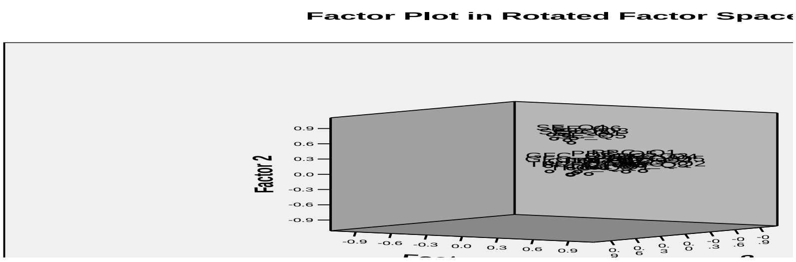
| Items | Factor | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| RFC_Q2 | .678 | | | | | |
| RFC_Q6 | .642 | | | | | |
| RFC_Q4 | .623 | | | | | |
| RFC_Q5 | .616 | | | | | |
| RFC_Q3 | .569 | | | | | |
| TFC_Q3 | | | | | | |
| SE_Q4 | | .732 | | | | |
| SE_Q6 | | .695 | | | | |
| SE_Q3 | | .673 | | | | |
| SE_Q2 | | .634 | | | | |
| SE_Q1 | | .616 | | | | |
| SE_Q5 | | .541 | | | | |
| PBC_Q2 | | | -.888 | | | |
| PBC_Q3 | | | -.831 | | | |
| PBC_Q4 | | | -.793 | | | |
| PBC_Q1 | | | -.628 | | | |
| PBC_Q5 | | | -.550 | | | |
| GFC_Q4 | | | | | | |
| GFC_Q2 | | | | .733 | | |
| GFC_Q1 | | | | .300 | | |
| GFC_Q6 | | | | | .582 | |
| GFC_Q5 | | | | | .565 | |
| GFC_Q3 | | | | | .349 | |
| RFC_Q1 | | | | | | .660 |
| TFC_Q1 | | | | | | .643 |
| TFC_Q2 | | | | | | .639 |
| TFC_Q7 | | | | | | .612 |
| TFC_Q6 | | | | | | .609 |
| TFC_Q5 | .323 | | | | | .513 |
| TFC_Q8 | | | | | | .494 |
| TFC_Q4 | | | | | | |

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
a Rotation converged in 10 iterations.

**Structure Matrix**

| | Factor | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| RFC_Q2 | .861 | .479 | -.627 | .332 | .510 | .641 |
| RFC_Q4 | .845 | .539 | -.637 | .306 | .419 | .685 |
| RFC_Q6 | .822 | .506 | -.614 | | .408 | .623 |
| RFC_Q5 | .819 | .527 | -.658 | .416 | .413 | .599 |
| RFC_Q3 | .750 | .430 | -.549 | .342 | .501 | .575 |
| TFC_Q3 | | | | | | |
| SE_Q6 | .356 | .842 | -.635 | | .526 | .442 |
| SE_Q3 | .381 | .782 | -.540 | | .504 | .333 |
| SE_Q2 | .316 | .773 | -.572 | .347 | .445 | .437 |
| SE_Q5 | .345 | .742 | -.620 | | .489 | .416 |
| SE_Q1 | .352 | .713 | -.530 | .393 | .305 | .379 |
| SE_Q4 | | .702 | -.417 | | | |
| PBC_Q2 | .413 | .552 | -.898 | .341 | .431 | .515 |
| PBC_Q3 | .446 | .547 | -.853 | | .370 | .476 |
| PBC_Q4 | .468 | .491 | -.815 | | .375 | .464 |
| PBC_Q5 | .399 | .582 | -.753 | | .515 | .513 |
| PBC_Q1 | .417 | .543 | -.731 | .341 | .314 | .389 |
| GFC_Q3 | .319 | .361 | -.518 | .391 | .518 | .404 |
| GFC_Q4 | .374 | .393 | -.503 | .423 | | .401 |
| GFC_Q2 | | .326 | | .756 | | |
| GFC_Q1 | | | -.353 | .404 | | .303 |
| GFC_Q6 | .320 | .321 | -.398 | | .648 | .365 |
| GFC_Q5 | | .434 | -.338 | | .643 | |
| RFC_Q1 | .647 | .456 | -.617 | .343 | .542 | .876 |
| TFC_Q7 | .679 | .498 | -.643 | .437 | .449 | .868 |
| TFC_Q6 | .721 | .494 | -.651 | | .429 | .868 |
| TFC_Q2 | .698 | .473 | -.617 | .322 | .402 | .867 |
| TFC_Q1 | .691 | .375 | -.552 | .346 | .398 | .850 |
| TFC_Q5 | .732 | .482 | -.651 | .344 | .404 | .823 |
| TFC_Q8 | .674 | .493 | -.628 | | .508 | .790 |
| TFC_Q4 | | | | | | |

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.



# Appendix J

# Comparison's Result (T-test and ANOVA)

## *J-1: T-Test (Gender with Common Technologies)*

**Group Statistics**

| | What is your Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| How long you have been using computer | Male | 297 | 2.7912 | 1.23717 | .07179 |
| | Female | 118 | 2.8898 | 1.23886 | .11405 |
| How long you have been using Internet | Male | 297 | 2.3333 | .86603 | .05025 |
| | Female | 118 | 2.3729 | .88479 | .08145 |
| How long you have been using Mobile Phone | Male | 297 | 3.2054 | .94524 | .05485 |
| | Female | 118 | 3.3475 | .99895 | .09196 |
| How long you have been using PDA( Personal Digital Assistant) | Male | 297 | 1.0236 | .15196 | .00882 |
| | Female | 118 | 1.0678 | .25247 | .02324 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| How long using computer | Equal variances assumed | .000 | .992 | -.732 | 413 | .465 | -.09858 | .13468 | -.36333 | .16616 |
| | Equal variances not assumed | | | -.732 | 214.759 | .465 | -.09858 | .13476 | -.36420 | .16704 |
| How long using Internet | Equal variances assumed | .126 | .723 | -.417 | 413 | .677 | -.03955 | .09482 | -.22594 | .14685 |
| | Equal variances not assumed | | | -.413 | 210.940 | .680 | -.03955 | .09571 | -.22821 | .14911 |
| How long using Mobile | Equal variances assumed | 2.125 | .146 | -1.359 | 413 | .175 | -.14207 | .10455 | -.34759 | .06344 |
| | Equal variances not assumed | | | -1.327 | 204.803 | .186 | -.14207 | .10708 | -.35318 | .06904 |
| How long using PDA | Equal variances assumed | 19.129 | .000 | -2.185 | 413 | .029 | -.04423 | .02024 | -.08402 | -.00443 |
| | Equal variances not assumed | | | -1.779 | 151.860 | .077 | -.04423 | .02486 | -.09334 | .00488 |

**Group Statistics**

| | What is your Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| On average, how frequently do you use computer | Male | 297 | 4.8418 | 1.31720 | .07643 |
| | Female | 118 | 4.8983 | 1.15018 | .10588 |
| On average, how frequently do you use Internet | Male | 297 | 4.6801 | 1.44799 | .08402 |
| | Female | 118 | 4.6017 | 1.39069 | .12802 |
| On average, how frequently do you use Mobile Phone | Male | 297 | 5.7845 | .41185 | .02390 |
| | Female | 118 | 5.7881 | .41037 | .03778 |
| On average, how frequently do you use PDA | Male | 297 | 1.0774 | .50410 | .02925 |
| | Female | 118 | 1.2119 | .79369 | .07307 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| On average, computer | Equal variances assumed | 4.910 | .027 | -.409 | 413 | .683 | -.05655 | .13843 | -.32867 | .21556 |
| | Equal variances not assumed | | | -.433 | 244.462 | .665 | -.05655 | .13059 | -.31377 | .20066 |
| On average, Internet | Equal variances assumed | .080 | .778 | .503 | 413 | .615 | .07844 | .15583 | -.22787 | .38475 |
| | Equal variances not assumed | | | .512 | 223.132 | .609 | .07844 | .15313 | -.22333 | .38021 |
| On average, Mobile | Equal variances assumed | .026 | .871 | -.081 | 413 | .936 | -.00362 | .04477 | -.09163 | .08439 |
| | Equal variances not assumed | | | -.081 | 215.724 | .935 | -.00362 | .04470 | -.09173 | .08449 |
| On average, PDA | Equal variances assumed | 16.752 | .000 | -2.057 | 413 | .040 | -.13442 | .06534 | -.26287 | -.00597 |
| | Equal variances not assumed | | | -1.708 | 155.926 | .090 | -.13442 | .07870 | -.28988 | .02104 |

## *J-2: T-Test (HE Degree with Common Technologies)*

**Group Statistics**

| | Educ | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| How long computer | Master | 175 | 2.6571 | 1.13823 | .08604 |
| | PhD | 240 | 2.9375 | 1.29379 | .08351 |
| How long Internet | Master | 175 | 2.2686 | .77451 | .05855 |
| | PhD | 240 | 2.4000 | .93200 | .06016 |
| How Mobile | Master | 175 | 3.0914 | .85277 | .06446 |
| | PhD | 240 | 3.3583 | 1.02108 | .06591 |
| How long PDA | Master | 175 | 1.0286 | .16708 | .01263 |
| | PhD | 240 | 1.0417 | .20024 | .01293 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| How long computer | Equal variances assumed | 1.121 | .290 | -2.292 | 413 | .022 | -.28036 | .12233 | -.52083 | -.03989 |
| | Equal variances not assumed | | | -2.338 | 398.674 | .020 | -.28036 | .11991 | -.51609 | -.04463 |
| How long Internet | Equal variances assumed | 4.745 | .030 | -1.521 | 413 | .129 | -.13143 | .08639 | -.30126 | .03840 |
| | Equal variances not assumed | | | -1.566 | 405.941 | .118 | -.13143 | .08395 | -.29645 | .03360 |
| How Mobile | Equal variances assumed | 16.336 | .000 | -2.815 | 413 | .005 | -.26690 | .09481 | -.45328 | -.08053 |
| | Equal variances not assumed | | | -2.895 | 405.402 | .004 | -.26690 | .09219 | -.44814 | -.08567 |
| How long PDA | Equal variances assumed | 2.004 | .158 | -.705 | 413 | .482 | -.01310 | .01859 | -.04963 | .02344 |
| | Equal variances not assumed | | | -.725 | 405.508 | .469 | -.01310 | .01807 | -.04862 | .02243 |

**Group Statistics**

| | Educ | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| On average, computer | Master | 175 | 4.7771 | 1.49387 | .11293 |
| | PhD | 240 | 4.9167 | 1.07915 | .06966 |
| On average, Internet | Master | 175 | 4.6171 | 1.46089 | .11043 |
| | PhD | 240 | 4.6875 | 1.41060 | .09105 |
| On average, Mobile | Master | 175 | 5.7429 | .43831 | .03313 |
| | PhD | 240 | 5.8167 | .38775 | .02503 |
| On average, PDA | Master | 175 | 1.0857 | .50123 | .03789 |
| | PhD | 240 | 1.1375 | .66742 | .04308 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. 2-tailed | Mean Difference | Std. Error Difference | Lower | Upper |
| On average, computer | Equal variances assumed | 15.037 | .000 | -1.105 | 413 | .270 | -.13952 | .12629 | -.38778 | .10873 |
| | Equal variances not assumed | | | -1.052 | 299.989 | .294 | -.13952 | .13268 | -.40063 | .12158 |
| On average, Internet | Equal variances assumed | .245 | .621 | -.494 | 413 | .621 | -.07036 | .14235 | -.35017 | .20945 |
| | Equal variances not assumed | | | -.492 | 367.384 | .623 | -.07036 | .14313 | -.35181 | .21110 |
| On average, Mobile | Equal variances assumed | 12.787 | .000 | -1.812 | 413 | .071 | -.07381 | .04074 | -.15389 | .00627 |
| | Equal variances not assumed | | | -1.778 | 346.982 | .076 | -.07381 | .04152 | -.15548 | .00786 |
| On average, PDA | Equal variances assumed | 3.058 | .081 | -.864 | 413 | .388 | -.05179 | .05994 | -.16961 | .06604 |
| | Equal variances not assumed | | | -.903 | 412.628 | .367 | -.05179 | .05737 | -.16457 | .06099 |

## ***J-3: T-Test (Place of HE Degree with Common Technologies)***

**Group Statistics**

| | Plc_dgr | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| How long computer | In home(Jordan) | 158 | 2.7595 | 1.20736 | .09605 |
| | Abroad | 257 | 2.8560 | 1.25573 | .07833 |
| How long Internet | In home(Jordan) | 158 | 2.2595 | .74167 | .05900 |
| | Abroad | 257 | 2.3969 | .93858 | .05855 |
| How Mobile | In home(Jordan) | 158 | 3.1899 | .97191 | .07732 |
| | Abroad | 257 | 3.2802 | .95572 | .05962 |
| How long PDA | In home(Jordan) | 158 | 1.0190 | .13691 | .01089 |
| | Abroad | 257 | 1.0467 | .21139 | .01319 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. 2-tailed | Mean Difference | Std. Error Difference | Lower | Upper |
| How long computer | Equal variances assumed | .301 | .584 | -.772 | 413 | .441 | -.09654 | .12511 | -.34247 | .14940 |
| | Equal variances not assumed | | | -.779 | 342.388 | .437 | -.09654 | .12394 | -.34032 | .14725 |
| How long Internet | Equal variances assumed | 9.411 | .002 | -1.564 | 413 | .119 | -.13739 | .08785 | -.31008 | .03530 |
| | Equal variances not assumed | | | -1.653 | 387.800 | .099 | -.13739 | .08312 | -.30082 | .02603 |
| How long Mobile | Equal variances assumed | .239 | .625 | -.928 | 413 | .354 | -.09028 | .09724 | -.28144 | .10087 |
| | Equal variances not assumed | | | -.925 | 328.048 | .356 | -.09028 | .09764 | -.28235 | .10179 |
| How long PDA | Equal variances assumed | 8.932 | .003 | -1.469 | 413 | .143 | -.02771 | .01887 | -.06479 | .00938 |
| | Equal variances not assumed | | | -1.620 | 411.868 | .106 | -.02771 | .01710 | -.06133 | .00592 |

**Group Statistics**

| | Plc_dgr | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| On average, computer | In home(Jordan) | 158 | 4.8228 | 1.30905 | .10414 |
| | Abroad | 257 | 4.8794 | 1.24884 | .07790 |
| On average, Internet | In home(Jordan) | 158 | 4.8038 | 1.40272 | .11159 |
| | Abroad | 257 | 4.5681 | 1.44300 | .09001 |
| On average, Mobile | In home(Jordan) | 158 | 5.7785 | .41659 | .03314 |
| | Abroad | 257 | 5.7899 | .40819 | .02546 |
| On average, PDA | In home(Jordan) | 158 | 1.0570 | .41074 | .03268 |
| | Abroad | 257 | 1.1518 | .69339 | .04325 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. 2-tailed | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference Lower | Upper |
| On average, computer | Equal variances assumed | 1.405 | .237 | -.440 | 413 | .660 | -.05659 | .12860 | -.30938 | .19620 |
| | Equal variances not assumed | | | -.435 | 320.340 | .664 | -.05659 | .13005 | -.31246 | .19928 |
| On average, Internet | Equal variances assumed | 1.013 | .315 | 1.633 | 413 | .103 | .23570 | .14435 | -.04804 | .51945 |
| | Equal variances not assumed | | | 1.644 | 339.590 | .101 | .23570 | .14337 | -.04630 | .51771 |
| On average, Mobile | Equal variances assumed | .298 | .586 | -.274 | 413 | .784 | -.01140 | .04159 | -.09316 | .07035 |
| | Equal variances not assumed | | | -.273 | 327.135 | .785 | -.01140 | .04179 | -.09362 | .07082 |
| On average, PDA | Equal variances assumed | 10.106 | .002 | -1.558 | 413 | .120 | -.09479 | .06084 | -.21438 | .02480 |
| | Equal variances not assumed | | | -1.749 | 412.507 | .081 | -.09479 | .05421 | -.20135 | .01177 |

## ***J-4: T-Test (Major with Common Technologies)***

**Group Statistics**

| | Major | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| How long computer | Scientific | 225 | 2.9556 | 1.26342 | .08423 |
| | Humanities | 190 | 2.6579 | 1.18804 | .08619 |
| How long Internet | Scientific | 225 | 2.4222 | .86316 | .05754 |
| | Humanities | 190 | 2.2526 | .87249 | .06330 |
| How Mobile | Scientific | 225 | 3.3467 | .99319 | .06621 |
| | Humanities | 190 | 3.1263 | .91133 | .06611 |
| How long PDA | Scientific | 225 | 1.0400 | .19640 | .01309 |
| | Humanities | 190 | 1.0316 | .17534 | .01272 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. 2-tailed | Mean Difference | Std. Error Difference | Lower | Upper |
| How long computer | Equal variances assumed | .141 | .708 | 2.457 | 413 | .014 | .29766 | .12114 | .05953 | .53579 |
| | Equal variances not assumed | | | 2.470 | 408.225 | .014 | .29766 | .12051 | .06076 | .53456 |
| How long Internet | Equal variances assumed | .237 | .627 | 1.984 | 413 | .048 | .16959 | .08547 | .00159 | .33759 |
| | Equal variances not assumed | | | 1.982 | 399.983 | .048 | .16959 | .08554 | .00142 | .33776 |
| How Mobile | Equal variances assumed | 8.075 | .005 | 2.338 | 413 | .020 | .22035 | .09425 | .03508 | .40562 |
| | Equal variances not assumed | | | 2.355 | 410.136 | .019 | .22035 | .09357 | .03641 | .40429 |
| How long PDA | Equal variances assumed | .838 | .360 | .457 | 413 | .648 | .00842 | .01843 | -.02781 | .04465 |
| | Equal variances not assumed | | | .461 | 411.705 | .645 | .00842 | .01825 | -.02746 | .04431 |

**Group Statistics**

| | Major | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| On average, computer | Scientific | 225 | 4.9200 | 1.08266 | .07218 |
| | Humanities | 190 | 4.7842 | 1.46232 | .10609 |
| On average, Internet | Scientific | 225 | 4.7733 | 1.22372 | .08158 |
| | Humanities | 190 | 4.5211 | 1.63529 | .11864 |
| On average, Mobile | Scientific | 225 | 5.7733 | .41961 | .02797 |
| | Humanities | 190 | 5.8000 | .40106 | .02910 |
| On average, PDA | Scientific | 225 | 1.1333 | .66144 | .04410 |
| | Humanities | 190 | 1.0947 | .52601 | .03816 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. 2-tailed | Mean Difference | Std. Error Difference | Lower | Upper |
| On average, computer | Equal variances assumed | 17.772 | .000 | 1.085 | 413 | .279 | .13579 | .12518 | -.11029 | .38187 |
| | Equal variances not assumed | | | 1.058 | 342.539 | .291 | .13579 | .12831 | -.11659 | .38817 |
| On average, Internet | Equal variances assumed | 21.891 | .000 | 1.794 | 413 | .073 | .25228 | .14059 | -.02407 | .52863 |
| | Equal variances not assumed | | | 1.752 | 344.932 | .081 | .25228 | .14398 | -.03091 | .53547 |
| On average, Mobile | Equal variances assumed | 1.750 | .187 | -.658 | 413 | .511 | -.02667 | .04052 | -.10631 | .05298 |
| | Equal variances not assumed | | | -.661 | 406.697 | .509 | -.02667 | .04036 | -.10601 | .05268 |
| On average, PDA | Equal variances assumed | 1.732 | .189 | .649 | 413 | .516 | .03860 | .05944 | -.07824 | .15543 |
| | Equal variances not assumed | | | .662 | 411.567 | .508 | .03860 | .05832 | -.07604 | .15323 |

## *J-5: ANOVA (Age with Common Technologies)*

**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| How long computer | Under 30 | 52 | 2.5000 | .93934 | .13026 | 2.2385 | 2.7615 | 1.00 | 5.00 |
| | 30 - 40 | 126 | 2.8095 | 1.00967 | .08995 | 2.6315 | 2.9875 | 1.00 | 6.00 |
| | 41 - 50 | 160 | 3.1375 | 1.37584 | .10877 | 2.9227 | 3.3523 | 1.00 | 6.00 |
| | 51 or older | 77 | 2.3896 | 1.27894 | .14575 | 2.0993 | 2.6799 | 1.00 | 6.00 |
| | Total | 415 | 2.8193 | 1.23696 | .06072 | 2.6999 | 2.9386 | 1.00 | 6.00 |
| How long Internet | Under 30 | 52 | 2.1538 | .57342 | .07952 | 1.9942 | 2.3135 | 1.00 | 3.00 |
| | 30 - 40 | 126 | 2.4048 | .64719 | .05766 | 2.2907 | 2.5189 | 1.00 | 4.00 |
| | 41 - 50 | 160 | 2.5938 | .95362 | .07539 | 2.4449 | 2.7426 | 1.00 | 5.00 |
| | 51 or older | 77 | 1.8571 | .95579 | .10892 | 1.6402 | 2.0741 | 1.00 | 5.00 |
| | Total | 415 | 2.3446 | .87051 | .04273 | 2.2606 | 2.4286 | 1.00 | 5.00 |
| How Mobile | Under 30 | 52 | 3.0769 | .51815 | .07185 | 2.9327 | 3.2212 | 2.00 | 4.00 |
| | 30 - 40 | 126 | 3.1508 | .94714 | .08438 | 2.9838 | 3.3178 | 2.00 | 5.00 |
| | 41 - 50 | 160 | 3.4062 | 1.13435 | .08968 | 3.2291 | 3.5834 | 2.00 | 6.00 |
| | 51 or older | 77 | 3.1818 | .77336 | .08813 | 3.0063 | 3.3573 | 2.00 | 6.00 |
| | Total | 415 | 3.2458 | .96174 | .04721 | 3.1530 | 3.3386 | 2.00 | 6.00 |
| How long PDA | Under 30 | 52 | 1.0000 | .00000 | .00000 | 1.0000 | 1.0000 | 1.00 | 1.00 |
| | 30 - 40 | 126 | 1.0238 | .15306 | .01364 | .9968 | 1.0508 | 1.00 | 2.00 |
| | 41 - 50 | 160 | 1.0750 | .26422 | .02089 | 1.0337 | 1.1163 | 1.00 | 2.00 |
| | 51 or older | 77 | 1.0000 | .00000 | .00000 | 1.0000 | 1.0000 | 1.00 | 1.00 |
| | Total | 415 | 1.0361 | .18688 | .00917 | 1.0181 | 1.0542 | 1.00 | 2.00 |

**Test of Homogeneity of Variances**

| | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| How long computer | 4.534 | 3 | 411 | .004 |
| How long Internet | 7.102 | 3 | 411 | .000 |
| How Mobile | 16.190 | 3 | 411 | .000 |
| How long PDA | 18.680 | 3 | 411 | .000 |

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| How long computer | Between Groups | 35.731 | 3 | 11.910 | 8.190 | .000 |
| | Within Groups | 597.715 | 411 | 1.454 | | |
| | Total | 633.446 | 414 | | | |
| How long Internet | Between Groups | 30.577 | 3 | 10.192 | 14.794 | .000 |
| | Within Groups | 283.149 | 411 | .689 | | |
| | Total | 313.725 | 414 | | | |
| How Mobile | Between Groups | 7.055 | 3 | 2.352 | 2.571 | .054 |
| | Within Groups | 375.876 | 411 | .915 | | |
| | Total | 382.930 | 414 | | | |
| How long PDA | Between Groups | .429 | 3 | .143 | 4.192 | .006 |
| | Within Groups | 14.029 | 411 | .034 | | |
| | Total | 14.458 | 414 | | | |

## Post Hoc Tests

**Multiple Comparisons**

Scheffe

| Dependent Variable | (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|---|
| How long computer | Under 30 | 30 - 40 | -.30952 | .19877 | .490 | -.8675 | .2484 |
| | | 41 - 50 | -.63750* | .19250 | .013 | -1.1779 | -.0971 |
| | | 51 or older | .11039 | .21646 | .967 | -.4972 | .7180 |
| | 30 - 40 | Under 30 | .30952 | .19877 | .490 | -.2484 | .8675 |
| | | 41 - 50 | -.32798 | .14364 | .159 | -.7312 | .0752 |
| | | 51 or older | .41991 | .17444 | .124 | -.0698 | .9096 |
| | 41 - 50 | Under 30 | .63750* | .19250 | .013 | .0971 | 1.1779 |
| | | 30 - 40 | .32798 | .14364 | .159 | -.0752 | .7312 |
| | | 51 or older | .74789* | .16726 | .000 | .2784 | 1.2174 |
| | 51 or older | Under 30 | -.11039 | .21646 | .967 | -.7180 | .4972 |
| | | 30 - 40 | -.41991 | .17444 | .124 | -.9096 | .0698 |
| | | 41 - 50 | -.74789* | .16726 | .000 | -1.2174 | -.2784 |
| How long Internet | Under 30 | 30 - 40 | -.25092 | .13681 | .340 | -.6349 | .1331 |
| | | 41 - 50 | -.43990* | .13249 | .012 | -.8118 | -.0680 |
| | | 51 or older | .29670 | .14898 | .267 | -.1215 | .7149 |
| | 30 - 40 | Under 30 | .25092 | .13681 | .340 | -.1331 | .6349 |
| | | 41 - 50 | -.18899 | .09886 | .303 | -.4665 | .0885 |
| | | 51 or older | .54762* | .12006 | .000 | .2106 | .8846 |
| | 41 - 50 | Under 30 | .43990* | .13249 | .012 | .0680 | .8118 |
| | | 30 - 40 | .18899 | .09886 | .303 | -.0885 | .4665 |
| | | 51 or older | .73661* | .11512 | .000 | .4134 | 1.0598 |
| | 51 or older | Under 30 | -.29670 | .14898 | .267 | -.7149 | .1215 |
| | | 30 - 40 | -.54762* | .12006 | .000 | -.8846 | -.2106 |
| | | 41 - 50 | -.73661* | .11512 | .000 | -1.0598 | -.4134 |
| How Mobile | Under 30 | 30 - 40 | -.07387 | .15762 | .974 | -.5163 | .3686 |
| | | 41 - 50 | -.32933 | .15265 | .201 | -.7578 | .0992 |
| | | 51 or older | -.10490 | .17165 | .946 | -.5867 | .3770 |
| | 30 - 40 | Under 30 | .07387 | .15762 | .974 | -.3686 | .5163 |
| | | 41 - 50 | -.25546 | .11390 | .171 | -.5752 | .0643 |
| | | 51 or older | -.03102 | .13833 | .997 | -.4193 | .3573 |
| | 41 - 50 | Under 30 | .32933 | .15265 | .201 | -.0992 | .7578 |
| | | 30 - 40 | .25546 | .11390 | .171 | -.0643 | .5752 |
| | | 51 or older | .22443 | .13264 | .414 | -.1479 | .5968 |
| | 51 or older | Under 30 | .10490 | .17165 | .946 | -.3770 | .5867 |
| | | 30 - 40 | .03102 | .13833 | .997 | -.3573 | .4193 |
| | | 41 - 50 | -.22443 | .13264 | .414 | -.5968 | .1479 |
| How long PDA | Under 30 | 30 - 40 | -.02381 | .03045 | .894 | -.1093 | .0617 |
| | | 41 - 50 | -.07500 | .02949 | .093 | -.1578 | .0078 |
| | | 51 or older | .00000 | .03316 | 1.000 | -.0931 | .0931 |
| | 30 - 40 | Under 30 | .02381 | .03045 | .894 | -.0617 | .1093 |
| | | 41 - 50 | -.05119 | .02201 | .146 | -.1130 | .0106 |
| | | 51 or older | .02381 | .02672 | .851 | -.0512 | .0988 |
| | 41 - 50 | Under 30 | .07500 | .02949 | .093 | -.0078 | .1578 |
| | | 30 - 40 | .05119 | .02201 | .146 | -.0106 | .1130 |
| | | 51 or older | .07500* | .02562 | .037 | .0031 | .1469 |
| | 51 or older | Under 30 | .00000 | .03316 | 1.000 | -.0931 | .0931 |
| | | 30 - 40 | -.02381 | .02672 | .851 | -.0988 | .0512 |
| | | 41 - 50 | -.07500* | .02562 | .037 | -.1469 | -.0031 |

*. The mean difference is significant at the 0.05 level.

**Homogeneous Subsets**

**How long computer**

Scheffe

| Age | N | Subset for alpha = 0.05 | |
|---|---|---|---|
| | | 1 | 2 |
| 51 or older | 77 | 2.3896 | |
| Under 30 | 52 | 2.5000 | |
| 30 - 40 | 126 | 2.8095 | 2.8095 |
| 41 - 50 | 160 | | 3.1375 |
| Sig. | | .158 | .365 |

Means for groups in homogeneous subsets are displayed.

**How long Internet**

Scheffe

| Age | N | Subset for alpha = 0.05 | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| 51 or older | 77 | 1.8571 | | |
| Under 30 | 52 | 2.1538 | 2.1538 | |
| 30 - 40 | 126 | | 2.4048 | 2.4048 |
| 41 - 50 | 160 | | | 2.5938 |
| Sig. | | .140 | .270 | .526 |

Means for groups in homogeneous subsets are displayed.

**How Mobile**

Scheffe

| Age | N | Subset for alpha = 0.05 |
|---|---|---|
| | | 1 |
| Under 30 | 52 | 3.0769 |
| 30 - 40 | 126 | 3.1508 |
| 51 or older | 77 | 3.1818 |
| 41 - 50 | 160 | 3.4062 |
| Sig. | | .166 |

Means for groups in homogeneous subsets are displayed.

**How long PDA**

Scheffe

| Age | N | Subset for alpha = 0.05 |
|---|---|---|
| | | 1 |
| Under 30 | 52 | 1.0000 |
| 51 or older | 77 | 1.0000 |
| 30 - 40 | 126 | 1.0238 |
| 41 - 50 | 160 | 1.0750 |
| Sig. | | .070 |

Means for groups in homogeneous subsets are displayed.

## ANOVA

**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| On average, computer | Under 30 | 52 | 4.7115 | 1.47311 | .20428 | 4.3014 | 5.1217 | 1.00 | 6.00 |
| | 30 - 40 | 126 | 5.1032 | 1.01058 | .09003 | 4.9250 | 5.2814 | 1.00 | 6.00 |
| | 41 - 50 | 160 | 4.8312 | 1.00453 | .07942 | 4.6744 | 4.9881 | 1.00 | 6.00 |
| | 51 or older | 77 | 4.6104 | 1.83644 | .20928 | 4.1936 | 5.0272 | 1.00 | 6.00 |
| | Total | 415 | 4.8578 | 1.27083 | .06238 | 4.7352 | 4.9805 | 1.00 | 6.00 |
| On average, Internet | Under 30 | 52 | 4.7115 | 1.41887 | .19676 | 4.3165 | 5.1066 | 1.00 | 6.00 |
| | 30 - 40 | 126 | 4.9206 | .91742 | .08173 | 4.7589 | 5.0824 | 1.00 | 6.00 |
| | 41 - 50 | 160 | 5.0000 | .95166 | .07524 | 4.8514 | 5.1486 | 1.00 | 6.00 |
| | 51 or older | 77 | 3.4805 | 2.18012 | .24845 | 2.9857 | 3.9753 | 1.00 | 6.00 |
| | Total | 415 | 4.6578 | 1.43070 | .07023 | 4.5198 | 4.7959 | 1.00 | 6.00 |
| On average, Mobile | Under 30 | 52 | 5.6731 | .47367 | .06569 | 5.5412 | 5.8049 | 5.00 | 6.00 |
| | 30 - 40 | 126 | 5.8095 | .39424 | .03512 | 5.7400 | 5.8790 | 5.00 | 6.00 |
| | 41 - 50 | 160 | 5.7750 | .41889 | .03312 | 5.7096 | 5.8404 | 5.00 | 6.00 |
| | 51 or older | 77 | 5.8442 | .36509 | .04161 | 5.7613 | 5.9270 | 5.00 | 6.00 |
| | Total | 415 | 5.7855 | .41094 | .02017 | 5.7459 | 5.8252 | 5.00 | 6.00 |
| On average, PDA | Under 30 | 52 | 1.0000 | .00000 | .00000 | 1.0000 | 1.0000 | 1.00 | 1.00 |
| | 30 - 40 | 126 | 1.0714 | .45919 | .04091 | .9905 | 1.1524 | 1.00 | 4.00 |
| | 41 - 50 | 160 | 1.2438 | .86691 | .06854 | 1.1084 | 1.3791 | 1.00 | 5.00 |
| | 51 or older | 77 | 1.0000 | .00000 | .00000 | 1.0000 | 1.0000 | 1.00 | 1.00 |
| | Total | 415 | 1.1157 | .60283 | .02959 | 1.0575 | 1.1738 | 1.00 | 5.00 |

**Test of Homogeneity of Variances**

| | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| On average, computer | 16.959 | 3 | 411 | .000 |
| On average, Internet | 77.766 | 3 | 411 | .000 |
| On average, Mobile | 6.758 | 3 | 411 | .000 |
| On average, PDA | 19.263 | 3 | 411 | .000 |

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| On average, computer | Between Groups | 13.525 | 3 | 4.508 | 2.828 | .038 |
| | Within Groups | 655.087 | 411 | 1.594 | | |
| | Total | 668.612 | 414 | | | |
| On average, Internet | Between Groups | 134.312 | 3 | 44.771 | 25.804 | .000 |
| | Within Groups | 713.100 | 411 | 1.735 | | |
| | Total | 847.412 | 414 | | | |
| On average, Mobile | Between Groups | 1.013 | 3 | .338 | 2.013 | .111 |
| | Within Groups | 68.901 | 411 | .168 | | |
| | Total | 69.913 | 414 | | | |
| On average, PDA | Between Groups | 4.597 | 3 | 1.532 | 4.318 | .005 |
| | Within Groups | 145.851 | 411 | .355 | | |
| | Total | 150.448 | 414 | | | |

## Post Hoc Tests

**Multiple Comparisons**

Scheffe

| Dependent Variable | (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|---|
| On average, computer | Under 30 | 30 - 40 | -.39164 | .20809 | .317 | -.9758 | .1925 |
| | | 41 - 50 | -.11971 | .20153 | .950 | -.6854 | .4460 |
| | | 51 or older | .10115 | .22661 | .978 | -.5350 | .7373 |
| | 30 - 40 | Under 30 | .39164 | .20809 | .317 | -.1925 | .9758 |
| | | 41 - 50 | .27192 | .15037 | .353 | -.1502 | .6940 |
| | | 51 or older | .49278 | .18262 | .065 | -.0198 | 1.0054 |
| | 41 - 50 | Under 30 | .11971 | .20153 | .950 | -.4460 | .6854 |
| | | 30 - 40 | -.27192 | .15037 | .353 | -.6940 | .1502 |
| | | 51 or older | .22086 | .17510 | .662 | -.2707 | .7124 |
| | 51 or older | Under 30 | -.10115 | .22661 | .978 | -.7373 | .5350 |
| | | 30 - 40 | -.49278 | .18262 | .065 | -1.0054 | .0198 |
| | | 41 - 50 | -.22086 | .17510 | .662 | -.7124 | .2707 |
| On average, Internet | Under 30 | 30 - 40 | -.20910 | .21711 | .819 | -.8185 | .4004 |
| | | 41 - 50 | -.28846 | .21026 | .598 | -.8787 | .3018 |
| | | 51 or older | 1.23102* | .23643 | .000 | .5673 | 1.8947 |
| | 30 - 40 | Under 30 | .20910 | .21711 | .819 | -.4004 | .8185 |
| | | 41 - 50 | -.07937 | .15689 | .968 | -.5198 | .3610 |
| | | 51 or older | 1.44012* | .19053 | .000 | .9053 | 1.9750 |
| | 41 - 50 | Under 30 | .28846 | .21026 | .598 | -.3018 | .8787 |
| | | 30 - 40 | .07937 | .15689 | .968 | -.3610 | .5198 |
| | | 51 or older | 1.51948* | .18269 | .000 | 1.0066 | 2.0323 |
| | 51 or older | Under 30 | -1.23102* | .23643 | .000 | -1.8947 | -.5673 |
| | | 30 - 40 | -1.44012* | .19053 | .000 | -1.9750 | -.9053 |
| | | 41 - 50 | -1.51948* | .18269 | .000 | -2.0323 | -1.0066 |
| On average, Mobile | Under 30 | 30 - 40 | -.13645 | .06749 | .254 | -.3259 | .0530 |
| | | 41 - 50 | -.10192 | .06536 | .488 | -.2854 | .0815 |
| | | 51 or older | -.17108 | .07349 | .145 | -.3774 | .0352 |
| | 30 - 40 | Under 30 | .13645 | .06749 | .254 | -.0530 | .3259 |
| | | 41 - 50 | .03452 | .04877 | .919 | -.1024 | .1714 |
| | | 51 or older | -.03463 | .05923 | .952 | -.2009 | .1316 |
| | 41 - 50 | Under 30 | .10192 | .06536 | .488 | -.0815 | .2854 |
| | | 30 - 40 | -.03452 | .04877 | .919 | -.1714 | .1024 |
| | | 51 or older | -.06916 | .05679 | .686 | -.2286 | .0903 |
| | 51 or older | Under 30 | .17108 | .07349 | .145 | -.0352 | .3774 |
| | | 30 - 40 | .03463 | .05923 | .952 | -.1316 | .2009 |
| | | 41 - 50 | .06916 | .05679 | .686 | -.0903 | .2286 |
| On average, PDA | Under 30 | 30 - 40 | -.07143 | .09819 | .912 | -.3471 | .2042 |
| | | 41 - 50 | -.24375 | .09509 | .089 | -.5107 | .0232 |
| | | 51 or older | .00000 | .10693 | 1.000 | -.3002 | .3002 |
| | 30 - 40 | Under 30 | .07143 | .09819 | .912 | -.2042 | .3471 |
| | | 41 - 50 | -.17232 | .07095 | .118 | -.3715 | .0269 |
| | | 51 or older | .07143 | .08617 | .876 | -.1705 | .3133 |
| | 41 - 50 | Under 30 | .24375 | .09509 | .089 | -.0232 | .5107 |
| | | 30 - 40 | .17232 | .07095 | .118 | -.0269 | .3715 |
| | | 51 or older | .24375* | .08262 | .035 | .0118 | .4757 |
| | 51 or older | Under 30 | .00000 | .10693 | 1.000 | -.3002 | .3002 |
| | | 30 - 40 | -.07143 | .08617 | .876 | -.3133 | .1705 |
| | | 41 - 50 | -.24375* | .08262 | .035 | -.4757 | -.0118 |

*. The mean difference is significant at the 0.05 level.

**Homogeneous Subsets**

**On average, computer**

Scheffe

| Age | N | Subset for alpha = 0.05 |
|---|---|---|
| | | 1 |
| 51 or older | 77 | 4.6104 |
| Under 30 | 52 | 4.7115 |
| 41 - 50 | 160 | 4.8312 |
| 30 - 40 | 126 | 5.1032 |
| Sig. | | .089 |

Means for groups in homogeneous subsets are displayed.

**On average, Internet**

Scheffe

| Age | N | Subset for alpha = 0.05 | |
|---|---|---|---|
| | | 1 | 2 |
| 51 or older | 77 | 3.4805 | |
| Under 30 | 52 | | 4.7115 |
| 30 - 40 | 126 | | 4.9206 |
| 41 - 50 | 160 | | 5.0000 |
| Sig. | | 1.000 | .559 |

Means for groups in homogeneous subsets are displayed.

**On average, Mobile**

Scheffe

| Age | N | Subset for alpha = 0.05 |
|---|---|---|
| | | 1 |
| Under 30 | 52 | 5.6731 |
| 41 - 50 | 160 | 5.7750 |
| 30 - 40 | 126 | 5.8095 |
| 51 or older | 77 | 5.8442 |
| Sig. | | .058 |

Means for groups in homogeneous subsets are displayed.

**On average, PDA**

Scheffe

| Age | N | Subset for alpha = 0.05 |
|---|---|---|
| | | 1 |
| Under 30 | 52 | 1.0000 |
| 51 or older | 77 | 1.0000 |
| 30 - 40 | 126 | 1.0714 |
| 41 - 50 | 160 | 1.2438 |
| Sig. | | .067 |

Means for groups in homogeneous subsets are displayed

## *J-6: ANOVA (Experience Common Technologies)*

**Descriptive**

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| How long computer | 1 - 5 | 138 | 2.6739 | .94493 | .08044 | 2.5149 | 2.8330 | 1.00 | 6.00 |
| | 6 - 10 | 157 | 2.8790 | 1.29768 | .10357 | 2.6744 | 3.0836 | 1.00 | 6.00 |
| | 11 - 15 | 93 | 3.0645 | 1.54502 | .16021 | 2.7463 | 3.3827 | 1.00 | 6.00 |
| | over 15 | 27 | 2.3704 | .74152 | .14271 | 2.0770 | 2.6637 | 1.00 | 4.00 |
| | Total | 415 | 2.8193 | 1.23696 | .06072 | 2.6999 | 2.9386 | 1.00 | 6.00 |
| How long Internet | 1 - 5 | 138 | 2.3043 | .57450 | .04890 | 2.2076 | 2.4011 | 1.00 | 3.00 |
| | 6 - 10 | 157 | 2.3885 | .93129 | .07433 | 2.2417 | 2.5353 | 1.00 | 5.00 |
| | 11 - 15 | 93 | 2.3978 | 1.14341 | .11857 | 2.1624 | 2.6333 | 1.00 | 5.00 |
| | over 15 | 27 | 2.1111 | .64051 | .12327 | 1.8577 | 2.3645 | 1.00 | 3.00 |
| | Total | 415 | 2.3446 | .87051 | .04273 | 2.2606 | 2.4286 | 1.00 | 5.00 |
| How Mobile | 1 - 5 | 138 | 3.0145 | .62765 | .05343 | 2.9088 | 3.1201 | 2.00 | 5.00 |
| | 6 - 10 | 157 | 3.5032 | 1.22278 | .09759 | 3.3104 | 3.6959 | 2.00 | 6.00 |
| | 11 - 15 | 93 | 3.1613 | .79796 | .08274 | 2.9970 | 3.3256 | 2.00 | 6.00 |
| | over 15 | 27 | 3.2222 | .84732 | .16307 | 2.8870 | 3.5574 | 2.00 | 5.00 |
| | Total | 415 | 3.2458 | .96174 | .04721 | 3.1530 | 3.3386 | 2.00 | 6.00 |
| How long PDA | 1 - 5 | 138 | 1.0217 | .14636 | .01246 | .9971 | 1.0464 | 1.00 | 2.00 |
| | 6 - 10 | 157 | 1.0191 | .13734 | .01096 | .9975 | 1.0408 | 1.00 | 2.00 |
| | 11 - 15 | 93 | 1.0968 | .29725 | .03082 | 1.0356 | 1.1580 | 1.00 | 2.00 |
| | over 15 | 27 | 1.0000 | .00000 | .00000 | 1.0000 | 1.0000 | 1.00 | 1.00 |
| | Total | 415 | 1.0361 | .18688 | .00917 | 1.0181 | 1.0542 | 1.00 | 2.00 |

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| How long computer | Between Groups | 14.510 | 3 | 4.837 | 3.212 | .023 |
| | Within Groups | 618.936 | 411 | 1.506 | | |
| | Total | 633.446 | 414 | | | |
| How long Internet | Between Groups | 2.262 | 3 | .754 | .995 | .395 |
| | Within Groups | 311.463 | 411 | .758 | | |
| | Total | 313.725 | 414 | | | |
| How Mobile | Between Groups | 18.463 | 3 | 6.154 | 6.940 | .000 |
| | Within Groups | 364.467 | 411 | .887 | | |
| | Total | 382.930 | 414 | | | |
| How long PDA | Between Groups | .451 | 3 | .150 | 4.415 | .005 |
| | Within Groups | 14.006 | 411 | .034 | | |
| | Total | 14.458 | 414 | | | |

## Post Hoc Tests

**Multiple Comparisons**

Scheffe

| Dependent Variable | (I) Exper | (J) Exper | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|---|
| How long computer | 1 - 5 | 6 - 10 | -.20507 | .14319 | .562 | -.6070 | .1969 |
| | | 11 - 15 | -.39060 | .16464 | .133 | -.8528 | .0715 |
| | | over 15 | .30354 | .25824 | .710 | -.4214 | 1.0284 |
| | 6 - 10 | 1 - 5 | .20507 | .14319 | .562 | -.1969 | .6070 |
| | | 11 - 15 | -.18554 | .16058 | .721 | -.6363 | .2652 |
| | | over 15 | .50861 | .25567 | .268 | -.2091 | 1.2263 |
| | 11 - 15 | 1 - 5 | .39060 | .16464 | .133 | -.0715 | .8528 |
| | | 6 - 10 | .18554 | .16058 | .721 | -.2652 | .6363 |
| | | over 15 | .69415 | .26827 | .084 | -.0589 | 1.4472 |
| | over 15 | 1 - 5 | -.30354 | .25824 | .710 | -1.0284 | .4214 |
| | | 6 - 10 | -.50861 | .25567 | .268 | -1.2263 | .2091 |
| | | 11 - 15 | -.69415 | .26827 | .084 | -1.4472 | .0589 |
| How long Internet | 1 - 5 | 6 - 10 | -.08419 | .10158 | .876 | -.3693 | .2010 |
| | | 11 - 15 | -.09350 | .11679 | .887 | -.4213 | .2343 |
| | | over 15 | .19324 | .18319 | .774 | -.3210 | .7075 |
| | 6 - 10 | 1 - 5 | .08419 | .10158 | .876 | -.2010 | .3693 |
| | | 11 - 15 | -.00931 | .11391 | 1.000 | -.3291 | .3104 |
| | | over 15 | .27742 | .18137 | .506 | -.2317 | .7865 |
| | 11 - 15 | 1 - 5 | .09350 | .11679 | .887 | -.2343 | .4213 |
| | | 6 - 10 | .00931 | .11391 | 1.000 | -.3104 | .3291 |
| | | over 15 | .28674 | .19030 | .519 | -.2475 | .8209 |
| | over 15 | 1 - 5 | -.19324 | .18319 | .774 | -.7075 | .3210 |
| | | 6 - 10 | -.27742 | .18137 | .506 | -.7865 | .2317 |
| | | 11 - 15 | -.28674 | .19030 | .519 | -.8209 | .2475 |
| How Mobile | 1 - 5 | 6 - 10 | -.48869* | .10988 | .000 | -.7971 | -.1802 |
| | | 11 - 15 | -.14680 | .12634 | .717 | -.5014 | .2078 |
| | | over 15 | -.20773 | .19817 | .777 | -.7640 | .3485 |
| | 6 - 10 | 1 - 5 | .48869* | .10988 | .000 | .1802 | .7971 |
| | | 11 - 15 | .34189 | .12322 | .054 | -.0040 | .6878 |
| | | over 15 | .28096 | .19619 | .562 | -.2698 | .8317 |
| | 11 - 15 | 1 - 5 | .14680 | .12634 | .717 | -.2078 | .5014 |
| | | 6 - 10 | -.34189 | .12322 | .054 | -.6878 | .0040 |
| | | over 15 | -.06093 | .20586 | .993 | -.6388 | .5169 |
| | over 15 | 1 - 5 | .20773 | .19817 | .777 | -.3485 | .7640 |
| | | 6 - 10 | -.28096 | .19619 | .562 | -.8317 | .2698 |
| | | 11 - 15 | .06093 | .20586 | .993 | -.5169 | .6388 |
| How long PDA | 1 - 5 | 6 - 10 | .00263 | .02154 | 1.000 | -.0578 | .0631 |
| | | 11 - 15 | -.07504* | .02477 | .028 | -.1446 | -.0055 |
| | | over 15 | .02174 | .03885 | .957 | -.0873 | .1308 |
| | 6 - 10 | 1 - 5 | -.00263 | .02154 | 1.000 | -.0631 | .0578 |
| | | 11 - 15 | -.07767* | .02416 | .017 | -.1455 | -.0099 |
| | | over 15 | .01911 | .03846 | .970 | -.0889 | .1271 |
| | 11 - 15 | 1 - 5 | .07504* | .02477 | .028 | .0055 | .1446 |
| | | 6 - 10 | .07767* | .02416 | .017 | .0099 | .1455 |
| | | over 15 | .09677 | .04036 | .126 | -.0165 | .2101 |
| | over 15 | 1 - 5 | -.02174 | .03885 | .957 | -.1308 | .0873 |
| | | 6 - 10 | -.01911 | .03846 | .970 | -.1271 | .0889 |
| | | 11 - 15 | -.09677 | .04036 | .126 | -.2101 | .0165 |

*. The mean difference is significant at the 0.05 level.

**Homogeneous Subsets**

**How long computer**

Scheffe

| | | Subset for alpha = 0.05 | |
|---|---|---|---|
| Exper | N | 1 | 2 |
| over 15 | 27 | 2.3704 | |
| 1 - 5 | 138 | 2.6739 | 2.6739 |
| 6 - 10 | 157 | 2.8790 | 2.8790 |
| 11 - 15 | 93 | | 3.0645 |
| Sig. | | .135 | .349 |

Means for groups in homogeneous subsets are displayed.

**How long Internet**

Scheffe

| | | Subset for alpha = 0.05 |
|---|---|---|
| Exper | N | 1 |
| over 15 | 27 | 2.1111 |
| 1 - 5 | 138 | 2.3043 |
| 6 - 10 | 157 | 2.3885 |
| 11 - 15 | 93 | 2.3978 |
| Sig. | | .318 |

Means for groups in homogeneous subsets are displayed.

**How Mobile**

Scheffe

| | | Subset for alpha = 0.05 | |
|---|---|---|---|
| Exper | N | 1 | 2 |
| 1 - 5 | 138 | 3.0145 | |
| 11 - 15 | 93 | 3.1613 | 3.1613 |
| over 15 | 27 | 3.2222 | 3.2222 |
| 6 - 10 | 157 | | 3.5032 |
| Sig. | | .663 | .233 |

Means for groups in homogeneous subsets are displayed.

**How long PDA**

Scheffe

| | | Subset for alpha = 0.05 | |
|---|---|---|---|
| Exper | N | 1 | 2 |
| over 15 | 27 | 1.0000 | |
| 6 - 10 | 157 | 1.0191 | 1.0191 |
| 1 - 5 | 138 | 1.0217 | 1.0217 |
| 11 - 15 | 93 | | 1.0968 |
| Sig. | | .929 | .125 |

Means for groups in homogeneous subsets are displayed.

## ANOVA

**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| On average, computer | 1 - 5 | 138 | 5.0000 | 1.26144 | .10738 | 4.7877 | 5.2123 | 1.00 | 6.00 |
| | 6 - 10 | 157 | 4.9108 | 1.12304 | .08963 | 4.7338 | 5.0879 | 1.00 | 6.00 |
| | 11 - 15 | 93 | 4.5699 | 1.33023 | .13794 | 4.2959 | 4.8439 | 1.00 | 6.00 |
| | over 15 | 27 | 4.8148 | 1.75493 | .33774 | 4.1206 | 5.5090 | 1.00 | 6.00 |
| | Total | 415 | 4.8578 | 1.27083 | .06238 | 4.7352 | 4.9805 | 1.00 | 6.00 |
| On average, Internet | 1 - 5 | 138 | 4.8478 | 1.15197 | .09806 | 4.6539 | 5.0417 | 1.00 | 6.00 |
| | 6 - 10 | 157 | 4.6433 | 1.40061 | .11178 | 4.4225 | 4.8641 | 1.00 | 6.00 |
| | 11 - 15 | 93 | 4.4086 | 1.72095 | .17845 | 4.0542 | 4.7630 | 1.00 | 6.00 |
| | over 15 | 27 | 4.6296 | 1.71303 | .32967 | 3.9520 | 5.3073 | 1.00 | 6.00 |
| | Total | 415 | 4.6578 | 1.43070 | .07023 | 4.5198 | 4.7959 | 1.00 | 6.00 |
| On average, Mobile | 1 - 5 | 138 | 5.7681 | .42357 | .03606 | 5.6968 | 5.8394 | 5.00 | 6.00 |
| | 6 - 10 | 157 | 5.8089 | .39441 | .03148 | 5.7467 | 5.8711 | 5.00 | 6.00 |
| | 11 - 15 | 93 | 5.8172 | .38859 | .04030 | 5.7372 | 5.8972 | 5.00 | 6.00 |
| | over 15 | 27 | 5.6296 | .49210 | .09471 | 5.4350 | 5.8243 | 5.00 | 6.00 |
| | Total | 415 | 5.7855 | .41094 | .02017 | 5.7459 | 5.8252 | 5.00 | 6.00 |
| On average, PDA | 1 - 5 | 138 | 1.0652 | .43909 | .03738 | .9913 | 1.1391 | 1.00 | 4.00 |
| | 6 - 10 | 157 | 1.0573 | .41203 | .03288 | .9924 | 1.1223 | 1.00 | 4.00 |
| | 11 - 15 | 93 | 1.3226 | 1.00175 | .10388 | 1.1163 | 1.5289 | 1.00 | 5.00 |
| | over 15 | 27 | 1.0000 | .00000 | .00000 | 1.0000 | 1.0000 | 1.00 | 1.00 |
| | Total | 415 | 1.1157 | .60283 | .02959 | 1.0575 | 1.1738 | 1.00 | 5.00 |

**Test of Homogeneity of Variances**

| | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| On average, computer | 3.629 | 3 | 411 | .013 |
| On average, Internet | 8.724 | 3 | 411 | .000 |
| On average, Mobile | 4.618 | 3 | 411 | .003 |
| On average, PDA | 20.697 | 3 | 411 | .000 |

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| On average, computer | Between Groups | 10.991 | 3 | 3.664 | 2.290 | .078 |
| | Within Groups | 657.621 | 411 | 1.600 | | |
| | Total | 668.612 | 414 | | | |
| On average, Internet | Between Groups | 10.813 | 3 | 3.604 | 1.771 | .152 |
| | Within Groups | 836.599 | 411 | 2.036 | | |
| | Total | 847.412 | 414 | | | |
| On average, Mobile | Between Groups | .877 | 3 | .292 | 1.741 | .158 |
| | Within Groups | 69.036 | 411 | .168 | | |
| | Total | 69.913 | 414 | | | |
| On average, PDA | Between Groups | 5.228 | 3 | 1.743 | 4.933 | .002 |
| | Within Groups | 145.220 | 411 | .353 | | |
| | Total | 150.448 | 414 | | | |

**Post Hoc Tests**

**Multiple Comparisons**

Scheffe

| Dependent Variable | (I) Exper | (J) Exper | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|---|
| On average, computer | 1 - 5 | 6 - 10 | .08917 | .14760 | .947 | -.3252 | .5035 |
| | | 11 - 15 | .43011 | .16970 | .094 | -.0463 | .9065 |
| | | over 15 | .18519 | .26619 | .922 | -.5620 | .9324 |
| | 6 - 10 | 1 - 5 | -.08917 | .14760 | .947 | -.5035 | .3252 |
| | | 11 - 15 | .34094 | .16552 | .238 | -.1237 | .8056 |
| | | over 15 | .09601 | .26354 | .988 | -.6438 | .8358 |
| | 11 - 15 | 1 - 5 | -.43011 | .16970 | .094 | -.9065 | .0463 |
| | | 6 - 10 | -.34094 | .16552 | .238 | -.8056 | .1237 |
| | | over 15 | -.24492 | .27652 | .853 | -1.0212 | .5313 |
| | over 15 | 1 - 5 | -.18519 | .26619 | .922 | -.9324 | .5620 |
| | | 6 - 10 | -.09601 | .26354 | .988 | -.8358 | .6438 |
| | | 11 - 15 | .24492 | .27652 | .853 | -.5313 | 1.0212 |
| On average, Internet | 1 - 5 | 6 - 10 | .20451 | .16648 | .680 | -.2628 | .6718 |
| | | 11 - 15 | .43922 | .19141 | .155 | -.0981 | .9765 |
| | | over 15 | .21820 | .30023 | .913 | -.6246 | 1.0610 |
| | 6 - 10 | 1 - 5 | -.20451 | .16648 | .680 | -.6718 | .2628 |
| | | 11 - 15 | .23471 | .18669 | .664 | -.2893 | .7588 |
| | | over 15 | .01368 | .29725 | 1.000 | -.8207 | .8481 |
| | 11 - 15 | 1 - 5 | -.43922 | .19141 | .155 | -.9765 | .0981 |
| | | 6 - 10 | -.23471 | .18669 | .664 | -.7588 | .2893 |
| | | over 15 | -.22103 | .31189 | .918 | -1.0965 | .6545 |
| | over 15 | 1 - 5 | -.21820 | .30023 | .913 | -1.0610 | .6246 |
| | | 6 - 10 | -.01368 | .29725 | 1.000 | -.8481 | .8207 |
| | | 11 - 15 | .22103 | .31189 | .918 | -.6545 | 1.0965 |
| On average, Mobile | 1 - 5 | 6 - 10 | -.04080 | .04782 | .867 | -.1750 | .0934 |
| | | 11 - 15 | -.04909 | .05498 | .850 | -.2034 | .1053 |
| | | over 15 | .13849 | .08625 | .462 | -.1036 | .3806 |
| | 6 - 10 | 1 - 5 | .04080 | .04782 | .867 | -.0934 | .1750 |
| | | 11 - 15 | -.00829 | .05363 | .999 | -.1588 | .1423 |
| | | over 15 | .17929 | .08539 | .222 | -.0604 | .4190 |
| | 11 - 15 | 1 - 5 | .04909 | .05498 | .850 | -.1053 | .2034 |
| | | 6 - 10 | .00829 | .05363 | .999 | -.1423 | .1588 |
| | | over 15 | .18757 | .08960 | .225 | -.0639 | .4391 |
| | over 15 | 1 - 5 | -.13849 | .08625 | .462 | -.3806 | .1036 |
| | | 6 - 10 | -.17929 | .08539 | .222 | -.4190 | .0604 |
| | | 11 - 15 | -.18757 | .08960 | .225 | -.4391 | .0639 |
| On average, PDA | 1 - 5 | 6 - 10 | .00789 | .06936 | 1.000 | -.1868 | .2026 |
| | | 11 - 15 | -.25736* | .07975 | .016 | -.4812 | -.0335 |
| | | over 15 | .06522 | .12509 | .965 | -.2859 | .4164 |
| | 6 - 10 | 1 - 5 | -.00789 | .06936 | 1.000 | -.2026 | .1868 |
| | | 11 - 15 | -.26526* | .07778 | .009 | -.4836 | -.0469 |
| | | over 15 | .05732 | .12384 | .975 | -.2903 | .4050 |
| | 11 - 15 | 1 - 5 | .25736* | .07975 | .016 | .0335 | .4812 |
| | | 6 - 10 | .26526* | .07778 | .009 | .0469 | .4836 |
| | | over 15 | .32258 | .12994 | .106 | -.0422 | .6873 |
| | over 15 | 1 - 5 | -.06522 | .12509 | .965 | -.4164 | .2859 |
| | | 6 - 10 | -.05732 | .12384 | .975 | -.4050 | .2903 |
| | | 11 - 15 | -.32258 | .12994 | .106 | -.6873 | .0422 |

*. The mean difference is significant at the 0.05 level.

**Homogeneous Subsets**

**On average, computer**

Scheffe

| Exper | N | Subset for alpha = 0.05 |
|---|---|---|
| | | 1 |
| 11 - 15 | 93 | 4.5699 |
| over 15 | 27 | 4.8148 |
| 6 - 10 | 157 | 4.9108 |
| 1 - 5 | 138 | 5.0000 |
| Sig. | | .289 |

Means for groups in homogeneous subsets are displayed.

**On average, Internet**

Scheffe

| Exper | N | Subset for alpha = 0.05 |
|---|---|---|
| | | 1 |
| 11 - 15 | 93 | 4.4086 |
| over 15 | 27 | 4.6296 |
| 6 - 10 | 157 | 4.6433 |
| 1 - 5 | 138 | 4.8478 |
| Sig. | | .380 |

Means for groups in homogeneous subsets are displayed.

**On average, Mobile**

Scheffe

| Exper | N | Subset for alpha = 0.05 |
|---|---|---|
| | | 1 |
| over 15 | 27 | 5.6296 |
| 1 - 5 | 138 | 5.7681 |
| 6 - 10 | 157 | 5.8089 |
| 11 - 15 | 93 | 5.8172 |
| Sig. | | .079 |

Means for groups in homogeneous subsets are displayed.

**On average, PDA**

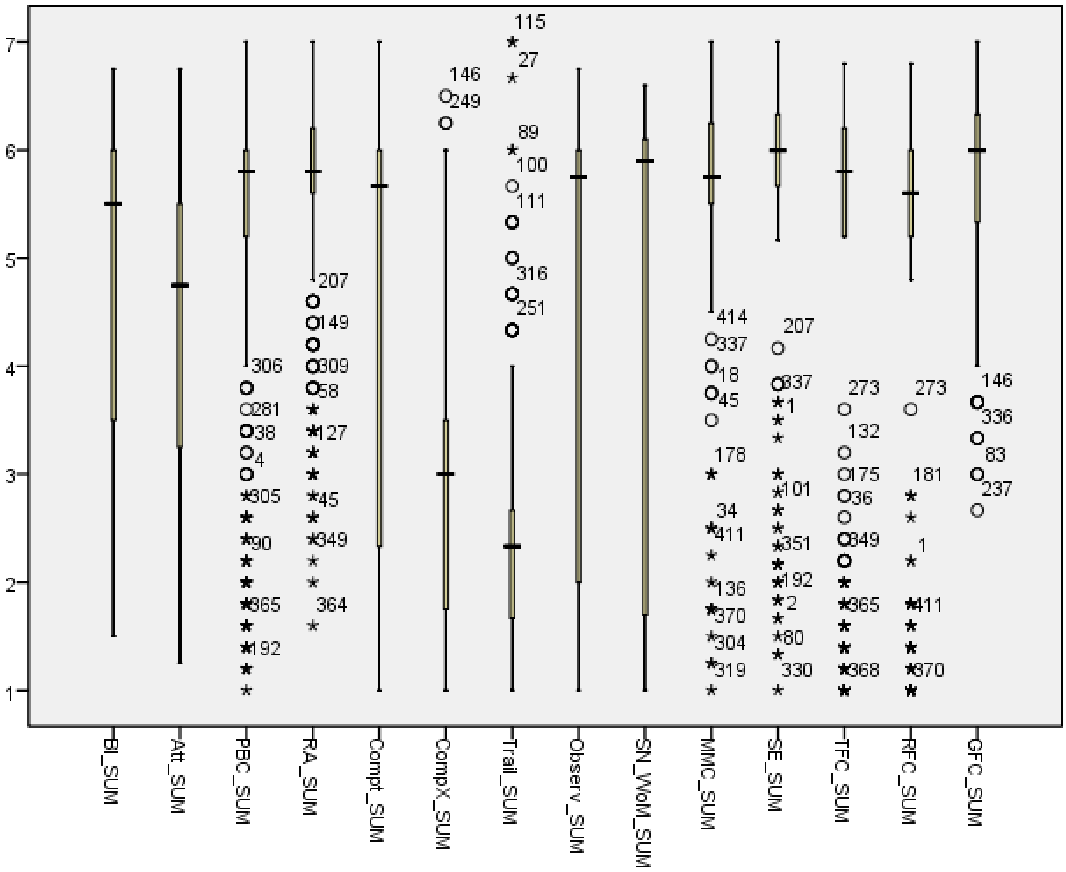
Scheffe

| Exper | N | Subset for alpha = 0.05 | |
|---|---|---|---|
| | | 1 | 2 |
| over 15 | 27 | 1.0000 | |
| 6 – 10 | 157 | 1.0573 | 1.0573 |
| 1 – 5 | 138 | 1.0652 | 1.0652 |
| 11 – 15 | 93 | | 1.3226 |
| Sig. | | .942 | .092 |

Means for groups in homogeneous subsets are displayed.

# Appendix K

## Box Plots – Outliers



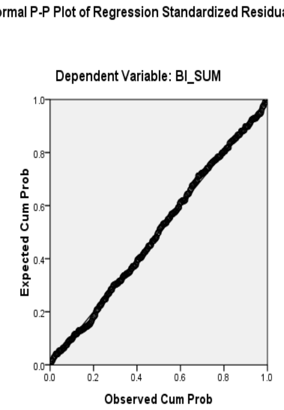

| Descriptives | | | | |
|---|---|---|---|---|
| | PBC | | Statistic | Std. Error |
| PBC_SUM | Mean | | 5.1749 | .07355 |
| | 95% Confidence Interval for Mean | Lower Bound | 5.0304 | |
| | | Upper Bound | 5.3195 | |
| | 5% Trimmed Mean | | 5.3023 | |
| | Median | | 5.8000 | |
| | Variance | | 2.245 | |
| | Std. Deviation | | 1.49839 | |
| | Minimum | | 1.00 | |
| | Maximum | | 7.00 | |
| | Range | | 6.00 | |
| | Interquartile Range | | .80 | |
| | Skewness | | -1.524 | .120 |
| | Kurtosis | | .913 | .239 |

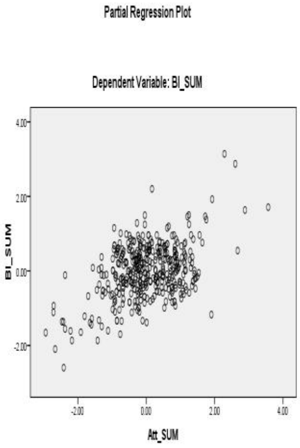
| | | | | |
|---|---|---|---|---|
| **RA_SUM** | Mean | | 5.5292 | .04925 |
| | 95% Confidence Interval for Mean | Lower Bound | 5.4324 | |
| | | Upper Bound | 5.6260 | |
| | 5% Trimmed Mean | | 5.6348 | |
| | Median | | 5.8000 | |
| | Variance | | 1.006 | |
| | Std. Deviation | | 1.00323 | |
| | Minimum | | 1.60 | |
| | Maximum | | 7.00 | |
| | Range | | 5.40 | |
| | Interquartile Range | | .60 | |
| | Skewness | | -1.707 | .120 |
| | Kurtosis | | 2.118 | .239 |
| **Compt_SUM** | Mean | | 4.3494 | .09572 |
| | 95% Confidence Interval for Mean | Lower Bound | 4.1612 | |
| | | Upper Bound | 4.5376 | |
| | 5% Trimmed Mean | | 4.3742 | |
| | Median | | 5.6667 | |
| | Variance | | 3.802 | |
| | Std. Deviation | | 1.94993 | |
| | Minimum | | 1.00 | |
| | Maximum | | 7.00 | |
| | Range | | 6.00 | |
| | Interquartile Range | | 3.67 | |
| | Skewness | | -.212 | .120 |
| | Kurtosis | | -1.738 | .239 |
| **Trial_SUM** | Mean | | 2.4040 | .05376 |
| | 95% Confidence Interval for Mean | Lower Bound | 2.2983 | |
| | | Upper Bound | 2.5097 | |
| | 5% Trimmed Mean | | 2.3170 | |
| | Median | | 2.3333 | |
| | Variance | | 1.200 | |
| | Std. Deviation | | 1.09522 | |
| | Minimum | | 1.00 | |
| | Maximum | | 7.00 | |
| | Range | | 6.00 | |
| | Interquartile Range | | 1.00 | |
| | Skewness | | 1.301 | .120 |
| | Kurtosis | | 1.948 | .239 |
| **MMC_SUM** | Mean | | 5.6404 | .04703 |
| | 95% Confidence Interval for Mean | Lower Bound | 5.5479 | |
| | | Upper Bound | 5.7328 | |
| | 5% Trimmed Mean | | 5.7600 | |
| | Median | | 5.7500 | |
| | Variance | | .918 | |
| | Std. Deviation | | .95807 | |
| | Minimum | | 1.00 | |
| | Maximum | | 7.00 | |
| | Range | | 6.00 | |
| | Interquartile Range | | .75 | |
| | Skewness | | -2.408 | .120 |
| | Kurtosis | | 7.653 | .239 |

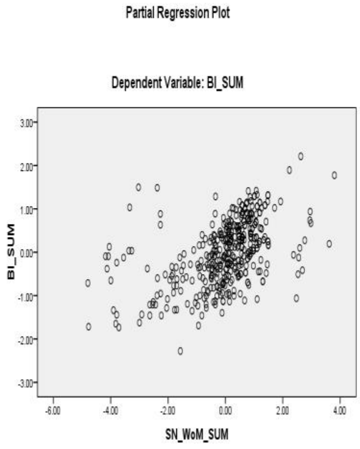
| | | | | |
|---|---|---|---|---|
| **SE_SUM** | Mean | | 5.7205 | .05734 |
| | 95% Confidence Interval for Mean | Lower Bound | 5.6078 | |
| | | Upper Bound | 5.8332 | |
| | 5% Trimmed Mean | | 5.8766 | |
| | Median | | 6.0000 | |
| | Variance | | 1.364 | |
| | Std. Deviation | | 1.16801 | |
| | Minimum | | 1.00 | |
| | Maximum | | 7.00 | |
| | Range | | 6.00 | |
| | Interquartile Range | | .67 | |
| | Skewness | | -2.372 | .120 |
| | Kurtosis | | 4.924 | .239 |
| **TFC_SUM** | Mean | | 4.9475 | .09478 |
| | 95% Confidence Interval for Mean | Lower Bound | 4.7612 | |
| | | Upper Bound | 5.1338 | |
| | 5% Trimmed Mean | | 5.0719 | |
| | Median | | 5.8000 | |
| | Variance | | 3.728 | |
| | Std. Deviation | | 1.93079 | |
| | Minimum | | 1.00 | |
| | Maximum | | 6.80 | |
| | Range | | 5.80 | |
| | Interquartile Range | | 1.00 | |
| | Skewness | | -1.189 | .120 |
| | Kurtosis | | -.375 | .239 |
| **RFC_SUM** | Mean | | 4.9147 | .08633 |
| | 95% Confidence Interval for Mean | Lower Bound | 4.7450 | |
| | | Upper Bound | 5.0844 | |
| | 5% Trimmed Mean | | 5.0400 | |
| | Median | | 5.6000 | |
| | Variance | | 3.093 | |
| | Std. Deviation | | 1.75877 | |
| | Minimum | | 1.00 | |
| | Maximum | | 6.80 | |
| | Range | | 5.80 | |
| | Interquartile Range | | .80 | |
| | Skewness | | -1.474 | .120 |
| | Kurtosis | | .536 | .239 |
| **GFC_SUM** | Mean | | 5.7309 | .04207 |
| | 95% Confidence Interval for Mean | Lower Bound | 5.6482 | |
| | | Upper Bound | 5.8136 | |
| | 5% Trimmed Mean | | 5.7805 | |
| | Median | | 6.0000 | |
| | Variance | | .734 | |
| | Std. Deviation | | .85700 | |
| | Minimum | | 2.67 | |
| | Maximum | | 7.00 | |
| | Range | | 4.33 | |
| | Interquartile Range | | 1.00 | |
| | Skewness | | -.936 | .120 |
| | Kurtosis | | .648 | .239 |

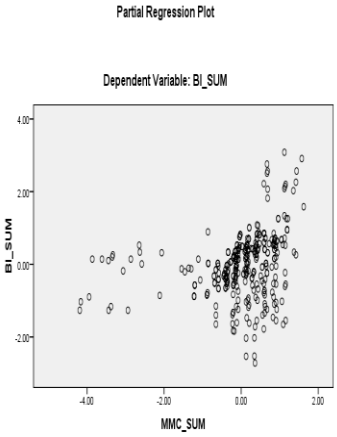
# Appendix L

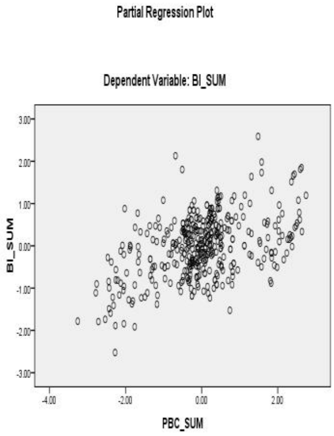
## Linearity test and Standardized Partial Regression Plots

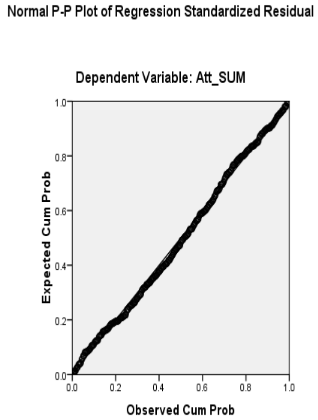


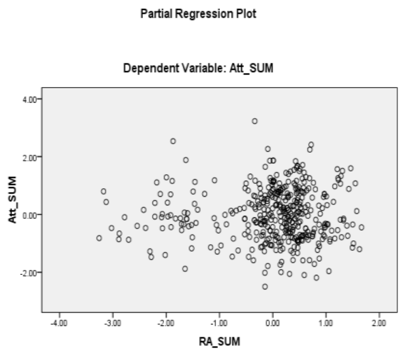



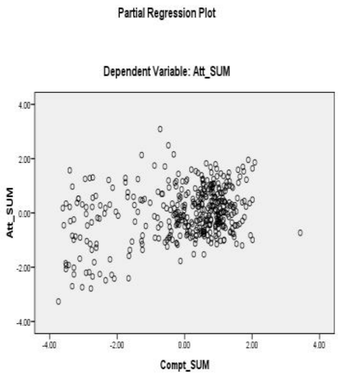



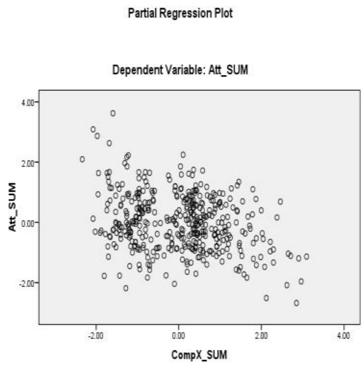



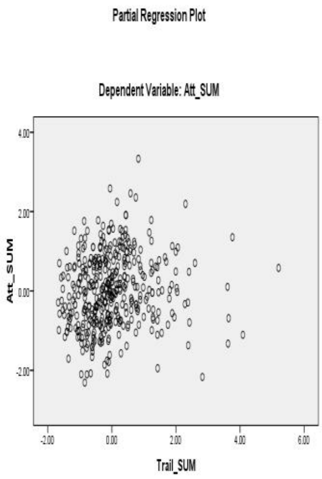



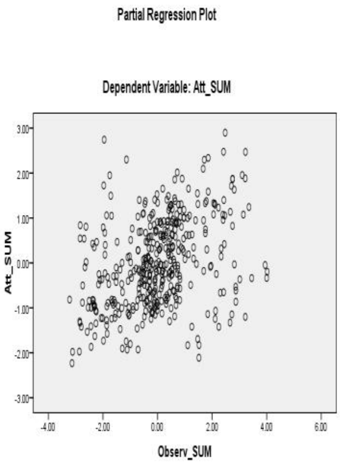



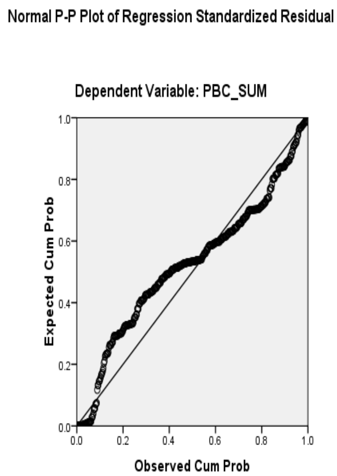



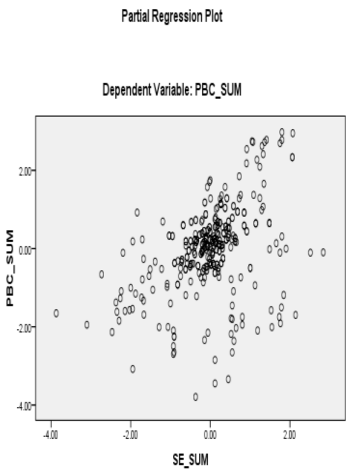



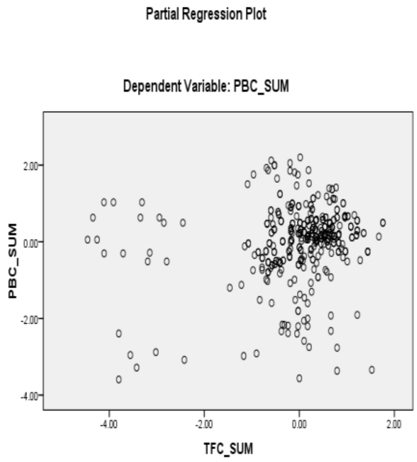



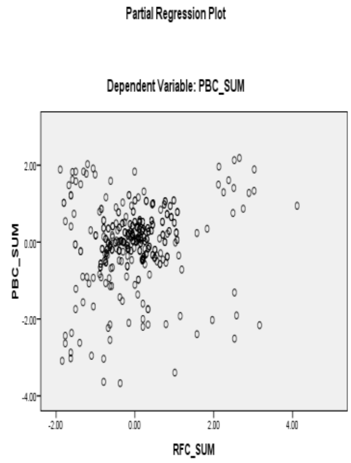

Partial Regression Plot
Dependent Variable: Att_SUM
Att_SUM
Trail_SUM

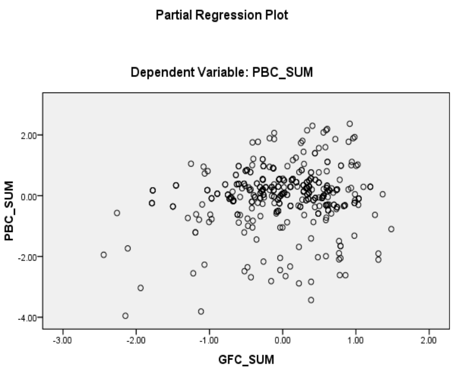

Partial Regression Plot
Dependent Variable: Att_SUM
Att_SUM
Observ_SUM


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: PBC_SUM
Expected Cum Prob
Observed Cum Prob


Partial Regression Plot
Dependent Variable: PBC_SUM
PBC_SUM
SE_SUM

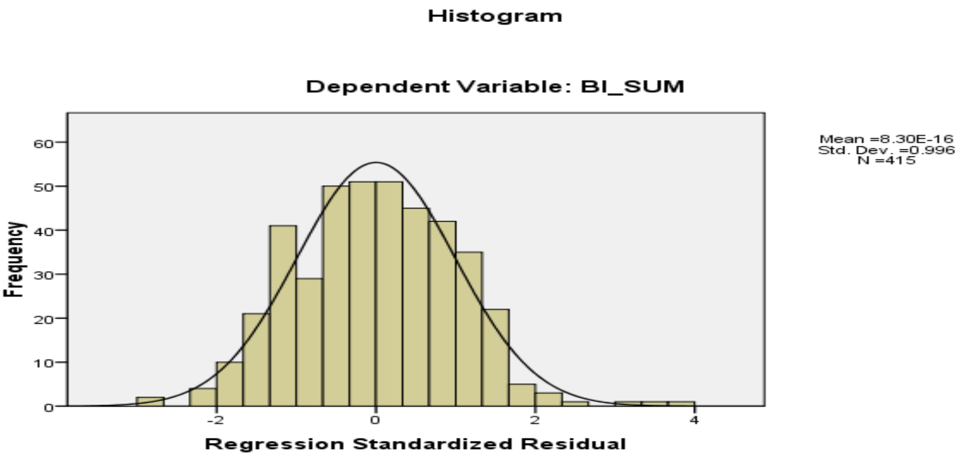

Partial Regression Plot
Dependent Variable: PBC_SUM
PBC_SUM
TFC_SUM


Partial Regression Plot
Dependent Variable: PBC_SUM
PBC_SUM
RFC_SUM

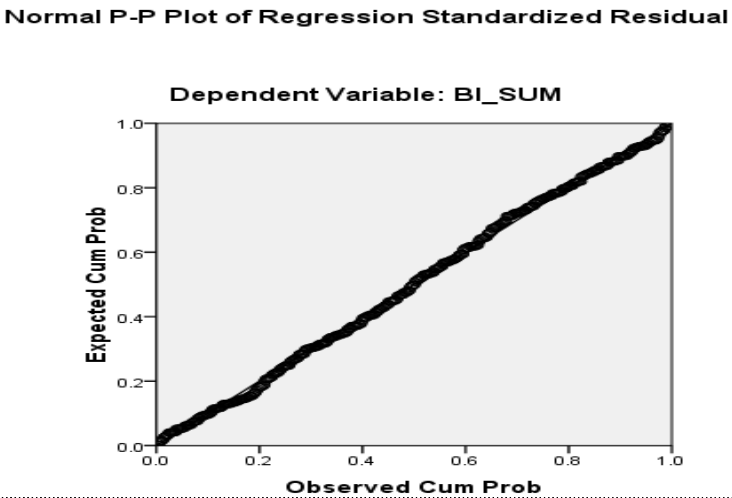

Partial Regression Plot
Dependent Variable: PBC_SUM
PBC_SUM
GFC_SUM

# Appendix M
# Regression Results

### *M-1*




### *M-2*




### *M-3*

**Test of Homogeneity of Variances**

| Factors | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| ATT | 3.231 | 22 | 392 | .000 |
| SN_WoM | 14.771 | 31 | 377 | .000 |
| MMC | 4.732 | 16 | 392 | .000 |
| PBC | 3.620 | 24 | 385 | .000 |