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Synopsis

Ever-increasing growth of ICT (Information and Communications Technology) today affects all aspects of human life; leading to rapid change and transition. Undoubtedly, the world's educational systems have been affected severely with the advancement of scientific, technical and technological domains. Higher Educational Institutions, in particular universities are becoming evidently pertinent in the realms of socio-economic, cultural and scientific advancement. Clearly, ICT has received global acceptance as one of the valuable educational necessities. In this regard, Iran as developing country faces many problems such as lack of cultural foundations for ICT adoption, lack of skilled human workforce, unfamiliarity with foreign languages, the lack of motivation and investigation spirits. In other words, there is evident lack of technological life skills which can be attributed to the inability of the traditional higher educational system in responding adequately to the fast changing needs in ICT. The main aim of this survey is to identify and determine the factors contributing to effective acceptance and use of ICT among faculty members of zone 8 branches of Islamic Azad University (IAU) in Tehran. Simple random sampling method was used in this research and a final total of 291 respondents comprising faculty members were selected. The survey questionnaire for this study consisted of 10 variables namely computer self-efficacy, computer competence, computer anxiety, management support, cultural perception, perceived usefulness, perceived ease of use, attitude towards using computer, behavioral intention to use and actual use. The researcher used a modified questionnaire from past literature and researchers' questionnaire. The Cronbach alpha (α) value for reliability of all the items in the questionnaire is .87. The collected data were analyzed by the Statistical Package for the Social Science (SPSS version 16) to obtain *t*-test and f-test for measuring agreement and significant co-relation between variables respectively. A Linear Structural Relations (Lisrel) statistical tool was used in Structural Equation Modeling (SEM) which analyzed the most effective variables in using ICT. The final result of this survey shows a model of accessibility and usage of information technology in private universities in Iran. Findings show that faculty members give importance to the use of ICT. Nine (9) variables affect ICT use and four of which -- namely computer competence, computer self-efficacy, management support and perceived ease of use of computer were strong predictors of ICT usage. Hence more attention must be focused on these four components in order to enhance ICT use in universities. Appropriate steps to increase computer competence and computer self-efficacy among faculty members and students with regard to using modern information and communication technologies must be addressed. Management support in terms of providing accessibility to both hardware and software is essential; therefore managers play a significant role in universities in encouraging the use of information technology.

Faktor Yang Mempengaruhi Penggunaan ICT Dalam Kalangan Ahli Fakulti Universiti Swasta Di Iran

Sinopsis

Perkembangan pesat dalam dunia ICT (Teknologi Maklumat dan Komunikasi) masa kini mempengaruhi hampir semua aspek kehidupan, dan membawa kepada perubahan ketara dan pembaharuan. Tidak dapat disangkal lagi bahawa perkembangan dalam domain saintifik, teknikal dan teknologi mempengaruhi sistem pendidikan di dunia. Institusi pendidikan tinggi, terutama universiti semakin menonjol dalam bidang sosio-ekonomi, kebudayaan dan perkembangan saintifik. Amat jelas bahawa ICT diterima oleh seluruh dunia sebagai kemudahan pendidikan yang amat perlu. Dalam hal ini, sebagai negara membangun Iran berhadapan dengan pelbagai masalah seperti kekurangan asas budaya untuk penerimaan ICT, kekurangan sumber manusia terlatih, kekurangan kemahiran dalam penguasaan bahasa asing, dan kekurangan motivasi serta semangat penerokaan. Amat jelas bahawa Iran menghadapi kekurangan kemahiran ICT akibat ketidakupayaan sistem pendidikan tradisi untuk memberi respon kepada dunia ICT yang pesat membangun. Objektif utama kajian ini adalah untuk mengenal pasti faktor-faktor yang menyumbang kepada penerimaan penggunaan ICT secara efektif dalam kalangan ahli fakulti zone 8 Islamic Azad University (IAU) di Tehran. Kaedah pensampelan rawak digunakan dalam kajian ini yang melibatkan 291 peserta. Soal selidik kajian menyelidik 10 pemboleh-ubah iaitu efikasi kendiri dalam penggunaan komputer, kompetensi mengguna komputer, kerisauan mengguna komputer, sokongan pengurusan, persepsi budaya, persepsi kepenggunaan, persepsi kesenangan mengguna, sikap terhadap mengguna komputer, kehendak untuk mengguna dan penggunaan sebenar. Pengkaji menggunakan borang soal selidik yang diubah suai daripada sorotan kajian lepas dan soal selidik pengkaji-pengkaji lepas yang menjalankan kajian dalam bidang yang sama. Item-item soal selidik telah diuji kebolehpercayaan dan memperoleh nilai (α) alpha Cronbach .87. Data kajian dianalisis dengan menggunakan program *'Statistical Package for the Social Sciences'* (SPSS versi 16) untuk memperoleh *t-test* dan *f-test* bagi mengukur persamaan dan hubungan signifikan antara pemboleh ubah. Program *Linear Structural Relations* (Lisrel) digunakan untuk *Structural Equation Modeling* (SEM) bagi mengenal pasti variabel-variabel paling berkesan dalam penggunaan ICT. Dapatan kajian menjanakan model aksesibiliti dan penggunaan teknologi informasi di universiti swasta di Iran. Dapatan menunjukkan ahli fakulti memberi keutamaan kepada penggunaan ICT. Sembilan (9) pemboleh ubah mempengaruhi penggunaan ICT, dan empat daripadanya kompetensi, efikasi kendiri, sokongan pengurusan and persepsi kesenangan penggunaan – merupakan peramal penting penggunaan ICT. Fokus perlu diberikan kepada komponen-komponen tersebut untuk menggalakkan penggunaan ICT di universiti. Langkah yang sesuai untuk mengembangkan kompetensi dan efikasi kendiri dalam kalangan ahli fakulti dan pelajar yang menggunakan ICT terkini perlu ditangani. Sokongan pengurusan dalam memberi akses kepada perisian dan hardware amat penting; oleh itu, pengurus memainkan peranan signifikan dalam menggalakkan penggunaan teknologi maklumat.

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Ever-increasing growth of information and communications technology (ICT) today affects all aspects of human life; hence it has been exposed to change and transition. These changes have been considerable particularly in the social, cultural, economic, political, and educational fields as well as many other domains and have provided the ground for rapid and irreversible transitions across the world. Consequently, today, familiarity with computer and other related skills seem to be prerequisite for productivity and cost effectiveness in all aspects of life (Comber, Colley, Hargreaves, & Dorn, 1997).

The world's educational systems have been affected severely with the advancement of scientific, technical and technological domains and hence these have provided necessary grounds for comprehensive reforms and changes in the world's educational system (Mahmoodi, Pezeshki-Rad, & Chizari, 2010). As such, over the last three decades ICT has been proposed as one of the most important sources and a significant element in the educational system; it has been applied at various educational levels especially higher education in countries in order to achieve developmental targets.

Presently, ICT, as one of the valuable solutions to the ever-increasing educational needs, has received global acceptance (Chao, 2001). According to Chang (2005), the ever-increasing popularity of ICT means that computers are being employed more at all educational levels.

In the education industry, institutions have gradually adapted to the potential impact of ICT while applying it in classes to improve the learning process (Tan, 2007). Meanwhile, universities are considered as the most important developmental tools of each country and their key and effective roles are gradually becoming obvious in socio-economic, cultural and scientific realms (Akhundi, 2010). In fact, higher education of each country is the main route to development because literacy is one of the important social indexes for stable development. In other words, literacy not only enhances general education rather its increasing level affects the manner and amount of political, economic, cultural and educational participation of its people. Naisbitt (1984) also believes that an up-to-date knowledge is significant for many jobs and professions.

Currently, universities worldwide are trying to find out how to adapt with such changes so that they overcome the challenges arising from implementation of ICT (Karimi Alavije, Khalifeh, & Bakhtiar, 2007).

With due attention to the above-mentioned issues as well as considering the fact that technology use is no longer limited to computer experts, it is essential now for all students and faculty members to have first-hand knowledge of computer technology and apply it for success in their future jobs (Rizza, 2000). At the same time, educational authorities, simultaneously with such changes must support learners in their attempts to satisfy educational needs of the 21st century. Yang (2007) believes that the impact of technology on higher education, work environment and life underscore the importance of technology's acceptance and application process; success depends on acceptance and adaptation of modern technologies extensively and with higher speed.

1.2 Problem Statement

Today, we are living in an age that is called the age of information and this is marked by rapid changes in the second half of the twentieth century in the field of science and technology leading to the formation of a modern society called information society (Morrow, Kelly, & Kirley, 2004). In the age of ICT, all human activities proceed towards electronic process based on the World Wide Web and the Internet. Consequently, new words like E-Commerce, E-Business, E-Training and E-Learning have attained prominence and entered into the vocabulary of all nations. Information and communications are modern age technology that has been resulted in reduced calculation time, accuracy in data processing, easy exchange of information and decreasing data costs (Jalaali, 2002).

Iran faces many problems in the field of ICT such as lack of cultural foundation for ICT adoption, lack of skilled human resource, unfamiliarity with foreign languages, lack of motivation and investigation spirits, lack of inclination to work, effort and operation and in one word, decreasing capability of life skill are the outcomes of inability of the traditional higher educational system in responding to the changing social needs. Our higher education is still book-oriented and students, despite their prominent capabilities and talents, are bound to pass lessons primarily by memorizing the subjects of some old books. Further, research and investigation as well as strengthening of searching spirit are at the lowest ebb in the educational system. Also, teaching is still teacher-and book-oriented and students have little roles in the learning process.

In this regard, the Supreme Leader of the Islamic Revolution Ayatollah Khomeini challenged the nation to focus on ICT as a way forward into the future and stressed on the relevance of information and communications technology as a remarkable science that should be taken seriously (Khamenei, 2012):

> Considering to realities that are in front of our eyes, this accelerated movement towards the peak of progress we wanted to achieve is not at all an illusion. It is a fact and our experiences over the past years show that professors and their students could be have vital role in new sciences and in sciences that play a significant role in our lives. This shows that we enjoy the necessary capacities. We need to take this issue seriously.

Researchers generally believe that ICT enhances individual and group productivity and total efficiency, stimulates creativity and provides opportunities for organizations to compete in an increasingly globalized world. Postgraduate and higher education, like other industries, perceive the impact of ICT for organizational growth and survival. "There are many organizations that spend a large portion of their budgets in the field of ICT with the aim to improve the general and partial performance of organization (Klaus, Gyires, & Wen, 2003).

Universities, as one of the scientific-research centers of the country, have researchers that through modern technologies perform investigations simultaneously with the tasks of teaching and learning and as components of the higher education system; they traverse the unknown borders of knowledge and through their services accelerate the rhythm of development and advancement of the country. Production of scientific information is considered to be the outcomes of academics' performance that is represented in the form of information resources such as books, articles, reports, research plans and so forth (Mahmoodi, 2004). Thus, it can be concluded that ICT use in education as well as in the research process is an undeniable fact.

After the victory of the Islamic revolution in Iran, in 1979, due to ever-increasing demands for education but limited admission capacity in public universities, policymakers

reinforced the idea of establishing Islamic Azad University (IAU) in order to train skilled, specialized, creative and informed human resources. This fundamental and principal movement was shaped with the direct support of Imam Khomeini; hence the emergence of this scientific and cultural institution was considered a valuable, unique and ideal opportunity for the growth of higher education and for putting into operation talented, able and competent youth of this country. The IAU started its activity with the aim of providing excellent educational opportunities and enhancing the culture level especially in deprived areas. With about 14 zones including 350 branches and centers inside and outside the country so far, this institution has played positive role in all educational, economic, cultural and social domains by training the human capital and identifying young talents. In other words, it has been recognized as the most successful educational model in the native environment (Akhundi, 2010).

However, Iran has lacked fruitful and effective exploitation of information and communications technology (ICT) in the field of higher education due to different challenges and problems encountered by academics and researchers at universities and research centers especially Islamic Azad University largely because of lack of suitable financial support from the government.

Although, extensive activities have been performed in the field of IT and ICT in Iran over the past few years and plan of development on IT use (TAKFA)[1] is a sample plan of such actions which has defined the actual framework at national level by considering special role and task for each sector and simultaneously, different plans are being executed in the higher education sector and considerable resistance still remains at relatively high level against change at universities and educational institutions (Mahmoodi et al., 2010).

[1] Development of use of IT= Toseeh Karborde Fannavari Ettelaat

Since acceptance and use of the ICT by individuals is vital for the success of a system (Money & Turner, 2004) studying the nature and effective factors on use of the ICT has assumed much importance (Chau, 2001). Consequently, perceiving a factor that reinforces the efficiency of information systems' application is still a significant issue for researchers and the people attached to this educational domain (Mun & Hwang, 2003) because merging of ICT in university classes require important transition that must be confirmed and accepted by the most significant factors and agents, namely students and faculty members (Jaffae, 1998).

The accomplished researches and studies in Iran show that despite the vital role information could play in the qualitative development of universities, an insignificant number of studies have been done in this field; hence more comprehensive works are needed to focus on different dimensions and viewpoints. So far, most of the surveys on ICT use in Iran have highlighted the role of ICT in employment or just the impact of the Internet on educational and research activities at student level. As such, effective factors in exploiting ICT at universities especially by faculty members as trainers of the specialized force as well as how these technologies have been used in education have not been touched upon. Faculty members are the principal elements of private and public universities who, through the acceptance and use of ICT, can help higher education develop considerably. Personal, social and psychical factors are effective in using ICT but no comprehensive research has yet been done in this regard. The current research is an attempt to bridge the gap in the existing literature by investigating which elements and factors are effective in facilitating ICT use by faculty members of the IAU at zone 8 branches of Tehran metropolis.

1.3 Objectives of the Study

The main aim of this survey is to identify and determine the effective factors on acceptance and use of ICT between faculty members of zone 8 branches in Tehran from IAU.

Special Objectives:

In order to achieve the above-mentioned aims, the objectives of this study are to:

1. Describe personal and professional characteristics of the faculty members of IAU in zone 8 branches in Tehran.
2. Assess the effective psycho-social factors on use of ICT between faculty members of IAU in zone 8 branches in Tehran.
3. Determine the differences in the personal and professional characteristics of faculty members and their actual use of ICT.
4. Determine the relationships between effective factors on use of ICT by faculty members.
5. Develop a model to predict factors that affect ICT use among faculty members.

1.4 Research Questions

This study is aimed at answering the following research questions:

1. What are the effective personal and professional characteristics of faculty members in the proposed study?
2. What are the effective factors on use of ICT by faculty members in this survey?
3. What are the differences in the personal and professional characteristics of respondents with the use of ICT by respondents?

4. What are the relationships between effective factors on use of ICT and the use of ICT by respondents?
5. Which conceptual model could be developed for use of ICT by faculty members of Islamic Azad University's branches in Tehran, Iran?

1.5 Significance of the Study

It can be acknowledged that the most tangible advantage of the ICT revolution for developing countries is their access to great resources in education at minimum cost. The Internet is a powerful source for wider and faster access to educational subjects and supports continuous learning activities. It has become an important tool for representing educational resources both at primary and higher levels. In fact, the Internet has been transformed into a cheap, efficient and global mechanism for educational representation (Bakhshi-Khaniki, 2001). Acceptance and use of ICT by individuals of every society is important for the success of each system (Money & Turner, 2004).

ICT is an expression from which many interpretations have been developed. Complexity and mutual impact of these interpretations are often debated. As such, for creating the best relations, four types of purposes or rational reasons have been identified for ICT usage in education: (a) encouragement to acquire ICT skills as an objective for users, (b) use of ICT in order to strengthen learner capabilities in current educational programs, (c) use of ICT to strengthen learner capabilities as an essential element to reform lessons that changes not only the manner of learning but also the learnt contents, and (d) use of ICT as a necessary element of reformations that changes the university's organizational structure.

Today, various ICT applications facilitate the learning process (Wang, 2008). In addition, ICT can support international participation in educational and professional development. It offers a range of options –from video conferences to multimedia and websites– that could be used in adapting to challenges faced by professors (Kaazemi, 2002; Zamaani, 2001). Indeed, evidence shows that ICT possibly has the capability to provide effective and flexible methods for professional development of professors in this age (Voogt & Pelrum, 2005).

Actually, development of human resources is considered as the principal axis of development. Previous policies and performances show that this issue has been neglected in spite of macro policy attention to the issue of human development especially from social elites, such that the human resource development index (HRDI) of Iran is moderate and recently the situation with regard to other countries has not only been unimproved but the Islamic Republic HRDI has degraded from rank 90 to 96. A prominent economist and Nobel laureate, Professor Gary Becker who coined the term human resources for the first time showed that about 70 percent of wealth or economy of a country lies in its people and skills, knowledge and talent of peoples are perceived as human capital of that country (Basic Education to Eliminate Poverty, p. 1)

Under certain conditions, ICT development brings positive outcomes for some individuals, institutions and social classes and leaves positive imprints on their individual and social life but at the same time a considerable portion of individuals at different levels will be deprived of such possibility. Today, this issue has been known as the digital divide of the developed and developing countries which can be decreased in Iran through prioritizing education especially the public education with the help of the government. The World Development Report (1990) states that valuable evidence showed that human capital development is one of the solutions to decrease poverty. Lack of improvement in education

especially higher education of a country is the worst result of poverty (Basic Education to Eliminate Poverty, p. 1).

With respect to the above issues, one of the main advantages of ICT use in educational systems of the world is to increase the growth ratio and enable individuals to access an educational level that ultimately will lead to human resource development of that society. Other advantages of ICT use include: increasing communication channels through tools such as electronic mail, discussion groups, chat rooms, and high flexibility in enabling when and where professors and students perform their tasks (Shabaani, 2005), developing learning styles; creating and stimulating motivation through different resources for improving the learning and teaching process; facilitation of teaching programming and designing instructional materials; fast and easy access to information of learners and the university at any time and place; enhancing lesson quality through participation among professors and students in programming and preparing instructional materials; increasing and improving academic reports of learners to parents; enhancing parents' knowledge with regard to learners' capabilities and talents and also increasing awareness about the learning and teaching process (Soltaani, 2005).

Evidence reveals that students should learn how to think, decide and judge exactly about their affairs instead of accumulating scientific facts in mind. And professors need to consider that the thought process and creativity cannot be attained by commanding, preaching, encouraging or inducing to imitating and obeying others, because limiting the education process to transmission and imitating scientific facts will restrict the natural growth of thinking. By paying attention to modern scientific changes, challenges and approaches Annis, Lipman, and Paul believe that the first aim of education must be to train reflective, creative and critical human beings (Shabaani, 2005) and this will not be realized unless we provide for competition in the global education domain in the age of ICT.

However, traditional educational methods will be no longer be responsive to students' needs and present educational conditions; hence this issue must be taken into account by policy makers and investors of the higher educational domain.

As such, the university, as a main body of higher education and important resource for supplying a skilled and reflective human capital, has played a determinant role in stable development and growth in terms of economic, social and cultural aspects and it is often introduced as the major axis of development. Consequently, strengthening of universities and keeping them secured and efficient is considered as the main political aim for all countries.

After the victory of the Islamic Revolution, Iran has witnessed a considerable quantitative growth in the higher education sector too. Increasing the number of students in various academic majors at different levels (Associates, B.A, M.A and Ph.D) and establishment of branches in most parts of the country by IAU led to the presence of higher number of eager youths at various levels; hence it created significant educational opportunity for girls and women to represent their capability and competency by entering the university.

However, in spite achieving one of the highest growth rates in Internet usage over the past decade with 43.2 percent of Iranians using the Internet in 2010, compared to just 42.8 percent in Russia and 31.6 percent in China (Stepanova, 2011), the international telecommunication union (ITU, 2011) cited that Iran has moved down considerably to rank 84 in the IDI 2008. Also, it is reported that internet use in higher education institutions is expected to rate around 7 percent till 2010 (Statistical Center of Iran, 2009). The dismal showing in ICT usage among faculty members whose vital role is pivotal for Iran's progress into the future as outlined by the Supreme Leader of the Islamic Revolution

Ayatollah Khomeini necessitate this study to examine the factors affecting the use of ICT among academics.

If we consider IAU as the biggest nongovernmental higher education center, undoubtedly, it has been able to deliver many educated persons to society over the past few years. Certainly Iran's education sector especially IAU enjoys elevated position as a center of specialized and efficient human resources as well as a center for imparting technical, medical and educational expertise in order to facilitate multi-faceted development of the country. Identifying and studying of effective factors on use of ICT could help managers and authorities effectively develop ICT programs.

Therefore, given the expansion of the internet especially among scientific and university communities, it is necessary to enhance the effectiveness of this technology by studying factors on its acceptance and application especially among faculty members and provide its optimal application for quantitative and qualitative growth of higher education in IAU. In fact, since this survey identifies effective factors on use of ICT by faculty members in educational-research activities, it can represent strategies for more optimal application of such technologies in the country's higher education domain.

1.6 Limitations of the Study

This survey has been performed to study the effective factors on ICT acceptance and usage by faculty members of IAU zone 8 branches of Tehran; hence it cannot be generalized to the whole higher education field. Despite such limitations, the survey findings are helpful in enhancing ICT use in the proposed branches of IAU as well as other branches of the same degree and with similar demographic conditions; hence it could provide good opportunities for other future research. Meanwhile, other difficulties encountered by the researcher are:

Reluctance in completing the questionnaire by research samples due to lack of time and having problems to access faculty members in a short time.

1.7 Scope of the Study

In the global area, the last several years have seen a significant growth in ICT opportunities. A diverse number of academic communities have been part of this process. There are numerous experiences where ICT growth appears to be having an important impact on socio-psycho realities (Holly, 2002). The streak of success stories in developing countries such as Iran point towards the growing potential of ICT. But we must remember that development comes at a price. The social, psychological, legal, financial, educational and human resources aspects of each country must create conditions favorable for ICT (Mahmoodi et al., 2010).

Also, emphasis of planners and decision makers in Iran is to promote the use of ICT in the formal education sector today by adapting themselves with these changes (Yaghoobi, 2002).

On the other hand, Faculty members as key persons in improving and increasing quality of education, are heavily dependent on e-resources for their required information and to keep themselves up-to-date in their subject area. Indeed, Faculty members access more and more resources in their respective departments or from their personal desktop/laptop (Thanuskodi, 2011).

This survey was accomplished during the academic year of 2009-2010. Also, this survey was conducted at the branches of IAU at zone 8 branches of Tehran that includes South of Tehran, Center of Tehran, North of Tehran, East of Tehran, West of Tehran, Tehran Medical, Islamshahr, Science and Research, and Pharmaceutical branches. This

zone is the oldest, the most important and the biggest zone of IAU in terms of number of students, fields and academic levels, faculty members, educational and research possibilities, and geographical location.

1.8 Conceptual & Operational Definitions

This section outlines the definitions of terms as they are used in this study.

Information and Communications Technology (ICT): Any type of technology such as computer hardware and software, telecommunication tools and information networks that allow the possibility of transferring, processing, storage, organization, information retrieval and making relation with the aim of solving problems and decision-making (Abdullah, 2007), education and learning in an educational environment. In this study ICT includes hardware (such as printer, scanner, external memory, wireless modem, satellite, and webcam), computer and related software (such as office software, professional software, and databases), and Internet (such as email, home page, e-learning, e-teaching, and chatting).

Actual use of ICT: In this study it means the actual use of computer and the Internet by faculty members in order to perform educational and research functions including teaching, attending conferences and scientific gatherings and eliminating organizational problems. Items could be captured were: usage of Internet in receiving news, the Internet in order to get authentic papers from academic journals, the Internet to receive and save audio, graphic and visual files, external facilities of the computer in teaching, the Internet to get more information about educational activities, the Internet to become notified about the national and international conferences, the Internet to participate in on-line classes and 10 items like these. Respondents were asked to rate from 1 to 5 pertaining

to the ICT by actual use of ICT to them. Five Likert-type response categories were used: 'Very Low', 'Low', 'Moderate', 'High' and 'Very High'. These categories were assigned values from 1 to 5 in the direction that gives the highest value to response that are perceived as an agreement to them. Respondents were asked to rate from 1 to 5 pertaining to the ICT by computer competency to them.

***Effective Factors on Use of ICT*:** In this study effective factors on the use of ICT means personal-professional factors (age, gender, marital status, educational degree, proficiency in English language, educational group, academic rank, work experience, working experience with ICT and computer competences) and psycho-social factors (computer self-efficacy, computer anxiety, computer attitude, intention to use, perceived ease of use, perceived usefulness, cultural perception, attitude toward ICT and management support).

Computer competencies: Wikianswers (2011) defines Computer Competency as being able to use a computer and perform the basic tasks needed to work with computing efficiently. Madden, Ellen, and Ajzen (1992) identified five domains of computer competencies for educators, including hardware skills, software skills, programming skills, integration skills, and general knowledge skills. Adams, Nelson, and Todd (1992) showed that presented competencies needed are in five areas: (a) attitudes and values, (b) computer capabilities and limitations, (c) computer anatomy and configuration, (d) computer careers and social implications, and (e) computer terms and concepts. To extract computer competencies items used offered several options such as use of email to communicate with others, the Internet to judge, computer to facilitate the administration affairs of the university, special software, the Internet in order to exchange data electronically, backup system in teaching, data banks and 23 items like these in the questionnaire. Five Likert-type response categories were used: 'Very High', 'High', 'Moderate', Low' and 'Very Low'.

These categories were assigned values from 1 to 5 in the direction that gives the highest value to response that are perceived as an agreement to them.

***Computer Self-efficacy*:** Compeau and Higgins (1995, p. 192) defined computer self-efficacy (CSE) as a "judgment of one's capability to apply computer technology to specific tasks (e.g. send an electronic file to a friend or preparing an electronic presentation)". Thatcher, Gundlach, McKnight, and Srite's (2007) computer self-efficacy scale was used to assess respondents' computer self-efficacy in this study. Computer self-efficacy had twenty items such as obtain good information through Internet in my own special field of study, type and print things easily and without the help of others, scan pictures and written documents and transfer it to the computer independently and without anybody's help, easily search needed information in the Internet, solve my trivial software problems without help of others, solve my trivial hardware problems without help of others, easily install secondary accessories to my computer and use them and 13 items like them. Five Likert-type response categories were used: 'Totally agree', 'Almost agree', 'No opinion', 'Disagree' and 'Totally disagree'. These categories were assigned values from 1 to 5 in the direction that gives the highest value to response that are perceived as an agreement to them.

Management Support: Igbaria, Zinatelli, Cragg, and Cavaye (1997) defined management support as a series of activities to ensure sufficient allocation of resources and act as a change agent to create a more conducive environment for successful performance of staff. The Igbaria et al. (1997) Management Support Scale was used to assess management support in this study. Management support refers to the perceived level of general support offered by top management. This notion was captured from 18 items such as awareness of the advantages of using computers, encouragement of employee computer

use, availability of required facilities and sources for using the computers in university, support advanced courses of teaching IT and the like. Five Likert-type response categories were used: 'Totally agree', 'Almost agree', 'No opinion', 'Disagree' and 'Totally disagree'. These categories were assigned values from 1 to 5 in the direction that gives the highest value to response that are perceived as an agreement to them.

***Cultural Perception*:** Cultural perception based on Rogers's (1995) idea, can be defined as "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (p. 15). In this study, cultural perception refers to the extent to which IAU faculty members perceive ICT use to be consistent with the cultural context of Iranian society and private universities. Zeinab's (2006) Cultural Perception Scale was used to assess the culture of faculty members in this study. The Cultural Perception Scale consists of 25 statements. Some of these statements are: Using ICT in educational places to keep information up-to-date, priority of disadvantages of using the net for the students more than the advantages, unreliability of sources and information obtained from the net, computers as a great influence on education in people's lives and so on. Five Likert-type response categories were used: 'Totally agree', 'Almost agree', 'No opinion', 'Disagree' and 'Totally disagree'. These categories were assigned values from 1 to 5 in the direction that gives the highest value to response that are perceived as an agreement to them.

***Perceived Usefulness (PU)*:** Davis, Bagozzi, and Warshaw (1989) defined PU as "the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context". In this study, we define PU as the degree to which individuals believe that use of ICT services will improve their communicational, educational and research performance. Park's (2004) perceived

usefulness scale was used to assess the perceived usefulness of technology in this study. This item was based on Venkatesh (2000) and Venkatesh and Davis (2000). The perceived usefulness scale consists of 22 statements such as Computers can do whatever we want, Use of ICT can increase communication with other research institutions, get useful information from the Internet, faculty could be more successful in educational practices, gathering information and sources from the Internet is cost-effective, develop research practices of the students using ICT, analyzing data more precisely, reducing time of doing things and so on. Five Likert-type response categories were used: 'Totally agree', 'Almost agree', 'No opinion', 'Disagree' and 'Totally disagree'. These categories were assigned values from 1 to 5 in the direction that gives the highest value to response that are perceived as an agreement to them.

Perceived Ease of Use: Davis (1989) defined this as the degree to which a person believes that using a particular system would be free from effort. The perceived ease of use scale (Park, 2004) was used to assess the perceived usefulness of ICT in this study. This questionnaire was based on Davis (1989) and Davis et al. (1989). This notion was realized from 10 statements such as: connect to the net whenever I wish, software are easily accessed, computer training classes are easy, use educational sites on the Internet easily and similar items. Five Likert-type response categories were used: 'Totally agree', 'Almost agree', 'No opinion', 'Disagree' and 'Totally disagree'. These categories were assigned values from 1 to 5 in the direction that gives the highest value to responses that are perceived as an agreement to them.

Behavioral Intention to use (BI): Behavioral Intention to use ICT is a measure of the likelihood that a person will adopt the application, whereas the technology acceptance model uses actual usage to represent a self-report measure of time or frequency of adopting

the application (Davis et al., 1989). In this study, we defined BI as the degree to which an individual intends to use ICT services. Malhotra and Galletta's (1999) behavioral intention scale was used to assess the measure of the strength of one's intention to perform a specified behavior (e.g., Fishbein & Ajzen, 1975, p. 288). The behavioral intention to use scale consists of 10 statements such as I like to do all my educational duties with computer, prefer to use the Internet to get access to new educational sources, like to type my class notes, very eager to use new software, use computer to see films and visual files and like them. Five Likert-type response categories were used: 'Totally agree', 'Almost agree', 'No opinion', 'Disagree' and 'Totally disagree'. These categories were assigned values from 1 to 5 in the direction that gives the highest value to responses that are perceived as an agreement to them.

Computer Anxiety: Computer anxiety has received considerable attention in the psychologically-based literature and is defined as generalized emotional distress or the tendency of an individual to be uneasy, apprehensive and/or phobic towards current or future use of computers (Igbaria & Iivari, 1998). Computer anxiety may include worries about embarrassment, looking foolish or even damaging computer equipment. In this study the computer anxiety scale consisted of 20 statements such as fear of losing their information, in dealing with something new about the computer, worrying that someone else comes and uses their information after working with the computer, getting headache and nausea after using the computer for several hours, being blamed by others after using the computer for several hours and 15 items similar to them. Five Likert-type response categories were used: 'Very High', 'High', 'Moderate', Low' and 'Very Low'. These categories were assigned values from 1 to 5 in the direction that gives the highest value to response that are perceived as an agreement to them.

Attitude toward ICT: Fishbein and Ajzen (1975) have offered a general definition of attitude as: "a learnt background that is used to respond to an issue in a favorable or unfavorable form" (p. 15).

According to Fishbein and Ajzen, attitudes are feelings of individuals and evaluations that they do about a thing, person, issue or event. In this research attitude towards computer includes any satisfaction or dissatisfaction, belief or disbelief, credence or non-credence, interest or disinterest of faculty members towards applying technologies related to computer in their life and in educational and research programs. Albirini's (2004b) attitude scale was used to assess the attitude toward using information technology in this study. This scale consisted of 28 statements such as afraid of using the computer, don't like using the computer, looking for a chance to use computer, don't like using the computer for teaching, using the computer saves time and energy, using computer should increase students' motivation for studying, computers are quick and useful systems in getting information, trying to get more information about computer, using the computer is the reason for students' weakness in their lessons and so on. Five Likert-type response categories were used: 'Totally agree', 'Almost agree', 'No opinion', 'Disagree' and 'Totally disagree'. These categories were assigned values from 1 to 5 in the direction that gives the highest value to responses that are perceived as an agreement to them.

Private university: Private university means Islamic Azad University of Iran that is the oldest, biggest and most important non-governmental institution in terms of number of students, majors and academic levels, faculty members and educational and research possibilities that is dependent on private resources such as students' fees. It has a brilliant report card in educational and research activities during its more than twenty five (25) year history with over 350 branches (units) and centers in the framework of fourteen zones of

the university inside and outside Iran. This survey takes into account branches of IAU in the zone 8 branches of Tehran.

Faculty members: in this study faculty members included all full-time academics with the scientific ranks of instructor, assistant professor, associate professor and full professor.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Given the pre-determined aims this chapter has been organized into two segments. The first segment discusses the study's principal concepts in three following parts and with due attention to research variables. Concepts and definitions of ICT are proposed in the first part. The second part refers to higher education, its functions, necessity of using ICT in higher education and policies of IAU in Iran with regard to ICT application. The third part reviews works on issues stating the impact of ICT on enhancing education and research activities in universities.

The second segment includes two parts; psycho-social theories and models of ICT usage in the literature are studied and reviewed in the first part. In the second part effective factors on ICT usage are studied and at last the conceptual model of research is represented based on the proposed factors. Results of accomplished researches in Iran and in the world are stated after discussion of the related factors.

2.2 Concepts and Definitions of ICT

Ever-increasing development of ICT in the world and dependence of other industries and activities on this industry, today, have led to automatic inclination of most countries towards this industry. As a result percentage of those who are connected to such industries is increased day to day (Crumpacker, 2003). Business approach and daily activities, the manner of communicating with others, access to information and generally all aspects of

human life have been involved in a great change by ever-increasing growth of these technologies (Shabaani, 2005). Knowledge learning and acquisition has not been excluded in this regard. Although human beings have used technologies and tools for their education and learning traditionally, perhaps education and learning has never been faced with tremendous transitions arising from applying ICT such as the Internet, computer, compact disc, multi-media systems and so on until now (AICTC, 2004).

2.2.1 Information and Communications Technology

Development of communicative networks and importance of information in social life has become the source of modern transitions in human life (Fathian & Norouzi, 2005). The information explosion phenomenon and emergence of information revolution give rise to the present age as the "age of information". Ever-increasing development of ICT is one of the most basic reasons for emerging and extending of such phenomenon. Today, all scopes of human life are affected by ICT and the range and depth of this impact will be increased in the future too (Rahmani, 2002). Given the variety of ICT use at different times and places, various definitions have been represented about the above technologies.

Technology has a wide concept in terms of application that includes fabrication, production techniques and using of software, hardware and data processing (i.e., operations like calculation, control, evaluation, filtration etc.).

Information is experience, data, knowledge, proved hypotheses and scientific results of researches (Sharifian, 2002). According to the above definition, the term ICT is used for those groups of electronic tools and technologies that assist human beings in recording, saving, processing, retrieving, transferring and receiving of information. This term contains technologies dependent on electromagnetic waves like the computer, transmission through fax, Internet, micrographs, satellites and telecommunication systems as well as older

technologies such as archive systems, calculation-mechanical machines, printing and engraving (Curtain, 2003).

According to adopted issues from the National Network of Iran's Schools (2011), communications are organized processes for information exchange among the sections that are usually performed through a range of signs. Communications process allows human beings to share experiences and knowledge. Common forms of human communications are: sign language, conversation, writing, symbol and radio broadcasting. Communications could be in one of the forms of mutual, one-sided, intentional and unintentional as well as verbal or non-verbal form. Moreover, they could be personal and interpersonal (National Network of Iran's Schools, 2011).

Iranian Informatics Higher Council Office represented the following definition for the term ICT in 1990: "ICT are applied to an integrated set of methods, hardware, software and communicative equipment that collect, save, retrieve, process, and transfer or demonstrate information in different forms (sound, image and text)".

ICTs are a set of hardware, software, telecommunications, human skills, services and supporting substructures of information management and information transmission that includes all research, educational, financial as well as other organizations (Holly, 2002). These technologies contain computer, Internet and technologies of program broadcasting such as radio, television and telephone. ICT tools are a combination of various human and machine factors where the computer is its most basic machine factor and computer user is its most basic human factor. Of course it should be considered that its machine factors are not just limited to computer, rather communications satellites constitute one part of machine factors too (Soltaani, 2005). But in the definition of ICT we can say that it is collecting, organizing, saving and disseminating of information such as sound, image, text or number that is performed by means of computer and telecommunications tools.

Given the proposed issues, ICT not only is limited to hardware, rather the manner of using of them including the ability to design, research, organize and manage are its elements in addition to hardware and the necessary knowledge (Sepehri, 2002).

2.2.2 Transition Process of ICT

In order to study ICT transition it is necessary to pay attention to the growth path of civilizations, since the kind of communications and tools of making relation are changed with changes in civilization. Growth path of human civilization has traversed three periods from the beginning until now in which ICTs have been proposed in a special form:

1. **Agriculture age:** it had gradually been developed during several thousand years and messages were mainly transferred through writing in this age (Soltaani, 2005).

2. **Industrial age:** printing**,** radio, film, cinema and telephone were tools of transferring messages in this period in addition to writing. In fact, this period (18th century) is the turning point of information documentation (Movahed Mohammadi, 2003).

3. **Information age:** Elvin Toffler calls it the "third wave". The applied technologies in the two previous periods were one-sided and this was their main deficiency but kind of communications were exposed to great transitions with regard to the two previous periods by the emerging and advancing of computer technology and access to the World Wide Web in the late 20th century (Jalaali, 2002). This age began from 1980 and by emergence of personal computers in the human life scope and is going to change the world with unbelievable speed, so that developing of this age along with the existing advanced technologies brings the fourth change wave in the world.

ICT in modern form has been considered since 1980**.** In this point in time many countries such as England, France, Switzerland, Canada, United States and Japan

concluded that ICT use could be a very important factor in their economic growth and development. Today, ICT has the fastest growth in comparison with other industries. The volume of investment in information technology industry in the world reached 3000 billion dollars in 2003 from 2200 billion dollars in 1999. Most part of such development occurred in the developed countries. The number of Internet users is accelerating and it has reached 1.3 billion persons in 2005 from 400 million persons in 2000 (Abedi & Okhovat, 2002). Among the ICT, Internet is the most important and effective tool in the formation and facilitation of transitions in the present age.

2.2.3 History of the Internet

Two researchers called Vinton Cerf and Robert Kahn invented the idea of creating the Internet in 1973 and defined it as a means for carrying information packets between two computers (Kusha, 2002). In 1975 the Internet was designed on paper and the American National Sciences Institute established USENET in order to represent network communications for more research centers and develop the international network in 1986 (Sooknanan, 2002). The number of subscribers of the Internet network in 1987 was ten thousand and it reached one hundred thousand in 1989. Internet continued its growth such that the number of existing computers in the network doubled annually during the 1990s. By commercialization of Internet in 1997, its services increased highly and its access costs were decreased (Akubue, 2003).

2.2.4 Internet in Iran

The Institute for Studies in Theoretical Physics and Mathematics (IPM) started its work in 1980 in order to establish and control research projects in mathematics and physics sciences and contact among universities in Iran and international institutes. In 1993 just a few universities in Iran such as Sharif Industrial University were connected to the Internet by this center to establish relations with the outside world (Eshraghi, 2006). IPM joined the computer network and as a result was connected to the Internet through the "Europe Academician Researches Network" and by cooperation with Vienna University in Austria in 1993. Iran's Assembly approved establishment of "Data communications affairs" company under the supervision of Iran Telecommunications Company in 1995 and this company became responsible for developing data services in Iran (Movahed Mohammadi, 2003). Iran became a member of the Unicode Consortium formally on 17.3.2001 and in 2002 weblog writing phenomenon was started for the first time in this country. The first weblog writing service for Persian people began its work in Iran in 2003 (Soltaani, 2005). The number of Internet users in the world has been reported as 900 million persons according to the published report by Internetworldstates website in February 2005 and Iran has the first rank in the Middle East with 32 million users according to the report of Ministry of ICT of Iran website (Soltaani, 2005).

However, Iran ranks 87th among the countries in the world in terms of applying ICTs based on recent research of the United Nations (Mahmoodi et al., 2010).

Digital access index is one of the global indices of development in the field of ICT. Influence coefficient of Internet in Iran is 43% while it is equal to 24.86% in United Arab Emirates among Arabian countries and has the highest influence coefficient of Internet in the Arab countries and the Middle East at present (Click Monthly Magazine, 2005).

Representation level of electronic training, easy and cheap access to Internet is determined based on influence coefficient of the Internet.

2.3 Higher Education and its Functions

Universities are subsets of the higher education system in the development process of a country and play a vital and key role as the centers that train and prepare efficient, competent and skilled human forces to respond to the real needs of society in various fields. According to Mann (2002) universities are an ideal environment for knowledge production and creation. Representing education and performing research are two main tasks and functions of higher education institutions. Education is the most effective mechanism of society to confront the biggest challenge of this century, namely stable development. Research is the major essence of inventions and scientific-cultural creativities of society and is the driving force in the educational and cultural system of the country that needs a strong structure and basis and chooses substantial and dynamic strategies for movement towards a valuable research system (Paryad, Nasr-Esfahani, & Liaghatdar, 2005).

The nature of higher education has been changing because of advancement in ICT. These technologies have had considerable impact on universities' mission in education and research aspects. Entering into the digital age and developing tools and ICT usage have led to formation of a new approach in education. University authorities are faced with the challenge of this transition, responding to needs and creating the necessary capacities. These centers have no alternative except ICT usage (Szatmary, 2000). Computer technology development and communications infrastructure has created a new aspect of remote learning called online education where Internet networks are used for direct teaching and learning activities (Bersin, 2003).

According to Biggam (2002), about 57 million students studied across the world in 1998 and given their ever-increasing number it is predicted that there will be 160 million applicants for higher education in 2025. Therefore, it is obvious that universities and higher education institutes cannot respond to needs of the country or massive number of higher education applicants—and maintain quality—just by using the present education system. Thus, it is necessary to use the electronic education system beside the present education system to increase admission capacity and optimal application of educational equipment at a reasonable limit (Golzari, 2005). The electronic education system proposes a modern method with regard to technologies and audio-visual media application in education. This system has been defined as a directed, comprehensive-oriented and based on modern approaches of learning with specific ultra-time and ultra-space characteristics. Unlike the traditional system it has the capability to cover more students in classes and different lessons and various levels with lower number of professors and even limited space (Farahani, 2002).

2.3.1 Necessity of ICT Usage in Higher Education

Educational concepts and methods are always affected by social changes in order to eliminate needs related to the existing social structure. In addition, social structures, population growth and also enhancement of the information intended by the present generation along with information explosion in the current age have been effective in changing educational methods (Abdhagh, Kalantari, & Kharat, 2002).

Applying of technology and communications in the current world has resulted in fundamental changes in education and learning. Extensive distribution and easy accessibility of information, flexibility and time and space-saving have changed educational life. All these changes suggest that ICT has gradually been converted to an

essential element for educational reforms and innovations of the present society and causes our education system to approach the age of electronic education. Learners in society undertake the major role in the transition to the information society. Only this stratum of the society has the ability, capacity and possibility of faster and faultless entrance into this unknown world without disruption of balance. The educational system along with its elements is the first part of the society that could enter into this scope easier and faster than other parts. Rapid and extensive development of electronic learning from the lowest to the highest levels of the country's educational system is the prerequisite of this movement.

Since the current trend towards incomplete information is decreasing and access to accurate information is increasing, universities can no longer spend time to transfer a set of prescribed information from the teacher to the learner during a constant time period; rather they must promulgate the "education for learning" culture (Geisert & Futrell, 2004). Importance of education and research will be doubled in the future but importance of existence of universities that offer education in the traditional manner may be damaged. If universities cannot adapt themselves to new conditions, their survival would be endangered and they are obliged to reconsider their strategic orientations in the field of educational content transition, education and learning methods and technical execution in the framework of technology (Kaazemi, 2002). The most important task that they must perform is being equipped with ICTs in order to increase power and capability. Technology does not replace the university; rather it could reinforce it. Emergence of the Internet and computer environments is an appropriate opportunity for university system empowerment (Roshan, 2003).

Perhaps it could be said that emergence of technology has been effective in changing and transforming universities and higher education institutes' educational system more than anything else. Some are concerned with such rapid and severe changes, because

they believe that modern technical organizations threaten traditional higher education centers through offering higher services. However, most scientists think that the present advanced world demands technology awareness and their application (Murphrey & Dooley, 2000). The clear-sighted have divided the role and function of ICTs in education and learning process into four groups:

- **Educational functions**: ICT system provides phenomena, education process and manner of execution of education in educational technology application that includes descriptive learning and this method emphasizes superior human being along with superior education and training. As a result students will be able to solve problems, answer questions and improve execution of work performance.

- **Exploratory function**: ICT creates possibilities and conditions for students to be able to do investigation through their existing information.

- **Instrumental function**: this group of technologies is not designed to be used in schools and practically have instrumental application. But it is possible to apply them to gain educational purposes in practice such as word processing and widespread software.

- **Communicative function**: technology is used to make relations that include educational programs and tools in this state. In such technologies teachers and students are permitted to send and receive messages, design questions or answer them through other networks and technologies.

According to Roblyer and Edwards (2000) the logic of using technology in education consists of the following: 1) motivation of learners 2) unique educational capabilities including linking the learners to information resources and tools of learning,

helping learners for better imagination of problems and their solutions, 3) supporting modern educational approaches like participatory learning, common intelligence and problem-solving ability, 4) increased productivity of teachers, 5) required skills of the age of technology such as technology literacy, information literacy, visual literacy and helping students to be constantly in the learner position.

Moreover, Hawkridge, Jaworski, and McMahon (1990) have explained four types of logic that are used to support technology synthesis in schools: (a) social: learners must be prepared to perceive computers and their role in the society, (b) professional: in order to find job opportunities for those having computer proficiencies, (c) educational: taking into account the positive impacts of technology in teaching and learning, and (d) convincing: technology is leading to change, improvement and reformation.

The following reasons could be regarded about the necessity of applying such technologies in higher education:

- Demand for learning is high because of the property of the world community and electronic education has allocated an extensive portion to itself because of cheapness and easy accessibility to the Internet.

- Traditional systems are unable to respond to the existing and future demand in confronting the ever-increasing demand for learning; thus an alternative solution would be essential (Schutter, 2002). Because of limitation of classes as well as output in traditional universities, one problem is that students may be unable to register. Naturally this problem does not exist in virtual and electronic education and thousands of students can register in a class (Dilghamani, 2004).

- Using of these technologies could be a suitable solution for reducing many financial issues and problems encountered in higher education. Studies by UK universities show that

academic cost of any student in an open university is one eighth that of a traditional university student (UNESCO, 2002). Given the existing statistics in the Internet magazine "Training Magazine" if educational institutions and universities use electronic education instead of traditional education, they will save about 50% to 75% in costs. The major part of saving is in costs related to travel, buildings, administrative and educational departments, maintenance and services. Not losing business hours constitutes another part of saving (Sebastian, 2003).

2.3.2 ICT Development Programs in Iran's Education

In spite of abundant investments and considerable practical actions in Iran, less infrastructure affairs have still been performed. We are at an early stage in the field of theoretical studies, representing of models and conceptual frameworks. First, several experiences in this regard are studied here and then the related researches will be examined. The "TAKFA" program is one of the programs initiated in order to develop ICT in Iran in different sectors such as education and higher education. TAKFA in Persian Language is an acronym of "development of information and communications technology application" and indeed is an informal name for note 13 of the budget rule that was included in compiling of the budget rule in 2003 and approved.

Scientific experiences: development of information and communications technology application program (DICTA) is consistent with programs of international institutions including the United Nations, International Labor Organization, International Monetary Fund, Asian and the Pacific Ocean communications community, the World Bank and the world business organization. It has represented the seven-fold programs for comprehensive

presence in the age of information and development of opportunities in order to stimulate the private sector (Zareeian, 2003):

1. Electronic government plan

2. ICT application development plan in education

3. ICT application development plan in higher education and medical education

4. ICT application development plan in social services development

5. ICT application development plan in commercial economy and business

6. Culture and art domain and strengthening of writing in Persian language in computer environment

7. Development plan of small and intermediate units active in ICT through establishment of technology growth and learning centers (Zareeian, 2003).

Article 1 of the TAKFA plan has done this in five paragraphs given to the importance of education and human resources development in stable development and extension of ICT:

Article 1- in order to enhance preparation of the country for comprehensive presence in the age of information and attain:

A) Systematic development of ICT in order to realize "knowledge-oriented" economy towards national stable development.

B) Human resources development as the strategic priority of ICT development towards creating of value-added occupation.

C) Cultural development and strengthening of the environment and national synergistic space.

D) Performing of substructure schemes of ICT development including access network, security, rules and regulations, resources and facilities.

E) Development of grounds and opportunities in order to mobilize the private sector as the key and strategic axis of ICT development.

2.3.3 Basic Policies and Orientations of IAU Research along with Programs, Expectations and Conclusions in 2010

Islamic Azad University follows the following policies for ICT development:

1. Enhancement of the university's share in production of advanced science and technology,
2. Enhancement of qualitative level of faculty members,
3. Establishment and reinforcement of scientific parks and research and entrepreneurship centers,
4. Implementation of modern knowledge and proficiencies in educational and research activities, and
5. Improvement of research performance through planning and executing of programs and planning for their accomplishment.

ICT Office Programs in IAU

ICT office in Iran's IAU compiles and follows programs in order to enhance ICT usage in universities and higher education institutes; the most important of them are:

A) Mechanization qualitative and quantitative development program in the University.

B) Qualitative and quantitative development program of ICT usage for mechanization.

C) Qualitative and quantitative development program of digital library plan and establish digital library.

D) Qualitative and quantitative development program to establish electronic book shops and other scientific productions.

Expectations and Results in ICT Scope in IAU

In Iran, the following expectations were drawn for ICT application in IAU:

1. Recognizing of the current situation in ICT scope in university branches.
2. ICT usage to offer electronic services to students, researchers, professors, faculty members through standards optimization approach such as speed, accuracy, confidentiality, security and quality.
3. Reinforcement of communicative bases in ICT area in order to establish integrated network of IAU.

4. Research and development in ICT scope to create new organizational strategies and identify potential opportunities in order to respond to needs of students, faculty members and improve university process effectiveness and efficiency by means of ICT.

5. Supplying and applying of appropriate substructures to offer electronic services through ICT.

6. Establish scientific, research and executive relation and participation in ICT scope with other university centers, organizations and the related corporations in order to improve ICT knowledge of the university.

7. Up-to-date information banks and sending them to the central organization.

8. Determining of shortages of the university equipment and branches.

9. Adopting of educational policies for the personnel in order to train proficient and specialized forces with the aim of improving technical knowledge of the personnel.

10. Updating of information bases of university equipment and branches.

2.3.4 Impact of ICT on Educational and Research Activities of the Universities

Educational-research activities are applied to systematic and creative activities that are accomplished in order to expand knowledge borders and provide essential scientific grounds for solving of the current and future problems as well as dissemination of technical and scientific knowledge through writing and translating of books, articles and science and technique magazines at country or international level (Shamsaee Golsefidi, 2005).

Performing scientific researches and producing information is one of the ways to reinforce scientific capital of each country that is realized objectively in the shadow of comprehensive attempts and applying of accurate scientific methods and ICT. University is

considered as the center of activities and faculty members are the factor for transmission of science to students and human society. Applying devices and equipment in order to gain and develop knowledge has always been considered in universities; various devices have been used to this end that each one has different impacts on science and thought development. Computer as one of the most important human accomplishments in various scientific and research grounds and applying of it in order to create Internet network has led to high transition in all fields of human activity including scientific fields (Vimoktanon & Piyawan, 1994). Internet network is the greatest computer network in the world that millions of people are applying today. Degree of using Internet network in most scientific and research centers of the world for educational and research aims has reached its peak. Iran has not been deprived of possibilities or services of this great phenomenon and the global scientific event too; hence this phenomenon has an appropriate impact on the process of education and research in educational and research centers.

No educational center is able to perform its role without having the scientific and research endowment. Since faculty members of universities and higher education centers are considered as scientific endowment of such centers, their research activities depict their role as evident in the form of books, articles and so on (Biglou, 1997). Represented statistics about publishing of scientific-encouraging articles, scientific-research articles illustrated in internal and external magazines, writing of books, offering of international articles, performing of plans and research and applied surveys during recent years demonstrate a considerable growth. Certainly emergence and application of technologies especially Internet has played a significant role (Semnaanian, 2005). Today, researchers like others use this network to perform various affairs including access to scientific resources and publishing the results of their activity. Investments have also been made in Iran and its university centers to establish such departments due to the importance of this

network and have made it possible for their students and professors to use it in order to obtain their research and educational aims (Mohagheghzade & Abdollahi, 2004). Georgia et al. (2011) in their study on the impact of ICT use in the classroom using both pupils and teachers samples found among other things positive teachers' attitude in terms of implementing ICT tools during the teaching/learning process, blending new technologies with the traditional methods of teaching/learning and sharing their new found experiences and knowledge with others. Teachers also stressed the need for class control and organizing children in different task-oriented activities while constantly having to decide when and how much of these new technologies are appropriate. The analysis of the study finds teacher attaching the importance of technology in his/her teaching process including teacher-student relationship. This clearly shows that pedagogical use of ICT makes understanding of subject matter content easier and when combined with traditional teaching method bring about attractive and quality teaching learning experiences and therefore should be considered for all types of courses or disciplines.

Similarly studies by Altun and Bekta (2010), Morris (2010) and Tezci (2009) supported the relevance of ICT use and quality teaching and learning; however, some issues were identified and recommendations listed. ICT implementation plans should be developed and put into practice with careful planning, monitoring and assessment taking into consideration teacher lack of awareness about what technologies are available and how they can be used to support curriculum delivery (Morris, 2010). According to Tezci (2009) teachers' ability and use of ICT in the teaching-learning process are fairly low with most common uses confined to the internet, e-mail, word processing and occasionally educational CDs. It is not surprising that teacher's corresponding attitude toward computer is lower than internet use. Further his research identifies teachers' low level of knowledge on ICT, and the fact that some technical knowledge is required in order to use ICT resulted

in significant correlation between their previous participation in a computer course and computer use. Teachers with previous computer experience have higher levels of knowledge on ICT and their ICT use is more frequent in terms of using these technologies as information transmission-based tools. This is an important finding as it shows that the higher the level of knowledge on ICT, the higher its level of use in education. In fact their attitudes also improve, which is very significant as it shows that teacher training will be a significant factor in the effective use of ICT in the learning-teaching process. Teachers' knowledge on how to use these technologies in the learning-teaching process resulted on their use of ICT effectively. It follows that if teachers are to implement and use the curriculum resources they already have available to them, then time and training in particular the hands-on practical know-how must be specifically tailored to meet teachers' individual needs taking into consideration their settings and the available technologies. With regard to new and emerging technologies, greater collaboration is recommended between pupils and teachers to facilitate the development of teaching and learning in this area. However, a fine balance will need to be maintained between the perceived awareness of the relevance of new and existing practice, sufficient resources and ease of access as well as the teachers being ready, prepared and willing to engage with new ways of working. Unfortunately, although most of the teachers received computer courses, it is difficult to say that they are good enough to use ICT. Despite the opportunities offered by these technologies, teachers most often use these technologies for informational purposes. This is too far from forming a learner-based learning environment.

Interestingly, Tezci (2009) also indicates no significant statistical gender differences in terms of attitudes towards computers although male teachers had higher scores than female teachers in terms of positive attitude, knowledge and usage of ICT in education.

Similarly, Rahimi and Yadollahi (2011) supports no gender-divide in ICT use and fear of computer technology in language instruction as will be discussed later in this chapter.

ICT can be viewed more as a trendy rather than gender issue. Faculties which were founded earlier have some differences on ICT usage compared to the newer faculties where more up-to-date ICT equipment and setting-up of ICT or IT related departments and courses are available (Kisla, 2009). These newer faculties may tend to use ICT more than the older ones. In this, universities and higher educational institutions will have a significant role to play. For all students who graduated from universities should know what ICT is and how ICT relates to their professional and daily lives. Thus, universities should not only encourage students to learn ICT but also to use it effectively**.**

2.4 Psycho-Social Theories and Models of Innovation Acceptance

This section presents various theories and models from different disciplines and used in forecasting and elucidating users' adoption of a novel product or technology.

These theories and models have been developed over time and arose as a consequence of efforts to validate and extend the models during the era each was introduced.

This segment contains three parts. Issues related to psycho-social theories of innovation acceptance (Social Cognitive Theory of Bandura, Theory of Reasoned Action, Theory of Planned Behavior, Decomposed Theory of Planned Behavior) and acceptance models (Technology Acceptance Model, Technology Acceptance Model 2, Unified Theory of Acceptance and Use of Technology and Diffusion of Innovation) are studied in the first part of this section.

Effective psycho-social factors on ICT usage (managers` support, computer anxiety, computer self-efficacy, cultural perception, perceived ease of use, perceived

usefulness, intention to use and attitude toward the use of ICT) and personal-professional factors (age, gender, academic group, English language qualifications, work experience in university, computer competencies, experience of working with ICT by faculty members) that are represented in the conceptual model of research along with results of researches will be discussed in the second part.

Finally, the conceptual model of this research is represented in the third part.

2.4.1 Innovation Acceptance Theories

2.4.1.1 Social Cognitive Theory (SCT)

Social Cognition Theory was presented by the well-known psychologist, Albert Bandura in 1986. Bandura as a social cognitive theorist postulated that behaviors were best understood in terms of "triadic reciprocal determinism", which was defined as a belief that cognition, behavior and the environment operate interactively as determinants of one another. This meant that individuals did not simply react to environmental events; the individuals were able to actively create their own environments and act to change them. Positive or negative feedback for behavior, in turn, influenced people's thinking (cognitions) and the ways in which they acted to change the environment (Bandura, 1986, pp. 23-24). The SCT proposes that behavior is the result of the interaction of a triadic reciprocal causation model in which behavior, cognitions and the environment all influence each other in a dynamic fashion (Figure 2.1).

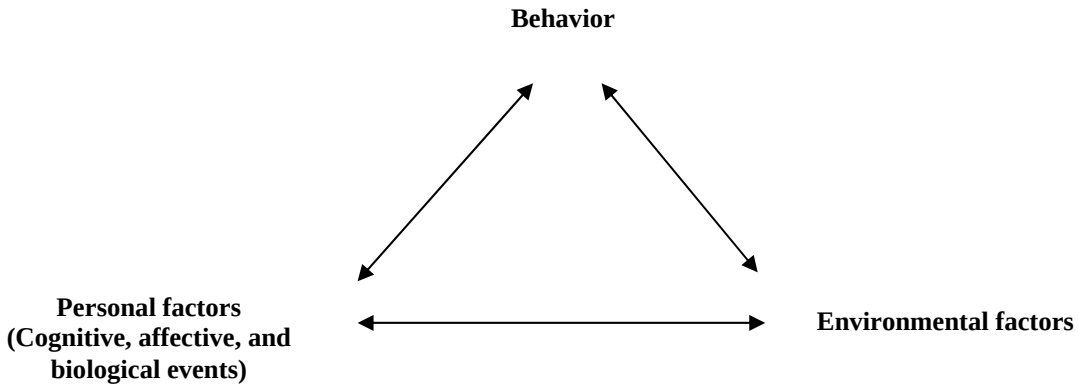


Figure 2.1. Model of mutual relationship among behavior, environmental impacts and personal factors according to Bandura.

As observed in Figure 2.1, this model emphasizes the mutual relationship among behavior, environmental impacts and personal factors (cognitive, sentimental and biological factors) that refer to the individual's perception to describe psychological functions. According to this theory individual motivation and behavior are affected by a triadic causality system. Bandura has rejected one-dimensional impacts of the environment on the individual's behavior that is one of the important hypotheses of behavioristic psychologists. According to Bandura, human beings have a kind of self-control and self-regulatory system. They control their thoughts, feelings and behaviors through these systems which play a determinant role in their fate. The individuals' self-efficacy or beliefs and judgments towards their abilities in performing tasks and responsibilities are much emphasized in this theory.

Bandura's (1997) perceived self-efficacy is portrayed as belief in one's aptitude to manage and accomplish a course of action or actions (p. 4). In other words, efficacy expectations are individual beliefs or convictions that one can produce certain behavior. Thus human behavior not only is controlled by the environment but cognitive processes

also play a significant role. Performance and learning of human beings are affected by cognitive, sentimental attitudes and feelings, expectations, beliefs and values. A human being is an active creature and affects the events of his or her life. According to Bandura, internal forces or environmental incentives do not propel individuals towards action peculiarly; rather a collection of the environment and incentives are determinant in this regard (Zimmerman, 2002).

Indeed, Bandura's social cognitive theory involves the converging relationship between a learner's external environment, behavior and personal factors (i.e., personal beliefs characteristics and experiences). Bandura (1986) stated that the acquisition of different levels of self-efficacy was determined by the following four major sources: (a) performance accomplishments (success or failures)–where efficacy expectations were ingrained in personal mastery experiences. Higher expectations were created by successful experience, whereas in contrast the low expectations were created by failure experiences. To change the low expectation one had to have a repeated and frequent success stimulated by individual determined effort; (b) vicarious experiences (observing other people's successes and failures) – seeing or visualizing other people performing successfully could inspire high self-perceptions of efficacy in observers; (c) verbal persuasion used as encouragement to let one know that one may have the necessary capabilities to accomplish the goal; and (d) emotional arousal difficult situations caused a high state of arousal where one could use this arousal information to judge one's capabilities (Magliaro, 2006).

Ryckman (2000) in his book Theories of Personality cited Bandura who indicated that individuals who knew what to do in a situation and who have the skills required to do it would not necessarily perform well if they had serious self-doubts about their capabilities. Therefore, it was postulated that different individuals with the same skills, or the same

individual on different occasions, may perform poorly, adequately, or extraordinarily. In addition, it was noted that competent functioning involved not only skills but also the judgments of self-efficacy to permit their effective use.

The amount of effort individuals expended on certain activities, how long they persisted in challenging tasks and in the face of disliked experiences depended on judgments of their self-efficacy. Individuals with low efficacy expectations were prone to avoid threatening situations that they believed would exceed their coping skills. If these individuals had to perform in threatening situations, their low efficacy expectation would lead them to expend little effort and to give up after a short time. In contrast, individuals with high efficacy expectations opted for challenging tasks in order to develop new skills. They were able to overcome their obstacles and engaged in activities that helped them to obtain their sub-goals and eventually become closer to achieving their main goals. Thus, the construct of self-efficacy is situation specific because self-efficacy is based on self-perceptions regarding particular behavior. Computer self-efficacy was defined by Venkatesh and Davis (1996) as the degree to which an individual is confident in using the power of the computer for a particular purpose as a result of accumulated, successful prior experiences. More specifically, Bandura (1997) posited that self-efficacy in advanced cognitive functioning is important when the obstacles of "technological innovations" and changing social practices (p. 239) force the student to adapt and proffer extended efforts of a protracted nature; hence, the self-efficacy beliefs contribute significantly to scholastic performance.

2.4.1.2 Theory of Reasoned Action (TRA)

The theory of Reasoned Action was proposed by Martin Fishbein and Isaac Ajzen in 1975 in order to test the relation between attitudes and behavior. Theory of Reasoned Action (TRA) is a model that has been studied in an extensive form in social psychology and was established on several dynamics including relations between beliefs, attitudes, intentions, and behaviors (Fishbein & Ajzen, 1975). According to this theory, behavior is affected by intentions and intentions are affected by attitude towards technology as well. Mental attitudes and norms are the main behavioral index of the individual. It means that the individual calculates the results of his behavior and decides to perform or not perform a special behavior.

While proposing this theory, Fishbein and Ajzen (1975) assumed that human beings make rational choices and also make systematic use of the information that they have in their decision making process. Thus, individuals consider the consequences of their actions whether or not they implement that particular behavior.

Fishbein and Ajzen tried to develop a model that includes all important predicting factors of a behavior. They defined this theory as: intention of individuals to perform a certain behavior is subjected to their attitude towards performing that behavior, their cognition from norms governed on that behavior and their motivation to follow those norms. This model considers some of the important situational factors especially beliefs that individuals have about behavior and their motivation to follow those beliefs. What gives prominence to this theory is the predictability and description of human behavior in different situations and it is possible to apply it to any deliberate behavior (Ajzen & Fishbein, 1980, p. 246).

The realized behavior (Y) that is affected by behavioral tendency is influenced by two rational ways based on this theory. One is the personal path and the other is social influences that are shown in Figure 2.2.

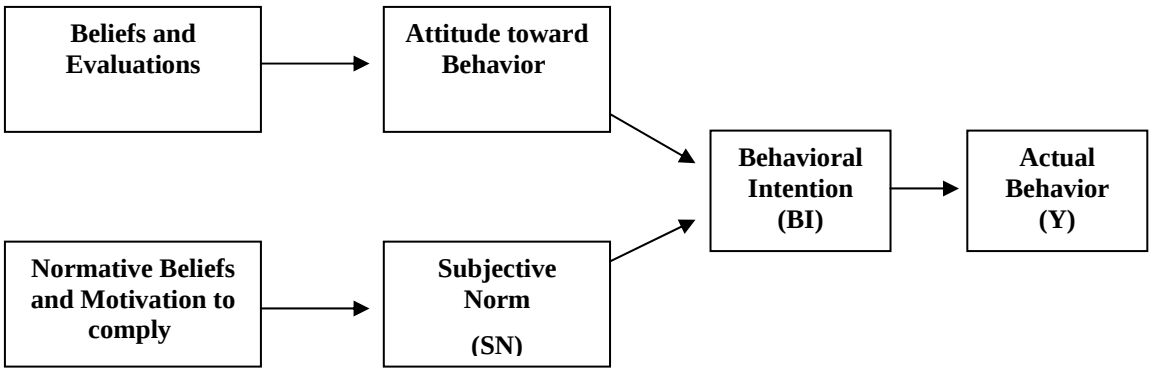


Figure 2.2. Theory of Reasoned Action (Fishbein & Ajzen, 1975).

The personal path is the personal judgment or beliefs about the consequences of the behavior, impacting attitude or a learned evaluation, toward the BI and finally, influencing the behavior, Y. Simultaneously, a second path, social influences, is also influencing the behavioral intention (BI) of the person. Normative beliefs and motivation to comply are the salient beliefs (bi) about the consequences of performing the event multiplied by the evaluation of the consequences (mc) which influences the subjective norm (SN) attitude and in turn influences BI (Azjen & Fishbein, 1980). Azjen and Fishbein (1980, p. 73) clarified normative belief (NB) to be the belief about the other person and that other person's behavioral prescription such as "my mother thinks I should not have a child." The subjective norm (SN) is also clarified by them, to be the perception that significantly affects the action or inaction of the behavior (p. 57). Personal norms are formed by normative beliefs and motivation in order to accompany a special act. They are the individuals' perception from their main referential beliefs. Both paths, the personal and social influence,

act simultaneously and are considered a prediction of one's intentions to perform the behavior, Y. In this theory behavioral intention is considered as the main predictor of behavior.

In fact, behavioral intention, the core determinant of user acceptance for this theory, is classified by the person's attitude toward behavior and subjective norms (Malhotra & Galletta, 1999). In this context, behavioral beliefs refer to an individual's positive or negative feelings about performing the intended behavior. Later, these beliefs are defined as silent or available beliefs that a person holds (Azjen & Fishbein, 1980). By presenting this behavioral intention model, Fishbein and Ajzen (1975) propose that researchers should be able to predict the performance of any behavior unless individuals make deliberate changes between evaluation and carrying out that behavior.

TRA hypothesizes that people's beliefs influence their attitude, which joins with subjective norms in shaping the behavioral intention that eventually guides or dictates the actual behavior (Lin & Wu, 2004).

Ajzen and Fishbein and others have successfully utilized TRA as a general model for predicting consumer behavior, marketing research as well as other behaviors (Davis et al., 1989). However, according to Vankatesh, Morris, Davis, and Davis (2003), there are some limitations in the theory. First, in TRA, there is no clear distinction made between attitude and norms, which may cause confusion and misusage when determining the concepts. Second, this theory does not take into account variables other than attitude and subjective norm that may affect the behavior, such as ability, time, cultural factors, and unconscious habits. Therefore, some behaviors may not be explained by this theory. Third, Fishbein and Ajzen (1975) pointed out that their observation was based on self-reports of individuals and not an actual and direct observation.

Fourth, in this theory, there is also a limitation for individuals who perceive that they have little power over their behaviors, so this theory does not clearly explain these kinds of individuals' behaviors. Thus, to overcome these problems, Ajzen developed and presented the Theory of Planned Behavior (TPB) (Schifter & Ajzen, 1985).

2.4.1.3 Theory of Planned Behavior (TPB)

The theory of Reasoned Action is applied under conditions that a considerable intentional control exists on behavior. When the level of intentional control on a behavior is decreased (i.e., the person is not able to perform it despite the behavioral intention) it is not used much. Observing this difference, Ajzen (1988-1991) established a new model and called it "Theory of Planned Behavior" (Agarwal & Karahanna, 2000).

TPB is the successor of the similar Theory of Reasoned Action of Ajzen and Fishbein (1975, 1980). This theory helps to understand how the behavior of people could be changed. The TPB is a theory which predicts deliberate behavior, because behavior can be planned. The succession was the result of the discovery that behavior appeared to be not 100% voluntary and under control. This resulted in the addition of perceived behavioral control. With this addition the theory was called the Theory of Planned Behavior.

In the Theory of Planned Behavior (TPB) Ajzen adds a third factor to the above mentioned two factors in theory of reasoned action which is called perceived control. He states that when attitude and mental norms are stable, easiness or hardness of performing a behavior will have a strong impact on its intention. Of course relative weights of these three structures are different in various societies and behaviors (Yi, Jackson, Park, & Probst, 2006).

It is stated in this model that performing a behavior is related with two factors: motivation (behavioral intention) and ability (behavioral control). Hence, Ajzen stated his theory as follows: the person who has a high perception of control on his behavior and intention of performing that behavior exists in him too will most likely perform that action.

Ajzen (1991) claimed that behavior is deliberative and planned and behavior is a determination of behavioral intention (Huang & Chuang, 2007). This theory posits that three beliefs affect behavioral intention. The first one is behavioral beliefs which lead to attitude. Attitude is defined in this theory as positive or negative feelings about that behavior or its outcomes (McCoy, 2002). Second, normative beliefs which lead to subjective norms consist of the referent's opinion and motivation to comply, motivation to what each referent thinks. Third, control beliefs that lead to perceived behavioral control refer to people's perceptions of their ability to perform a given behavior. Figure 2.3 depicts the schematic view of TPB.

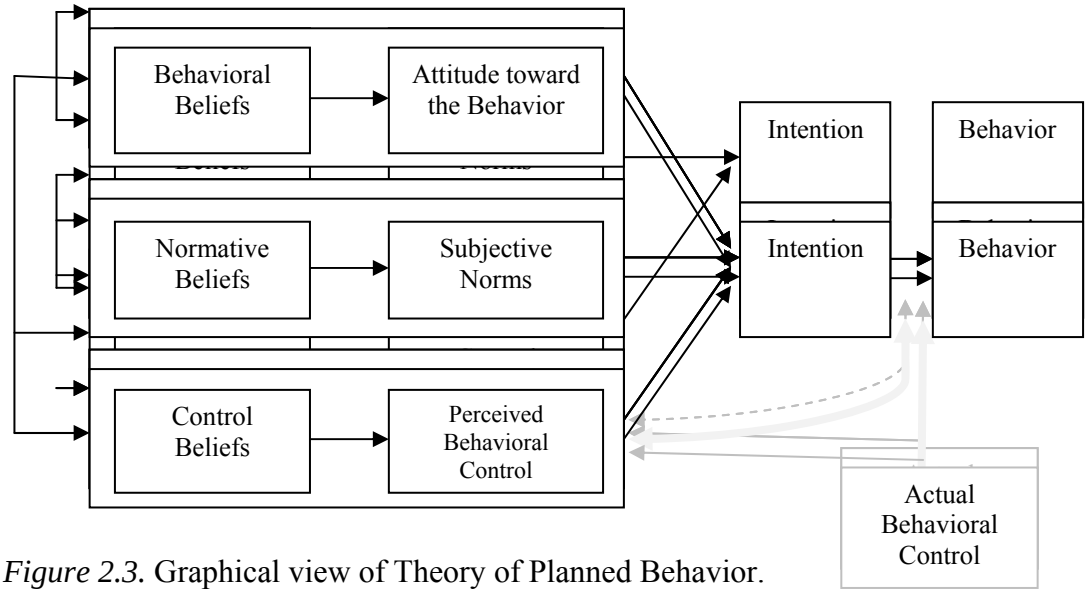


Figure 2.3. Graphical view of Theory of Planned Behavior.

(Adapted from: Ajzen's personal website: http://www.people.umass.edu/aizen/tpb.diag.html)

This perception of behavioral control consists of two dimensions, internal and external, which are affected by the individual's knowledge capacity. Internal perceptions refer to past experience and channels where information is received and external perception refers to social influence and resource limitations including technical and managerial support (Lee, Kim, Rhee, & Trimi, 2006; Veiga, Floyd, & Dechant, 2001).

TPB also hypothesizes that knowledge affects not only attitudes but also perceived behavioral control and that there is a strong correlation between intention and behavior. In this theory, behavioral intention can be defined as the perceived likelihood of performing the behavior (Lin & Wu, 2004). In sum, people are more likely to perform the behavior and intention if they have a more favorable attitude and subjective norm in addition to considerable perceived behavioral control to that targeted behavior (Ajzen, 2002).

Results of accomplished studies by many researchers (including Bhattacherjee, 2002; Harrison, Mykytyn, & Schneider, 1997; Song & Zahedi, 2001; Suh & Han, 2003; Tan & Teo, 2000; Taylor & Todd, 1995; Trafimow & Duran, 1998) confirmed helpfulness of this theory in predicting users' behavior from technology.

2.4.1.4 Decomposed Theory of Planned Behavior

As an extension to the theory of planned behavior, which was an improvement on the theory of reasoned action, Taylor and Todd (1995b) proposed decomposing the constructs of TPB into detailed components. The decomposed theory of planned behavior (DTPB) expands the TPB by including constructs from the diffusions of innovation (DOI) perspective.

According to Taylor and Todd, attitude, personal norms and perception of behavior control affect behavioral intention to the same degree (Brown, Massey, Montoya-Weiss, & Burkman, 2002).

On the other hand, Shimp and Kavas (1984) argue that it is not possible to attribute determinant cognitive components of attitude and beliefs just to a single unit of behavioral or perceptual belief (like what is observed in TAM and TPB). Accordingly, studies of Taylor and Todd (1995, 1995a) reveal that three prominent characteristics of perceived usefulness (relative advantage), perceived ease of use (degree of complication) and compatibility affect individuals' attitude towards an innovation according to diffusion of innovation theory. Perceived usefulness or relative advantage refers to the degree that innovation brings advantages such as economic profits, increased easiness and satisfaction. Perceived ease of use shows the degree that is thought technology could be complicated in terms of perception, learning or action. Hence innovative technologies with applications that appear easy are accepted and used more by users. Compatibility is applied to the degree of proportion of innovation to previous experience, the existing potential values and current needs. Tornatzky and Klein (1982) proposed that if technology is adapted with job responsibilities and the individual's value system, its level of compatibility would be higher too. Perceived usefulness should be related positively to degree of compatibility and innovation. The decomposition of TPB constructs can be summarized in Figure 2.4.

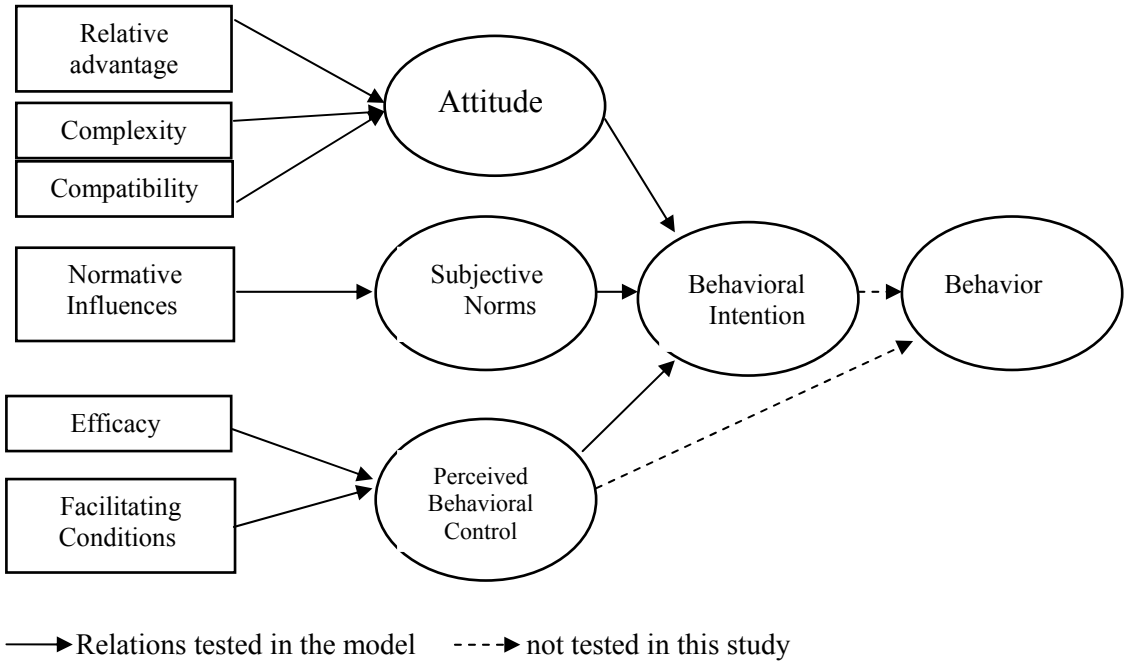


Figure 2.4. Theory of Planned Behavior with beliefs decomposed.

Source: Taylor & Todd (1995a)

In their effort, Taylor and Todd depended on the previous research that established a consistent relation among the three characteristics of innovation (including relative advantage, compatibility, and complexity) and adoption decisions in general and IT usage specifically (Moore & Benbasat, 1991). Results of a study regarding crossover effects between decomposed beliefs (Taylor & Todd, 1995) showed that relative advantage and compatibility affected perceived behavioral control (PBC), normative influences affected attitude, and facilitating conditions influenced subjective norms.

Taylor and Todd (1995a) aimed at examining the appropriateness of TRA, TPB and DTPB as models to predict user adoption behavior. The results proved that pure TRA and TPB are capable of predicting behavior, but the decomposed version is better at explaining this behavior. They recommend the use of DTPB as a tool to affect certain aspects of

behavior that planners and managers might need to change through systems design and educational strategies (Al-Qeisi, 2009).

2.4.2 Innovation Acceptance Models

Extensive researches have been accomplished to study variables related to innovation acceptance in diverse environments (Agarwal & Prasad, 1998; Dillon & Morris 1996). As a result, several theoretical models have been designed to describe intention of users towards innovation application as well as actual application of technology (Agarwal & Prasad 1998; Vankatesh et al., 2003). In this section some of the most important proposed models in the field of innovation acceptance and application will be studied.

2.4.2.1 Diffusion of Innovation (DOI) Model

Everett Rogers (1996), a professor of rural sociology developed the Diffusion of Innovations model. Rogers synthesized research from over 508 diffusion studies and produced a theory for the adoption of innovations among individuals and organizations (Wikipedia, 2011).

An innovation is an idea, technology, or practice, which is perceived as new by an individual or other unit of adoption. Diffusion is a process in which an innovation is communicated through certain channels over time among members of a social system. It is a special type of communication concerned with the spread of messages that are perceived as new ideas.

The diffusion of innovation model provides well developed concepts and a large body of empirical results applicable to the study of technology adoption, and identifies numerous factors that facilitate or hinder technology adoption and implementation. These factors include the innovation-decision process and attributions of the innovation (Fichman, 1992).

Innovation Decision Process

The innovation-decision process is the process through which an individual passes from first knowledge about the innovation to formulating an attitude towards it, to a decision regarding adoption or rejection, to implementation of the new idea, and to confirmation of this decision. This process consists of five stages:

1) **Knowledge:** when the individual is exposed to an innovation's existence and gains an understanding of how it functions.

2) **Persuasion**: when the individual forms a favorable attitude towards the innovation. Individuals at this stage become psychologically involved; they seek information about the innovation, decide on credible message sources and interpret the messages they receive to develop a general perception of the innovation. Rogers argued that the attitude people form about an innovation in this stage is expected to lead them to a subsequent change in overt behavior. Nevertheless, in many cases attitude and actions may be disparate. Thus, a favorable or unfavorable attitude towards an innovation does not necessarily lead to an adoption or rejection of that innovation.

3) **Decision**: when an individual engages in activities that lead to a choice to adopt or reject an innovation. Most individuals prefer to try an innovation first on a small scale before

making the decision to adopt or reject it. Innovations that prove to have a relative advantage upon trial by an individual or a confident peer/ opinion leader, drive an individual to make the adoption/ rejection decision. Rogers argued that the rejection decision can happen at any stage of the innovation decision process.

4) **Implementation**: when the individual puts an innovation into use. Up until this stage, the individual involved in the innovation-decision process has mainly been engaged in a mental exercise of thinking and deciding. At this stage implementation of the process involves overt behavior change as the innovation is put to use. Problems may arise as to how to use it; as a result, individuals rely on a change agent to provide information and technical assistance as they begin using the innovation. Rogers stated that during the implementation stage, the original idea may be re-invented for reasons such as complexity and difficulty to understand that leads to simplification; ignorance and inadequate learning of adopters; many possible applications (e.g., computers & Internet); and local pride of ownership (Rogers, 2003).

5) **Confirmation:** when the individual seeks reinforcement for an innovation-decision already made but may reverse the decision if exposed to conflicting messages about it. At this stage, individuals might seek to avoid a state of conflict (or internal disequilibrium) related to adopting the new idea. They might, if they have already decided against the adoption of the new idea, become exposed to pro-innovation messages causing a state of dissonance that can be reduced by adopting the new idea. Or quite the opposite, they might experience a discontinuance; reject an innovation after having previously adopted it (Al-Qeisi, 2009).

Attributes of the Innovation

According to Rogers, individuals' perceptions of innovation attributes affect the rate of adoption. Most of the variance in the rate of adoption (49-87 percent) is explained by the five perceived attributes of an innovation:

1. **Relative Advantage**: is the degree to which an innovation is perceived as better than the idea it supersedes by a particular group of users, measured in terms that matter to those users, like economic advantage, social prestige, convenience, or satisfaction (Robinson, 2009).

2. **Compatibility**: is the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs of potential adopters.

3. **Complexity**: is the degree to which an innovation is perceived as relatively difficult to understand and use and being consistent with the values, past experiences, and needs of adopters.

4. **Trialability**: is the degree to which an innovation may be experimented with on a limited basis.

5. **Observability**: is the degree to which the results of an innovation are visible to others.

Rogers (2003) believed that the more people involved in making a decision the slower the rate of adoption, so innovations requiring an organization innovation-decision are generally adopted less rapidly than an individual optional-decision. To speed up the rate of adoption, fewer people should be involved. In addition, social system norms and network

connectedness, agents' promotion efforts and changes within such efforts also affect the rate of adoption of an innovation at any stage of the process (Al-Qeisi, 2009).

Although the DOI model tries to explain the innovation decision process and factors determining the rate of adoption, it has been argued that this model does not provide evidence on how attitude evolves into accept/reject decisions, and how innovation characteristics fit into this process (Chen, Gillenson, & Sherrell, 2002; Karahanna, Straub, & Chervany, 1999).

2.4.2.2 Technology Acceptance Model (TAM)

Davis proposed this model in 1985 in order to model the subject of technology acceptance by users. Indeed this model determines how users accept a technology and apply it. The theoretical origin of the TAM model is reasoned action theory of Fishbein and Ajzen (1975) that is considered as a framework to predict and explain the manner of human beings' behavior and is focused on determinant factors of deliberate behaviors (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The theory of reasoned action specifies existing causal relations in the flow of movement from beliefs, attitudes and tendencies towards behavior. Davis (1985) proposed the technology acceptance model (TAM) by means of theory of reasoned action to focus on the scope of technology acceptance by the individual. Indeed this model describes effective individual factors on technology acceptance by users. He proposed a model to predict and accept technology by substitution of determinants or ideological variables of theory of reasoned action with two key beliefs of mental perception from usefulness and mental perception from ease of use.

The model suggests that when presented with a new technology, a number of factors influence users' decision about how and when they will use it. The main factors include "perceived usefulness (PU)" and "perceived ease-of-use (PEOU)." And these two factors affect individuals' attitude towards applying a technology that is led to make decision about using of the intended technology and at last application is performed. PU was defined by Fred Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance". In other words, degree of users' belief that applying such technology helps them perform their work better (Davis, 1989). Davis defined PEOU as "the degree to which a person believes that using a particular system would be free from effort" (Davis 1989).

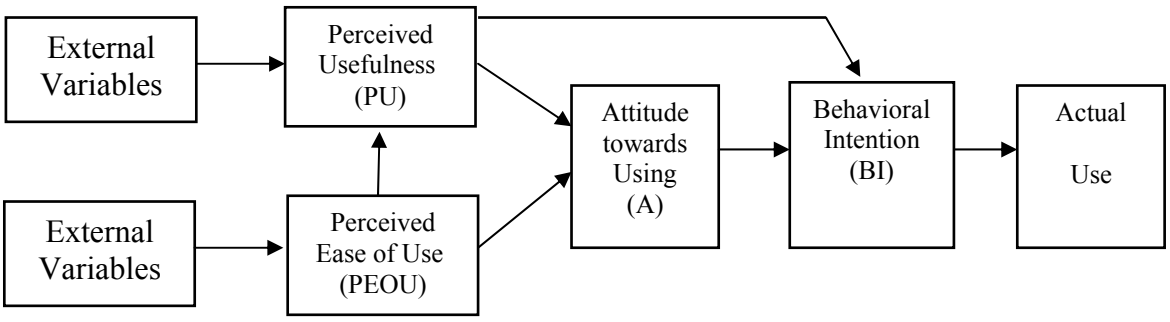


Figure 2.5. Technology Acceptance Model (TAM) based on Davis et al. (1989).

Moreover, as observed in this model mental perception from ease of use affects mental perception from usefulness directly, both of which are effective on information and communications technology acceptance. Also, external variables that are effective on mental perception from ease of use and usefulness may be important factors in the technology acceptance model that include characteristics of information and communications technology, personal properties and environmental variables (Kuo & Yen,

2009; Pituch & Lee, 2006). External factors in this model could include each kind of factor such as organizational factors, social factors, characteristics of computer system like kind of hardware and software, manner of education and assistances of other individuals in computer system usage that affect individuals' mental perception from ease of use and usefulness of information technology (Davis et al., 1989).

In 1993, Davis tested the original TAM on 112 users and found perceived usefulness (PU) 50% more influential than ease of use (EOU) in determining usage by the participants. It appears that the above model is an acceptable theory among researchers of information systems in order to study users' accepted behavior in the field of information and communications technology (Liu, Liao, & Peng, 2005). Various researches have been accomplished during the last ten years in which this model has been used as theoretical framework in the issue of technology acceptance and the existing relations among the proposed variables in this model have been confirmed. Their conclusion is that perceived ease of use and perceived usefulness are important determinants in predicting intentions and actual application of computers (Drennan, Kennedy, & Pisarki, 2005; Igbaria et al., 1997; Lu, Yu, Liu, & Yao, 2003).

Venkatesh and Davis (1996) believe that TAM has been used in several studies to predict user's acceptance and using the technology based on two factors of perceived ease of use and perceived usefulness. But it is necessary to study predictors and determinants of the key structure of acceptance more in order to design interventions and effective educational mechanisms to improve and enhance technology acceptance level by the user. These two researchers focused on identification of perceived ease of use determinants. They performed three experimental studies with 108 respondents and six different educational systems. Results demonstrate that individuals' attitude and beliefs about

perceived ease of use of a specific system depends on the degree of user's self-efficacy in using the computer. Finally they confirmed that TAM is a model which could support acceptance of a technology.

Three meta-analyses (King & He, 2006; Legris, Ingham, & Collerette, 2003; Ma & Liu, 2004) agree the TAM is a robust theoretical model to explain and understand acceptance of technology.

Van Der Heijden (2003) described the TAM as "a parsimonious, theoretically and empirically justified model intended to explain the acceptance of information systems" (p. 541). TAM is a popular model for explaining the behavior of technology users (Van Der Heijden, 2003). The TAM deals directly with issues regarding the implementation of new technology. The strength of the TAM is that it is simple and easy to apply to many situations; it is designed to explain technology acceptance on an individual level in wide user populations and to explain the contexts with which technology is used (Hu, Clark, & Ma, 2003).

The Pan, Gunter, Sivo, and Cornell (2005) study was based on earlier research conducted by Pan (2003), which successfully replicated the application of the TAM through the identification of causal relationships existing among student perceived ease of use, perceived usefulness, and attitude towards WebCT.

According to the reviewed studies by Kowitlawakul (2008), the confirmation of the model's validity has been tested across various technology systems: wireless Internet (i.e., Lu et al., 2003), voice mail (i.e., Straub, Limayem, & Karahanna, 1995), word processor (i.e., Agarwal & Prasad, 1999), spreadsheets (i.e., Jackson, Chow, & Leitch, 1997), database management systems (i.e., Szajna, 1996), email (i.e., Straub, Keil, & Brenner,

1997), the Internet (i.e., Chen et al., 2002), telemedicine technology (Hu, Chau, Liu Sheng, & Tam, 1999), computer-based documentation (Ammenwerth, Mansmann, Iller, & Eichstadter, 2003), e-Health (An, 2005), and electronic logistics information system (Tung, Chang, & Chou, 2007).

In a study using the TAM, Sun and Zhang (2006) used 71 out of 72 studies to indicate the effects of perceived usefulness as a statistically significant influence on attitude, behavioral intention, or usage. They determined that perceived usefulness is an important, if not the most important, factor that influences user acceptance of technology.

For example, the survey conducted in New Zealand (Igbaria et al., 1997) supported the original TAM by confirming that both perceived ease of use and perceived usefulness were key determinant factors in explaining actual use. Also, Venkatesh (2000) identified perceived ease of use as a key driver of user acceptance of computer technology with additional key determinants of computer self-efficacy, facilitating condition, computer anxiety, and perceived enjoyment. Perceived ease of use was not a key determinant in his study.

Unlike the first set of studies, Szajna's (1996) study showed that the perceived ease of use did not affect graduate business students' intention to use electronic mail. Instead, the perceived ease of use had an effect directly on perceived usefulness. The study did not mention that the two key determinants influence users' attitudes, making it difficult to compare to all of the above studies.

Deficiencies of the TAM model:

The TAM model puts emphasis at first step on application of the modern technology, but it does not consider long term application of such technologies.

The concept of continuance is critical because technology acceptance research often focuses on the initial adoption of technology and overlooks or ignores long-term use and the integration of new technology into the daily activities of employees.

Some researchers (Chau, 1996; Mathieson, 1991; Venkatesh & Davis, 1996) believe that the TAM model is incomplete and lacks the capability to determine deficiencies of technology application. Therefore, it is necessary to develop this model to understand reasons for resistance to technology.

Venkatesh and Davis (1996) have discussed that the TAM can help predict acceptance, but does not always help us understand and explain acceptance beyond attributing the system characteristics of ease of use and usefulness.

Although research indicates strong validity of the TAM (Chau, 1996), some critics believe it is too simple and has a limited number of constructs to describe behaviors. Mathieson (1991) pointed out that the TAM does not provide detailed information, but general opinions about the users and the system. Goodhue (1995) criticized the general nature of the TAM because of all the possible extensions to the model. Goodhue argued that a model with so many extensions would not be applicable to a single general theory for user evaluations. These criticisms suggest a need to expand the TAM in new ways.

Another important weak point of the technology acceptance model is that social factors which have a main role in individuals' attitude towards technology acceptance have not been considered. In order to solve this problem the technology acceptance model 2 was compiled to add other theoretical structures such as processes of social impacts (mental norms, voluntariness and mental image) and instrumental processes of cognition (quality of the product, visibility of results and importance of job) to the primary model (Tung &

Chang, 2008; Yu, Li, & Gagnon, 2008). Social impacts and instrumental processes of cognition affect information and communications technology acceptance significantly by users (Yu, Ha, Choy, & Rho, 2005).

2.4.2.3 Technology Acceptance Model 2

The original TAM model, as mentioned previously, was based on Ajzen's TRA model but did not include the subjective norms construct. Several studies agreed upon the need for adding other variables to serve as determinants of the major construct since the original model lacked such determinants for PU and PEOU.

Delone and McLean (1992) believe that one of the factors that must be considered is the environment of the user. The TAM showed various results in environments in which technology acceptance was voluntary or intentional.

If the technology is merely recommended and the end user has a willful choice to use it without repercussions, then the technology is considered voluntary (Agarwal & Prasad, 1997; Venkatesh & Davis, 2000). Thus the necessity of paying attention to environmental factors like organizational support or organizational structure is perceived here.

Pan et al. (2005) furthered their research into the application of the academic TAM by including questions about gender, work status (part-time vs. full-time students). They used structural equation modeling to measure four latent factors: perceived ease of use, perceived usefulness, attitude toward WebCT, and actual use of WebCT. They also identified two outside latent variables: computer self-efficacy and subjective norms. Their research uncovered that the students' perceptions of the software's ease of use influenced their attitude toward software instruction. Positive attitudes led to increased use and

students who felt that the software was easy to use and useful in completing their coursework had a more favorable view of the software. The researchers stressed the importance and need of adding external variables such as computer self-efficacy to future research.

Tung and Chang (2007) created an extended TAM, which included computer self-efficacy, and computer anxiety to explain adolescent technology acceptance. Their research showed that computer self-efficacy had a powerful impact on the behavioral intent of adolescents to use online learning. Computer anxiety had a negative impact on computer self-efficacy and ultimate intent to use the program.

By considering all of these studies, Vankatesh and Davis (2000) presented the TAM2 model. They extended the original TAM model to explain perceived usefulness and usage intentions in terms of social influence and cognitive instrumental processes. TAM2 includes additional key determinants of perceived usefulness and usage intention constructs which are meant to explain the changes in technology acceptance over time as individuals gain experience in using the intended technology. Figure 2.6 shows the proposed model of TAM2. The new model incorporates additional theoretical constructs covering social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use).

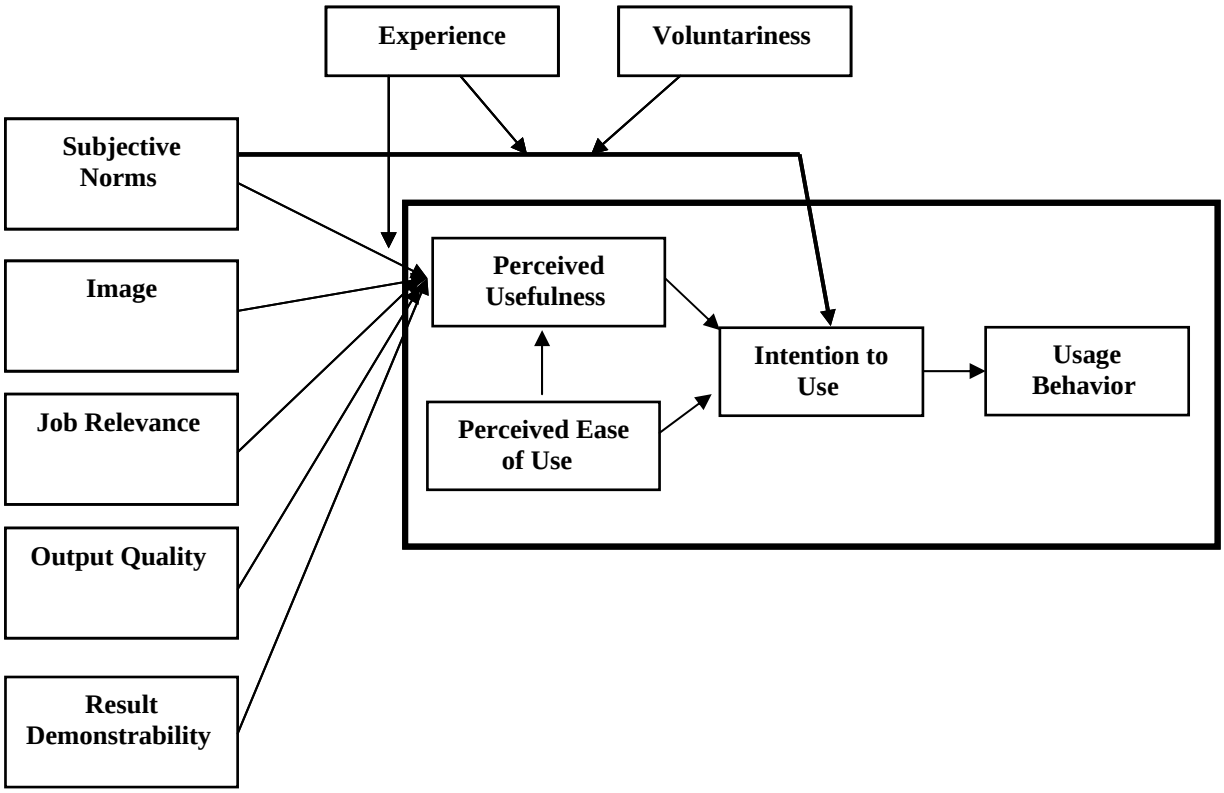


Figure 2.6. TAM2- Extension of the Technology Acceptance Model (Venkatesh & Davis, 2000).

Venkatesh and Davis (2000) explained the role of social influences in computer usage contexts. According to them, TAM2 theorizes that the subjective norms have a direct effect on intention over PU & PEOU will occur in mandatory system usage settings. The model posits voluntariness as a moderating variable to distinguish between mandatory versus voluntary compliance with organizational settings. Nevertheless, subjective norms can influence intention through PU or what is called internalization. TAM2 theorizes that internalization will occur whether system usage context is voluntary or mandatory.

Experience is theorized to mediate the relations between subjective norms and intentions on one hand and subjective norms-PU (internalization) on the other. As mentioned previously, the relation between SN and intention would be stronger in the mandatory usage context and prior to implementation or at early stages of use. Yet, the

relation is expected to weaken with gained experience during system usage. Experience would have the same effect on the SN-PU relation.

As for the cognitive instrumental process, TAM2 proposes that individuals rely on the match between their job goals and the outcomes of using the system (job relevance) as a basis for evaluating system usefulness (usefulness perceptions). The same is valid when it comes to result demonstrability and output quality; if both are effective then the system used is perceived as useful. Such relation does not change with increased experience. The results of their four longitudinal studies carried out on four different systems at four organizations at three points in time showed that the new model, TAM2, explained 34-52 per cent of the variance in usage intention and up to 60 per cent of the variance in perceived usefulness (Al-Qeisi, 2009).

Often cited in the literature is the Legris et al. (2003) meta-analysis of 22 studies indicating the TAM2 is the evolved model and the literature reflects adding system design features similar to the improvements in the TAM2 as depicted in Figure 2.6.

2.4.2.4 The Unified Theory of Acceptance and Use of Technology (UTAUT)

Vankatesh et al. (2003) proposed the unified theory of acceptance and use of technology (UTAUT). This is one of the newest models about technology acceptance and application resulting from combination of principal structures of several well-known models about technology acceptance such as technology acceptance model, diffusion of innovation theory, theory of reasoned action, theory of planned behavior and social cognition theory. This model is aimed at explaining adopter intentions to use a new idea or technology and subsequent usage behavior. The theory posits that four key constructs are direct determinants of usage intention and behavior as follows:

1. Performance Expectancy (PE): is the degree to which individuals believe that using the system will help them to attain gains in job performance. The constructs in the other models that pertain to performance expectancy are: perceived usefulness (TAM), and relative advantage (DOI). Based on the literature, the influence of performance expectancy on behavioral intention is hypothesized to be moderated by gender and age; such an effect would be stronger for men, particularly younger workers.

2. Effort Expectancy (EE): is the degree of ease associated with the use of the system. The constructs in the other models that capture the same concept are: perceived ease of use (TAM), and complexity (DOI). The construct in each individual model was significant in both voluntary and mandatory settings, and as expected from the literature it was significant only during the post training measurement. Based on the literature, the influence of effort expectancy on behavioral intentions is hypothesized to be moderated by gender, age, and experience.

3. Social Influence (SI): is the degree to which individuals perceive that important others believe they should use the new system. Similar constructs are represented in existing models: subjective norms (TRA and TAM2), and image (DOI). The comparison between models found that this construct behaved similarly; it is insignificant in voluntary contexts and becomes significant when use is mandatory.

4. Facilitating Conditions (FC): is the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. This definition captures different constructs in existing models: perceived behavioral control (TPB/DTPB), and compatibility (DOI). The comparison between models revealed that the relationship between intention and this construct in each model is similar in both voluntary

and mandatory settings in the first training period but such influence disappears in the second period (one month after implementation).

Based on the literature, when both performance expectancy and effort expectancy constructs are present, facilitating conditions become insignificant; and consistent with TPB/DTPB facilitating conditions are also direct antecedents of usage. This effect is expected to increase with experience with technology as users find multiple avenues for help and support. Hence, the influence of facilitating conditions on usage is hypothesized to be moderated by age and experience. Gender, age, experience, and voluntariness of use are posited to mediate the impact of the four key constructs on usage intention and behavior (Gupta, Dasgupta, & Gupta, 2008). Figure 2.7 shows the unified model of acceptance and use of technology.

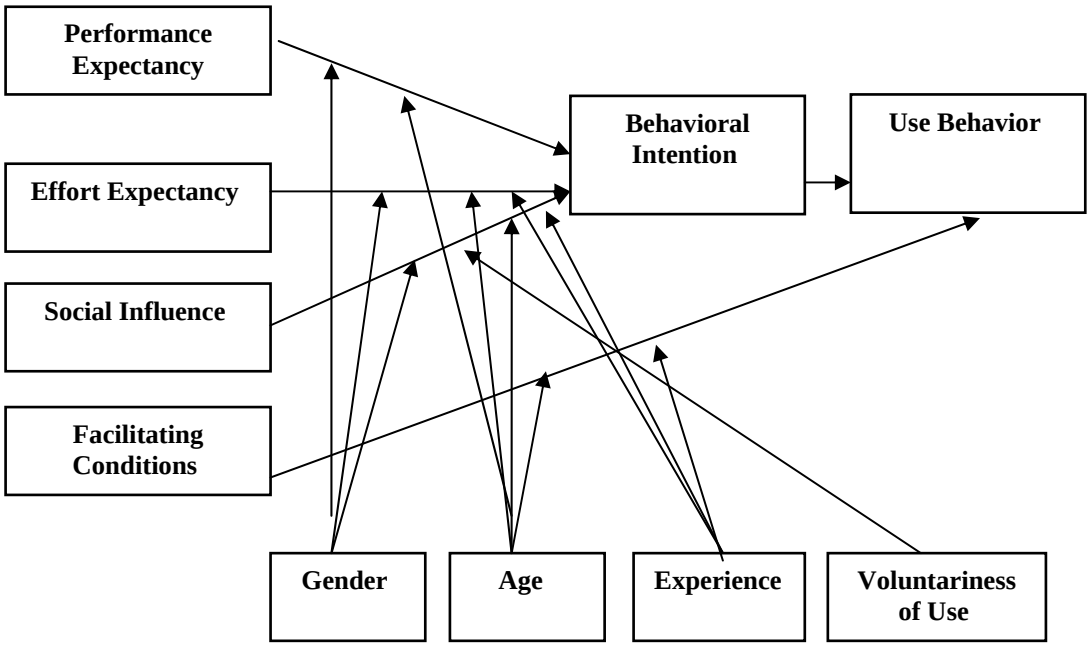


Figure 2.7. UTAUT Research Model. Source: Venkatesh et al. (2003)

Several empirical tests provided strong support for UTAUT. A test for the invariance of the new measurement scale of the UTAUT instrument was carried out by Li and Kishore (2006). The main purpose of their study was to test whether the key constructs in the UTAUT model were invariant across different population subgroups. The area of application for their study was Web log system users. Hence, the difference in subgroups is based on the demographic characteristics: gender, general computing knowledge, specific Web log-related knowledge, experience with Web logs, and usage frequency of Web logs. Based on previous literature, they hypothesized that the UTAUT four key constructs would be invariant across male and female groups, low and high computing general knowledge users, users with or without particular Web log knowledge/ experience, and users with low and high frequency use of Web logs.

The findings indicated that users with different experience and knowledge in computing and Web log use have the same interpretation of the instruments of performance expectancy and effort expectancy. On the other hand, social influence is not interpreted similarly among users with high or low frequency of Web log usage; nor are the scores of facilitating conditions instrument comparable for users with different levels of web log experience and usage frequency from the perspective of statistical significance, although they are comparable for computing and Web log knowledge.

Knutsen (2005) used a subset of the UTAUT to explore the relationship among expectations related to performance of a new mobile service, efforts needed to utilize new mobile services, and how these constructs affect attitudes toward new mobile services. The research design consisted of performance expectancy (PE) and effort expectancy (EE), age as an antecedent to the UTAUT constructs, and attitude as a subsequent of the two constructs of UTAUT.

Also, effort expectancy was hypothesized to affect performance expectancy. The empirical results significantly verified the relationship between PE-EE and attitude as well as between EE-PE. Results also suggested that PE and EE are strong determinants of attitude toward new mobile services. Increased age was found to be connected to lower levels of anticipated ease with new mobile services. However, age appeared to have a positive effect on PE indicating that older individuals have higher expectations towards new mobile services (Knutsen, 2005).

Table 2.1shows result of some researches related to technology acceptance briefly.

Table 2.1
Summary of Research on Technology Adoption

Researcher	Application Technology	Population	Results
Moore & Benbesat (1991)	Theory, Empirical, and Survey	business users	Main factors affecting technology adoption were; Voluntariness, Image, Relative Advantage, Compatibility, Ease of Use, Trialability, Result Demonstrability.
Venkatesh & Davis (1996)	Empirical and Survey	MBA students	Objective usability influences perceived ease of use perceptions about a specific system after direct experience with the system.
Chau (2001)	MS Word	Business Adm Students	Computer attitude and computer self-efficacy affect actual use of MS Word.
Chau & Hu (2001)	Telemedicine technology	Physicians	Compatability, perceived behavioral control, SN were significant at technology acceptance.
Lee (2002)	CMS	Higher Ed. Students	Task value and computer self-efficacy were the most significant predictors of perceived ease of use.
Carswell & Venkatesh (2002)	CMS	Graduate Students	Subjective norm and perceived behavioral control, result demonstrability, visibility, trial ability, compatibility, expected grade, intent to continue to use were the most significant predictors of adoption of system.

Venkatesh et al. (2003)	1.Online meeting manager 2.Database application 3.Portfolio analyzer 4.Accounting system	Managers and employees	Compared 8 competing models: TRA, TAM, MM, TPB, C-TAM-TPB, MPCU, IDT, CT. Proposed Model: UTAUT. Moderators were Gender, age, experience, voluntariness. BI was high in mandatory and voluntary groups; performance expectancy, effort expectancy and social influence were significant constructs. No influence from PBC at all.
Legris et al. (2003)	Literature Review and Analysis		TAM was found to be useful, but should be integrated into a broader model that includes variables related to human and social change processes, and to the adoption of the innovation model.
Sen (2005)	Algebra instruction	Higher Ed. Students	Computer self-efficacy; Subjective norms; Perceived usefulness was the most significant predictor of perceived ease of use; The perceived ease of use is not the effective predictor of perceived usefulness rather perceived usefulness positively predicted perceived ease of use.
Grandon, Alshare, & Kwun (2005)	Online education	Students	Significant determinants were; Culture, convenience; quality; self-efficacy were the most predictors of online education acceptance.
Thompson et al. (2006)	Empirical and Survey	undergraduate MIS students	Main predictors; Personal Innovativeness with IT, Ease of Use, Affect, CSE, Social Factors, Perceived Usefulness, Perceived Behavioral Control, Future Intention.
Sun & Zhang (2006)	Literature review, Theory		Main factors: subjective Norm, Perceived Usefulness, Perceived Ease of Use. 3 groups of Moderating factors: 1.Organizational factors, Voluntariness, 2.Technology: Individual/ Group factors: Purpose, Complexity. 3. Individual factors: Intellectual Capability, Cultural Background, Gender, Age, Experience.
Korukonda (2006)	Empirical and Survey	graduate and undergraduate students	CA, Personality, Math Skills, Verbal Skills, Cognitive Orientation, Computer Experience. Suggested that CA is not simply a short-term negative attitude toward ICTs, but is impacted by individual characteristics.
Ngai, Poon & Chan (2007)	CMS	Higher Ed. Students	Technical support was a main factor to adoption the system.

2.5 Conclusion

Organizations need technology in the information age in order to remain competitive and this dependence is increasing day by day. Thus, recognizing the important factors in technology acceptance and application and perceiving factors effective on the individual's tendency towards technology application are very significant, because otherwise technology will still remain unused. Table 2.2 summarizes the trends of theories and models in the field of technology acceptance as discussed above.

Table 2.2

Trends of Proposed Theories and Models in the Field of Technology Acceptance

Conclusions	**Theory/model**	**Author**	**Year**
Central mechanisms: attitude towards behavior and personal norms	TRA	Fishbein & Ajzen	1975
Emphasizing the importance of three predominant characteristics of perceived usefulness , perceived ease of use and cultural perception	DTPB	Taylor & Todd	1995
Determining the process of innovation decision and innovation characteristics	DOI	Rogers	2003
Application is affected by perceived usefulness and perceived ease of use.	TAM	Davis	1985
Computer self-efficacy had a significant impact on behavior control.	Combining TPB/ TAM	Taylor & Todd	1995
It creates a norm for environments in which application is compulsive.	Development and compiling of TAM and TAM2	Venkatesh & Davis	2000
Designing and confirming UTAUT	UTAUT	Vankatesh, Morris, Davis, & Davis	2003

The following Table 2.3 shows the result of some researches done using the above models and theories.

Table 2.3

Literature Reviewed for Technology Acceptance

Year	Author	Model	Purpose of the Research	Findings
1975	Fishbein and Ajzen	TRA	Model development of TRA	Core constructs: attitude toward behavior and subjective norms
1989	Davis	TAM	Studied perceived, ease of use and likelihood to use	Use is affected by perceived ease of use and perceived usefulness
1991	Thompson, Higgins and Howell	MPCU	Developed MPCU model, related to personal computer usage behavior	Examined affect toward use rather than intention
1991	Ajzen	Tested TPB	Reviewed several studies that used TPB, tested it	Review
1991	Moore and Benbasat	IDT development	Adapted characteristics of innovations presented before	Refined constructs to study technology acceptance
1989	Davis, Bagozzi and Warshaw	MM	Development of Motivational Model	Core constructs were extrinsic and intrinsic motivators
1995	Rogers	Development of IDT	Studied, adapted and enhanced IDT	book
1995	Taylor and Todd	TPB/TAM combination	Studied ease of use, usefulness, CSE, peer influence and computer attitudes	CSE shown to have sig. impact on behavioral control
1997	Lopez and Manson	Acceptance & utilization	Studied perceived usefulness and factors influencing technology acceptance	Perceived usefulness was principal determinant of use
2000	Venkatesh and Davis	TAM2	Model development of TAM2	Added norm for setting where use was mandatory
2003	Venkatesh, Morris, Davis and Davis	UTAUT	Model development	Designed and validated UTAUT

2007	Sheykh Shoaee and Olumi	TAM	Studied factors influencing on technology acceptance	Perceived usefulness and ease of use were important factors influence on ICT acceptance
2010	Moradi et al	TAM/TPB	Studied perceived usefulness, ease of use, and factors influencing technology acceptance	Perceived usefulness and ease of use were principal determinants of IT acceptance

2.6 Effective factors on ICT Usage in Educational Environments

In this section effective factors on acceptance and usage of ICTs are identified and determined by educators in educational environments especially faculty members in universities and higher education institutions based on the proposed theories and models in the field of technology acceptance that have been used with regard to ICT acceptance too. These factors are generally classified into two classes in this research; individual-professional factors and psycho-social factors.

2.6.1 Effective individual-professional factors on ICT usage

Important determinant factors could affect ICT usage in different environments. Educators and educational environments have special characteristics, properties and conditions that could be important determinants of ICT usage. Thus, one of the important and determinant factors that have been examined in this study as effective factors on ICT usage by faculty members is the individual-professional factor of educators mentioned in the following.

Results of many studies (Abpeima, 2003; Lippert, 2000; Mahmoodi, 2004; Moody et al., 2004; Yaghubi, 2002) reveal that the most important effective individual-

professional factors on ICT usage by teachers are: age, gender, educational degree, teaching experience, working experience with computer, educational group, university rank, English language qualifications and computer capability and empowerment. After reviewing many studies on educational technology and faculty members it was determined that there were contradictory findings about the relation between the above individual-professional variables and actual use of computer by faculty members. The factors will be discussed separately.

Age

Several researches have shown that younger faculty members use ICT more than older teachers because they have a more positive attitude towards technology and their usage in educational environments (Brumini, Kovic, Zombori, Lulic, & Petrovecki, 2005; Simpson & Kenrick, 1997).

On the other hand, a number of studies have revealed that age plays a critical factor in relation to attitudes towards computers (Blankenship, 1998; Chio, 1992; Kendel, 1995). Foroushani, Khosravipour, and Yaghoubi (2009) found that younger people had more positive attitudes towards using computers in instruction and demonstrated a higher computer literacy than older ones. Similarly, Kendel (1995) found that age was a statistically significant factor for teachers' attitudes towards computers; in his study, the younger teachers demonstrated more positive attitudes than older teachers towards computers

Research was done by Hakimi (1997) to determine usage level of ICT by faculty members and students with descriptive research method in two medical sciences

universities of Sistan-Baluchestan and Zahedan. Results of this research demonstrated that 81 percent of faculty members of Zahedan medical sciences university used Internet for research and 19 percent used it in educational and teaching activities. A negative and significant correlation was observed among age groups and degree of technology usage in this study.

Abpeima (2003) studied the attitude to Internet based distance education of faculty members and students of supplementary studies in agriculture education major. This research showed that younger faculty members had a more positive attitude and more tendencies towards implementing educational courses than older ones. Marasovic, Kenney, Elliott, and Sindhusake (1977) performed a study in technical secondary schools in Australia and found a significant difference between age and Internet usage by teachers of such schools; average usage of Internet in research activities by older teachers was at a higher level than in younger teachers. Spiegel (2001) investigated the attitudes and the usage habits of secondary school teachers at four public schools in the Netherlands. He examined the correlation of age with the attitude and computer usage and found that age was significantly related to some uses of computers, such as e-mail and web page development. However, the findings of the study revealed that age was not significantly correlated with attitudes towards computers.

Moody et al. (2004) in their study concluded that there was a negative and significant relation between age and Internet usage. They perceived that older teachers used Internet more than younger ones.

Rahimi and Yadollahi (2011) in their study examined the relationship between computer anxiety and ICT integration among EFL teachers in Iran. Based on the results of this study, the older EFL teachers had higher level of computer anxiety and hence, they

incorporated ICT tools in their instructional practices less than younger teachers. Age does play a significant role in determining both the level of computer anxiety and the degree of ICT use.

Considering the studies reviewed, it is clear that there are contradictory results in the current literature about the relationship between age and computer and ICT usage by educators. It means that a positive and significant relationship has been observed between age and computer usage by teachers in some studies, while others found a negative relationship between age and computer usage.

Gender

Although no relation between gender and ICT usage level has been reported in some researches studying effective individual factors on use of ICT by educators (including studies by Loyd & Gressard, 1986; Kendel, 1995; Woodrow, 1992) results of some researches illustrate existence of a significant difference between gender and ICT usage level. Effatnejad (2004) concluded in his study that female educators show higher levels of computer usage than male educators. Anderson (2002) conducted research on Internet usage level by faculty members in Athabasca university of Canada and concluded that a significant difference was observed between gender and level of using modern educational technologies in educational and research activities.

Moreover, the Rahimi and Yadollahi (2011) study demonstrates an agreement with those who believe that gender-divide in ICT use and fear of computer technology are closing in the 21st century. It was found that no gender difference exists in computer anxiety and ICT utilization in language instruction. Nevertheless, some studies have revealed that gender difference existed regarding computer anxiety and ICT integration. According to Abu Bakar et al. (2005) the lack of gender differences could possibly be

attributed to the fact that participants in this study were academicians who worked in an ICT-rich environment where ICT facilities and relevant computer software packages are easily available. This means both females and male academicians have equal exposure to ICT at their workplace. The reliance on ICT among these academicians could be another reason for the lack of gender disparity. With such inconclusive and inconsistent results from literature on gender differences, it can be concluded that it is psychological gender rather than biological gender which has more effect on computer anxiety and consequently computer use. However, Tomte (2008) identified some challenges in achieving gender equity in society through more gender-balanced use of technology and ICT policies that promote supportive and systematic endeavors. Both education and research community in particular have to find ways to stress the relevance of gender-balance and to address gender-specific challenges, for example in using ICT to improve the performance of female learners, raising awareness in teachers and even parents consciousness on how to broaden the view on thinking of gender and ICT, and how to approach boys' and girls' different attitudes, performances and talk about ICT. Studies conducted ought to include both quantitative and qualitative approaches, in order to grasp the diversity of preferences and uses of ICT devices, tools and media. Finally, educational policies should consider relating more strongly to other governmental bodies who work with the gender issue, in order to incorporate gender and ICT issues in a broader sense, like in the workplace, and in lifelong learning.

Working Experience with ICT

Results of some studies illustrate those individuals who have more record and experience in ICT usage can have a high impact on less experienced individuals in this regard (Taylor & Todd, 1995). Educators who have worked with modern technologies in working environments for a long time can have much impact on technology usage by other educators with less experience in this field.

The existing literature suggests there is consensus among researchers that EUT plays a significant role in technology acceptance (Ball, 2008; Thompson, Compeau, & Higgins, 2006; Venkatesh et al., 2003).

Szajna (1996) stated that an additional experience component, added to the original TAM would be a significant enhancement. In addition, Venkatesh and Davis (1996) added the experience factor with computers to the TAM, and found that it had a positive impact on perceived ease of use of technology

The role of EUT has also been fairly consistent across acceptance models, with EUT playing both a direct role and an indirect role through its influence on other variables (Venkatesh et al., 2003).

In a review of eight acceptance models, Venkatesh et al. found EUT to be a key moderator of other variables in the models. Additional evidence of the role of EUT was provided in Venkatesh et al. (2003), as EUT was found to have significant moderating influence and to be an integral feature of the UTAUT. Similarly, in an empirical study assessing the influence of EUT on IT usage, Taylor and Todd (1995) found that EUT influenced both the determinants of intention to use and actual ICT usage. As Dupagne and Krendel (1992) have shown, positive attitudes increase as computer experience increases.

Teachers have many concerns about using computers in the classroom. Some are skeptical about the value of computers in education. Actual experience with the computer can play a major role in reducing computer anxiety, which is one of the main sources of teacher resistance to integrating technology in their classrooms (Gardner, Discenza, & Dukes, 1993).

Fletcher and Deeds (1995) found that working experience with ICT by agricultural teachers was effective on amount of computer and Internet use in the class. They also stated that whenever teachers had more experience and knowledge about computers and ICT, they showed higher acceptance of technologies as well as lower fear and concern. Simpson and Kenrick's study (1997) showed that previous experience with computers did not necessarily positively increase employees' attitudes, and employees who had more than 21 years of experience had the most negative attitudes.

Yildirim (2000) found a significant correlation between prior computer experience and attitudes toward computers, both of which (attitude, and experience) significantly affect teacher competence with computers.

Providing additional evidence of the indirect role EUT plays in technology acceptance, EUT has been found to be a significant predictor of Computer self-efficacy or CSE (Cassidy & Eachus, 2002; Doyle, Stamouli, & Huggard, 2005). Brumini et al. (2005) found that previous computer experience is one of the factors influencing positive employees' attitudes toward ICT. In summary, many research studies mention the years of experience with computers as one of the factors influencing educators' attitudes toward ICT.

In another study designed to investigate the inter-dependence between EUT, CSE, and CA, Doyle et al. (2005) found similar results. Results indicated that as EUT increased, CSE also increased.

Moreover, as EUT increased, CA decreased. Ball (2008) suggests that educators' technology acceptance and usage may be influenced by both the extent and the type of EUT they are exposed to (Christensen & Knezek, 2002; Woods, Baker, & Hopper, 2004). In an empirical study among 450 business users, Igbaria and Iivari (1998) investigated EUT as a determinant of CSE, and gathered measurements of both the extent and diversity of EUT from participants. Results suggested that providing opportunities for users to gain EUT may be helpful in strengthening their CSE perceptions and accelerate their decision to utilize computer applications (Igbaria & Iivari, 1998).

Years of Working

Hazrati (1999) performed a study to examine condition of using Internet by faculty members of Iran, Tehran and Shahid Beheshti Medical Sciences Universities and stated that the highest percentage of Internet users (82.7%) had working experience lower than 7 years.

Albirini (2004b) in a study in Australia found a negative significant relationship between working experience of faculty members and usage level of modern educational technologies such as online education. It means that faculty members with more teaching experience had more resistance and lower acceptance in the field of implementing online educational courses.

In contrast, Stricklin, Bierer, and Struk (2003) noted that years of experience in teaching had a weak relationship with Internet usage in educational and research activities

of human arts faculty members in India. It was determined in this survey that educators who had taught in the university for many years adapted themselves more easily to the technology environment change. Their understanding from a special computer system may have changed during a special time period due to their experience.

Computer Competence

Research has highlighted the importance of teachers' computer competency in order to utilize computers as an educational tool in their classrooms (Hardy, 1998; Karimi-Alavije et al., 2007; Knezek, 2000; Siegel, 1995). According to the U.S Department of Education (2004), only 10% of public school teachers reported feeling "very well prepared" for the use of ICT in the classroom, while the majority (53%) reported feeling "somewhat prepared," and 13% reported feeling "not at all prepared" (p. 66). It has been shown that teachers' self-competence and their perception of the relevance of computers in their teaching is a significant factor behind teachers' use of computers (Marcinkiewicz, 1994).

In another context, Na (1993) conducted a large scale study in Korea to examine the attitudes of agricultural teachers towards computers in education in relation to selected variables: computer training, perceived level of computer knowledge, perceived level of computer skills, computer availability, and personal characteristics. The study showed that computer training, knowledge, skills, and availability were positively correlated to the attitudes of the teachers towards computers in education.

Knezek (2000) identified three main variables contributing to technology implementation: attitudes towards technology, skills using technology, and access to technology in terms of hardware, software, and technical support. The model hypothesizes that high level of will (attitude), skill (proficiency), and tools (level of access) will produce

higher levels of technology integration that will positively reflect on student achievement. Besides that, some demographic variables might play a significant role in technology integration; these include age, gender, grade level, and teaching experience. The model postulates that educators with higher levels of will, skill, and tools will exhibit higher level of technology integration in the classroom. The greater the presence of these components within the educator, the more the educator will apply technology. In the current study, the competence of EFL teachers in terms of computer knowledge was also investigated.

English Language Qualifications

A large section of the existing information and transactions in Internet is in English language. It has been estimated that 80% of online content is in English. Also a large portion of prepared educational software in the global market is in English while only 57% of Internet users know English. In websites like UNESCO website two or more languages exist but that again does not solve the problem of the Persian user (Mansourian, 2002). Optimal enjoyment from Internet requires sufficient proficiency and familiarity with English language; however, a very high percentage of individuals lack the necessary literacy and proficiency of English language in the developing countries and encountered problems in using the Internet (Atashak, 2010).

Movahed Mohammadi (2003) performed a survey titled “role of Internet informatics network and web in educational-research activities of students of supplementary studies of agricultural universities in Tehran, Tarbiat Moddaress, Shiraz and Isfahan industrial universities” in 2003. Obtained results show that there is a significant

relation between Internet usage level with computer proficiency level, educational level, English language qualifications, hours of Internet usage, educational major and university.

Taik Sup Auh (2002) in this regard states that language is the most important obstacle in using the Internet. Mahmoodi (2004) found a significant difference between proficiency level of English language by faculty members of Tehran and Tarbiat Modares universities and ICT application level in educational-research activities.

2.6.2 Psycho - Social Factors

Another group of effective factors on ICT usage by educators in educational environments that are considered in this survey are psycho-social factors.

Computer Self-Efficacy

Computer self-efficacy is often included in models that have been represented to develop TAM (Gong, Xu, & Yu, 2004; Igbaria & Ivari, 1995). Bandura (1997) has defined self-efficacy as the individual's belief in creating impact. In other words, Self-efficacy (SE) refers to the belief that one has the capability to perform a particular behavior; it has often been investigated as a construct in technology acceptance research (Compeau & Higgins, 1995; Moradi, Mehrani, & Broumand, 2010).

Computer self-efficacy (CSE) refers to self-efficacy (SE) as it relates to computing behavior (Compeau & Higgins, 1995a). Research generally suggests those individuals' beliefs about or perceptions of ICT have a significant influence on their usage behavior (Agarwal & Karahanna, 2000).

According to Compeau and Higgins (1995), researchers generally agree that a positive relationship exists between CSE and IT use, and that understanding CSE is important to the successful implementation of systems in organizations. In a study based on Bandura's work, Compeau and Higgins (1995a) developed a 10-item, reliable and valid measure of CSE, and empirically tested their model in a study of managers and other professionals. Results confirmed that CSE was an important factor for the universities in successful ICT implementation.

In a further empirical test of the CSE instrument developed by Compeau and Higgins (1995a), Compeau, Higgins, and Huff (1999) confirmed the findings of the prior CSE study. The results of their study provided strong confirmation and evidence that CSE impacts an individual's affective and behavioral reactions to ICT.

CSE has often been linked with other variables in technology acceptance research (Agarwal, Sambamurthy, & Stair, 2000). In their study, Compeau and Higgins (1995) found significant relationships between CSE and outcome expectations, affect, anxiety and use. CSE was also found to have a moderating influence on encouragement by others and management support.

In a study designed to investigate how users' general CSE beliefs predict their specific CSE beliefs, Agarwal et al. (2000) developed a model and empirically tested it with 186 university students. Results indicated that CSE was a key antecedent of perceived ease of use, and was strongly influenced by personal innovativeness with ICT.

Agarwal et al. (2000) also concluded that prior EUT had a significant effect on general CSE, which is defined as a "generalized individual belief about the ability to use information technology" (p. 427).

Agarwal and Karahanna (2000) developed a multi-dimensional model that incorporated holistic experiences such as enjoyment along with CSE, perceived ease of use and perceived usefulness. In an empirical test of their model among 288 students, Agarwal and Karahanna (2000) found that CSE had a significant influence on perceived usefulness and perceived ease of use.

Havelka (2003) hypothesized relationships between CSE and individual characteristics such as academic major, gender, experience with the use of technology (EUT), family income and computer anxiety (CA). In an empirical test of the model, Havelka (2003) surveyed 324 students and found that users with lower levels of CA had higher levels of CSE. Results also indicated a strong, positive relationship between experience with the use of technology (EUT) and CSE. Other significant differences in CSE were found among students with different majors and family income levels.

In a study designed to investigate the influence of CSE on acceptance of a Web-based learning system Gong et al. (2004) extended the TAM and included the additional construct of CSE. In an empirical test of their model, Gong et al. (2004) surveyed 280 instructors and found that CSE had a strong direct effect on both perceived ease of use and intention to use information technologies.

Table 2.4 presents a summary of research studies related to CSE and technology acceptance.

Table 2.4

Summary of Computer Self-efficacy Studies

Study	Methodology	Instrument Constructs	Main Findings or Contribution
Compeau & Higgins, 1995	Empirical and Survey	Encouragement by Others, Others' Use, Support, CSE, Outcome Expectations, Affect, Usage	CSE was found to have a significant influence on individuals' expectations of the outcomes of using computers, emotional reactions to computers, and actual computer use.
Agarwal & Karahanna, 2000	Empirical and Survey	Personal Innovativeness, Playfulness, Cognitive Absorption, Perceived Usefulness, Perceived Ease of Use, CSE, BI	CSE had a significant influence on perceived usefulness and perceived ease of use.
Igbaria & Iivari, 1995	Empirical and Survey	EUT, Organizational Support, CA, Perceived Ease of Use, Perceived Usefulness, CSE, System Usage	CSE had both direct and indirect effects on system usage.
Compeau et al., 1999	Empirical and Survey	CSE, Outcome Expectations (Performance), Outcome Expectations (Personal), Affect, Anxiety, Usage	Results showed strong confirmation that CSE impacts an individual's affective and behavioral reactions to IT.
Agarwal et al., 2000	Empirical and Survey	EUT, Personal Innovativeness in IT, General CSE, Specific CSE and Perceived Ease of Use	CSE was a key antecedent of perceived ease of use, and was strongly influenced by personal innovativeness with IT. Prior EUT had a significant effect on general CSE.
Gong et al., 2004	Empirical and Survey	Perceived Usefulness, Perceived Ease of Use, CSE, Attitude, BI	Identified additional key determinants of acceptance. Research results consistent with TAM. CSE was found to have a significant influence on acceptance.
Havelka, 2003	Empirical and Survey	Academic Major, Gender, ACT Scores, EUT, Family Income, CA, CSE	Hypothesized relationships between individual characteristics and CSE. Users with lower levels of CA had higher levels of CSE. Strong, positive relationship between EUT and CSE.

Computer Anxiety

According to the literature, it appears researchers generally agree that CA plays an important role in technology acceptance among instructors (Christensen & Knezek, 2002; Korukonda, 2006). However, research results are mixed, and there is no agreement on a specific definition of CA (Korukonda, 2006). Literature has generally defined and operationalized CA as being "synonymous with negative thoughts and attitudes about the use of computers" (Korukonda, 2006, p. 1921). According to Venkatesh (2000), CA is a negative affective reaction toward computer use, and has a significant impact on attitudes toward computer use. Korukonda (2006), however, suggested that although literature suggests a relationship exists between CA and other variables, for example, EUT, CA is not simply a negative, short-term attitude toward ICT that can be overcome by increasing EUT.

In an effort to define and operationalize CA, Heinssen, Glass, and Knight (1987) developed the 19-item Computer Anxiety Rating Scale (CARS), which measured the behavioral, cognitive, and affective components of CA. Heinssen et al. (1987) empirically tested the instrument among 270 introductory psychology students; they found the scale to be highly valid and reliable. According to the results, "computer anxiety was found to be related to a consistent pattern of responding: lower expectations, poorer performance, more subjective anxiety and attention to bodily sensations, and a higher frequency of debilitative thoughts" (Heinssen et al., 1987, p. 57).

According to Ball (2008), some researchers have suggested that a relationship also exists between CA and other variables in acceptance models (Hackbarth, Grover, & Yi, 2003; Saadè & Kira, 2006). CA has often been investigated as an antecedent to the perceived ease of use and perceived usefulness constructs in TAM (Saadè & Kira, 2006;

Venkatesh, 2000). In an empirical study of 246 business users, Venkatesh (2000) investigated the determinants of perceived ease of use through a model that integrated three groups of constructs – control, intrinsic motivation, and emotion – into TAM. Emotion was conceptualized as CA. Results suggested that CA played an important role in forming users' perceived ease of use about a new system. Other models have investigated CA as a moderating variable (Hackbarth et al., 2003; Saadè & Kira, 2006). In an empirical study of 114 students, Saadè and Kira (2006) found that CA had a moderating influence on both perceived ease of use and perceived usefulness.

Literature suggests a possible relationship between computer anxiety (CA), experience with the use of technology (EUT), and demographic variables (Yang, Mohamed, & Beyerbach, 1999). According to Korukonda (2006) individual characteristics may also influence CA. In an empirical study designed to investigate how EUT affects the relationship of CA within 10 demographic variables, Yang et al. (1999) found a significant relationship between EUT and CA. In additional research controlling for the effect of EUT, Yang et al. (1999) found that EUT had the greatest influence on CA, with demographic variables having a less significant contribution. In an empirical study of 242 university students, Korukonda (2006) researched the impact of individual characteristics and personality dimensions on levels of CA. Results provided evidence that several dimensions of personality differences and verbal skills had a significant impact on CA, while the evidence with respect to math skills and EUT was mixed.

According to Yang et al. (1999), CA is not only a stumbling block for instructors in integrating emerging information technology into education programs, but is one of the main reasons for limited instructor technology acceptance. In an empirical study designed

to investigate the effects of technology integration education on the attitudes of instructors and students, Christensen and Knezek (2002) found that instructor CA tended to increase along with the level of technological skill of students. Results also suggested that greater levels of perceived importance of computers in students fostered higher levels of CA in instructors.

In an empirical study of 242 university students, Korukonda (2006) researched the impact of individual characteristics and personality dimensions on levels of CA. He showed that some professional characteristics of students such as English language qualifications, passing educational courses and level of computer literacy and skill have important impact on CA. Table 2.5 represents a summary of researches related to CA and technology acceptance.

Also, Attaran (2005) cited that Education should choose the following approaches in the realm of ICT:

1. Education should emphasize critical thinking, communication, and problem solving and also it should not be limited to the transformation of knowledge; instead it should prepare students to face new problems.
2. Education should train global citizens; the future citizens who are not only cautious of their own history, culture, and language, but also need extensive knowledge of the world and the multiplicity of cultures and people.
3. Education should make an attempt to reinforce the spirit of cooperation and establish this spirit in industries, businesses, governments, organizations, and also instructional institutes' money; hence education should not just be limited to knowledge.

Table 2.5

Summary of Researches Related to Computer Anxiety and Technology Acceptance

Study	Methodology	Sample	Instrument / Constructs	Findings
Christensen & Knezek (2002)	Empirical and Survey	60 instructors in a public elementary school	Selected constructs from the Teachers' Attitudes Toward Computers Questionnaire, Confidence, Computer Importance, Computer Enjoyment, CA	Instructor CA tended to increase along with the level of technological skill of students. Higher levels of computer importance to students fostered higher levels of CA in instructors.
Venkatesh (2000)	Empirical and Survey	246 business users in three longitudinal field studies	Three groups of constructs: 1. Control 2. Intrinsic Motivation 3. Emotion	Results suggested that CA played an important role in forming users' perceived ease of use about a new system.
Korukonda (2006)	Empirical and Survey	242 graduate and undergra-duate students at a small private university	CA, Personality, Math Skills, Verbal Skills, Cognitive Orientation, EUT	Suggested that CA is not simply a short-term negative attitude toward ICTs, but is impacted by individual characteristics.
Yang et al. (1999)	Empirical and Survey	245 vocational-technical instructors	Age, Ethnic/Cultural Background, Gender, Highest Education Level, Teaching/Pro-fessional Area, School Type, Learning Style, Number of computer-related courses or training workshops completed, Self-ranked computer skills, Self-perception toward computer usage, CA	Results showed that EUT had the greatest influence on CA, with demographic variables having a less significant contribution.

Hackbarth et al. (2003)	Empirical and Survey	116 university graduate students	System Experience, Perceived Ease of Use, Playfulness, CA	CA had a negative influence on perceived ease of use. CA fully mediated the influence of system experience on perceived ease of use.
Heinssen et al. (1987)	Empirical and Survey	270 introductory psychology students	19 items surveying behavioral, cognitive, and affective components of CA	Developed CARS: Computer Anxiety Rating Scale. 19-item survey designed to measure user CA. Results suggested CA related to greater math and test anxiety, and to less EUT and mechanical interest.
Saadè & Kira (2006)	Empirical and Survey	114 students taking an introductory IS Management course	Affect, Anxiety, Perceived Usefulness, Perceived Ease of Use, Attitude	CA was found to have a moderating influence on perceived ease of use and perceived usefulness.
Fuller, Vician & Brown, (2006)	Empirical and Survey	89 undergraduate students taking an IS course at a university	CA, Oral Communication Apprehension, Written Communication, Apprehension, Email/Web Experience, Email Anxiety, EUT, Age, Learning	Results showed that CA had a significant impact on learners in online educational settings.

Management Support

Managers play a significant role in preparing and supporting staff for new technology implementation (Kowitlawakul, 2008). Communication and collaboration during preparations to implement a new technology in the classroom bring the lecturer and manager together and make them closer to each other. Therefore, employee managers'

perception of a particular technology used in the classroom would have a great impact on staff's perspective of the technology.

In IS, management support is defined as the extent to which top and mid-level management allocate sufficient resources to the implementation effort and are willing to accept the risks, while encouraging and promoting the implementation effort (Larsen, 2003); management support has in fact been studied in conjunction with TAM and has appeared to be of importance in an individual's decision process on whether or not to accept a technology (Ford, Weissbein, & Plamondon, 2003). Managements are also likely to affect the perceptions of workers. In fact, top management commitment and support can help shape individual beliefs that IT is useful and instrumentally rewarding (Purvis, Sambamurthy, & Zmud, 2001). In Igbaria and Iivari (1998), management support was included in the construct of organizational support and was defined solely as providing encouragement and the allocation of resources. The result indicated that management support was significantly related to usage, whereas it was not significant towards perceived usefulness (Rizvi, 2005).

Cultural Perceptions

Cultural perception that is similar to compatibility factor in Rogers's diffusion of innovation model is applied to a degree that innovation is proportional to the existing potential values, previous experience and current needs (Rogers, 1983). According to Rogers (1995), few studies have investigated the relationship between the cultural perception and the rate of technology adoption. Harper (1987) claimed that the study of the role of culture on technology perception is significant in examining individuals' attitudes towards IT. He contended that culture can play a role in the existence of negative attitudes

towards computers for two reasons: first, "people's apprehension that life is becoming too mechanical, so they resist contributing to a computer culture. The second cause is related to this concern that there are some social problems that need to be solved before computer-education is addressed" (p. 47). In a study by Al-Oteawi (2002), it was revealed that Saudi teachers avoided using the Internet in their instruction due to the fear of encountering unethical material. Most of the teachers perceived the materials found on the Internet to be unsuitable to Saudi culture. Tornatzky and Klein (1982) in their study found that if technology is compliant with the individual's job responsibilities and value system, it will have more compatibility.

Perceived Usefulness and Perceived Ease of Use

According to Davis (1986, 1989), TAM has two significant dimensions of cognitive response that emerged from external variables. Many studies stated that perceived usefulness and perceived ease of use are two crucial beliefs for computer acceptance behaviors in TAM (Davis, 1989; Davis et al., 1989). Karimi-Alavije et al. (2007) showed that perceived usefulness and perceived ease of use played an important role in computer usage in education. Legris and colleagues (2003) stated that perceived usefulness and perceived ease of use have been considered important to understand the individual's acceptance and use of technology.

PU is an individual's subjective assessment of the extent to which using an ICT will enhance the individual's performance in achieving relevant objectives. Although this construct is usually reflexively associated with the Technology Acceptance Model (TAM) (Davis, 1989), it is also present in several other important models of ICT acceptance. For instance, PU is a key component in the Decomposed Theory of Planned Behavior model of

ICT acceptance (Taylor & Todd, 1995a). According to Agarwal and Prasad (1998) and Plouffe, Hulland, and Vandenbosch (2001), the construct Relative Advantage, in the Perceived Characteristics of Innovation model (PCI) of ICT acceptance (Moore & Benbasat, 1991), and in the Diffusion of Innovation Theory (Rogers, 1995), is identical to PU. In the Unifield Theory of Acceptance and Use of Technology model (UTAUT) the construct Performance Expectancy is equivalent to PU (Venkatesh et al., 2003).

PU in ICT acceptance models is usually applied as the determinant factor of ICT acceptance by an individual. PU mechanism in all models of information technology acceptance is one of the most important determinant/background factors of ICT acceptance by the individual in the long-term and short-term. In many researches it is the only stable and important determinant factor of information technology in the long-term (Vankatesh et al., 2003).

Lopez and Manson (1997) studied perceived usefulness and other factors that influenced technology acceptance. Their research stressed the importance of understanding the motivations to use of ICT, as unused technology was considered wasted. Lopez and Manson determined that perceived usefulness was a principal determinant of use, and was a greater determinant than ease of use.

Intention and Attitude

During the early 1970s the Theory of Reasoned Action was developed and expanded upon by Ajzen and Fishbein. By 1980 the theory was used to study human behavior and develop appropriate interventions. This theory provides a framework for studying the link between attitudes and behavior. According to the theory, the most important determinant of a person's behavior is behavioral intent. The individual's intention to perform a behavior is a

combination of his or her attitude toward performing the behavior and subjective norms. Ajzen and Fishbein (1980) assumed that individuals are usually quite rational and make systematic use of information available to them. Accordingly, people "consider the implications of their actions before they decide to engage or not engage in a given behavior" (p. 5).

According to Fishbein and Ajzen (1975) attitudes are learned presuppositions that are used to respond to an object in a favorable or unfavorable form. Attitude is defined as a positive or a negative feeling associated with performing a specific behavior (Ajzen & Fishbein, 1980). Fishbein and Ajzen (1975) suggested that it is possible to determine attitudes by beliefs and attitudes are the bridge between belief and tendency before behavior is operationalized.

Fishbein stipulated that individuals will have a favorable attitude if they believe that the performance of the behavior will lead to mostly positive results and vice-versa. In other words, a person's attitude toward a behavior consists of 1) a belief that that particular behavior leads to a certain outcome and 2) an evaluation of the outcome of that behavior (Zeinab, 2006).

Ajzen and Fishbein (1980) indicated that attitudes consist of three elements: affect, cognition, and behavior. The affective element refers to the individual's emotional feelings or liking of a person or an object. The cognitive element refers to the person's knowledge about a person or an object. The behavioral element refers to the person's overt behavior towards a person or an object. According to Ajzen and Fishbein, "a complete description of attitude requires that all three components be assessed by obtaining measures of all the three response classes" (1980, p. 20).

Rogers (1995) asserted that attitudes determine whether a person is willing to try a new innovation or not. Woodrow (1992) suggested that a teacher's positive attitude toward technology is a "necessary condition for the effective use of computers in the classroom" (p. 200). According to Chin and Hortin (1994), the teacher clearly must act as the "change agent" (p. 83) in the relationship between instructional technology and the learner. With the explosion of information in all areas of our lives, the growing need for a more competent workforce increases the pressure for IT integration in university classrooms. In large part, then, the responsibility for preparing highly qualified workers who can cope with the challenges of a global economy rests on teachers. In order for teachers to integrate technology successfully in their classrooms, it is crucial that they cultivate and maintain positive attitudes toward technology and attain adequate computer skills (Hignite & Echternacht, 1992).

Multiple research studies have investigated employees' attitudes toward computer and information technology in many regions and with a variety of technology computer systems (Brumini et al., 2005; Karimi-Alavije et al., 2007; Moody et al., 2004; Smith, Smith, Krugman, & Oman, 2005). The study designs ranged from pre-post computerization studies to non-experiment descriptive studies that examined the variables influencing computer acceptance. The descriptive studies tried to correlate attitudes with variables such as age, years of experience, computer experience, and education level. The results in some studies support each other. Interestingly though, other studies show conflicting results even though researchers used the same instrument with the same population.

Loyd and Gressard (1986) found that teachers' positive attitudes toward computers correlated positively with their experience in using computers. Many researchers have observed that successful technology integration in the classroom depends primarily on

addressing teachers' attitudes towards computers (Kluever, Lam, Hoffman, Green, & Swearingen, 1994; Selwyn, 1997).

Christensen and Knezek (2002) conducted a study of teachers' attitudes, skills, and access to computer tools in Laredo, Texas. They used combined research instruments, including the Teachers' Attitude towards Computer (TAC), Teachers' Attitudes towards Information Technology (TAT), Teacher Perceptions Self-Assessment (TPSA), Stages of Adoption (Rogers, 1995) and Concern-Based Analysis Measure (CBAM) throughout the spring semester of the 2000-2001 school years, among a sample of 517 teachers representing 21 public schools in the district. The researchers found that the teachers' competence and confidence in their computer use correlated with their home access. Accordingly, the researchers surmized that frequent use of a computer at home would increase a teacher's level of confidence when using technology in school.

Kotrlik, Harrison, and Redmann (2000) conducted a study comparing ICT training, knowledge, and skills among Louisiana secondary vocational teachers. The population for the study consisted of all vocational teachers in Louisiana, and a stratified random sample of 1,126 of these teachers was used. The results of the study indicated that secondary vocational teachers in Louisiana had limited access to both the Internet and new technologies. Nevertheless, most of the teachers thought highly of technology regardless of their program area. Although the study revealed positive attitudes towards ICT, the knowledge and skills of the teachers surveyed were found to be average to below average both in terms of software as well as general computer competency. Even more importantly, the results indicated that most of the teachers were self-taught or self-directed, depending on the extent of their personal experience and opportunities to attend in-service workshops provided by the state. A very low percentage of teachers reported participating in any college courses or workshops related to instructional technology in the classroom.

Some studies have determined that age is an important factor in relation to teachers' attitude towards computers; these studies include Blankenship (1998); Kendel (1995); Mahmoodi (2004); Yaghoubi (2009); Abpeima (2003) and Movahed Mohammadi (2004). In contrast, Subair and Kankgenna (2004) have shown that some studies such as Handler (1993); Massoud (1991); and Woodrow (1992) found no significant relationship between age and attitude towards computers.

Kersaint, Horton, Stohl, and Garofalo (2003) in a similar study perceived that positive attitude of teachers about modern educational technology facilitates its use in schools and universities and merges technology with teaching. Also Al-Qeisi (2009) found that most educators who had negative or neutral attitude about ICT acceptance in education did not have the necessary knowledge and skill about computers and technologies which enable them to make decisions deliberately. A negative and significant correlation was observed between amount of the existing obstacles in the path of ICT usage and educators' attitude towards impact of such technologies on enhancement of education quality in this study.

Results of Sooknanan's research (2002) in Trinidad and Tobago demonstrated that educators' attitude towards ICT is related with relative advantages, compatibility and capability of observing technologies. Bullock (2004) in a study perceived that attitude of professors is an effective factor or a strong obstacle in technology acceptance.

2.7 Conclusion and Representation of the Conceptual Model

The need to determine effective factors on preparing, developing and improving technical skills of educators at the global level is vital due to the global nature of ICT. As emerging educational technology is a main driver in higher education (e.g. Blumenstyk, 2006; Conole, Laat, Dillon, & Darby, 2008; Hiltz & Turoff, 2005), a review of educational technology trends and issues, as well as technology acceptance in education, was conducted to discover what is already known within these areas of research.

Given the above issues and by studying literature of accomplished studies it appears that various individual-professional and psycho-social factors affect ICT acceptance by educators and faculty members. This issue is very important in Iran's higher education including Islamic Azad University.

In technology acceptance research, three constructs, CSE (e.g., Bandura, 1997; Compeau & Higgins, 1995; Havelka, 2003), CA (e.g., Heinssen et al., 1987; Venkatesh, 2000), and EUT (e.g., Agarwal & Karahanna, 2000; Igbaria & Iivari, 1998; Sun & Zhang, 2006; Thompson et al., 2006), have consistently been found to have a significant impact on technology acceptance; therefore, research studies related to these constructs were included in the literature review. These constructs have been found to have both direct and indirect influences on technology acceptance, and on each other.

As a general conclusion we can say that ICT usage by faculty members is a complicated and multi-dimensional phenomenon affected by various factors. The most important effective factors in this field that have been studied and confirmed in most surveys are selected in this study and their relation with ICT acceptance variable has been examined. Age, gender, teaching experience, experience of working with ICT, scientific

rank, educational group and university, English language qualifications, computer competencies among educational-research factors and computer self-efficacy, computer anxiety, management support, perceived usefulness, perceived ease of use and intention to use among psycho-social factors are considered as effective factors on ICT usage. Finally the researcher represented the research conceptual model based on the above mentioned theories and models as well as the literature review. It is represented in Figure 2.8.

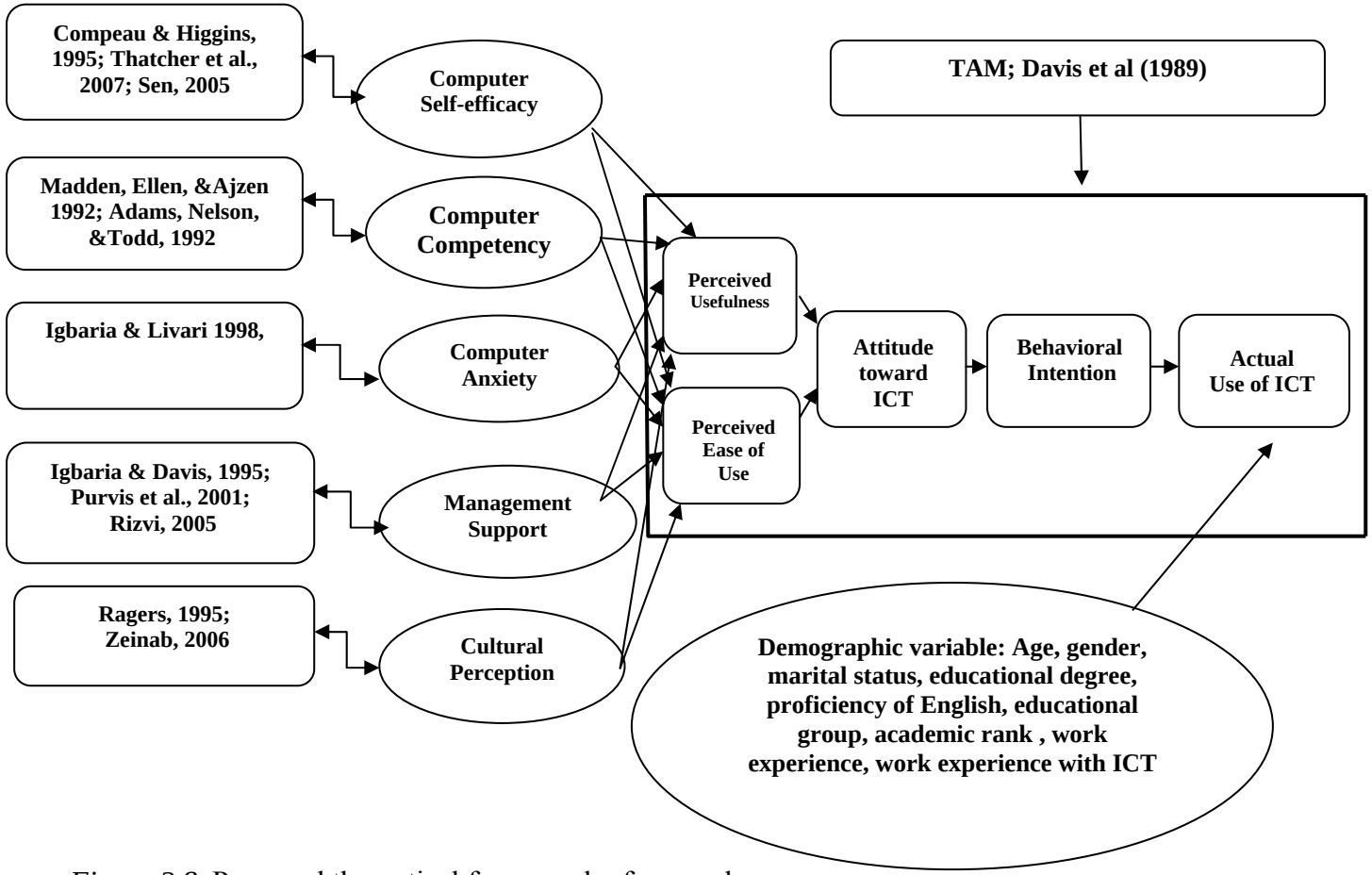


Figure 2.8. Proposed theoretical framework of research.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter will illustrate the procedures and methods used to conduct this research. It is organized under the following sub-headings: introduction to methodology, research design, statistical population of the study, sampling procedure, sample size of the study, instrumentation, pilot study, reliability and validity, data collection and data analysis scheme.

The chapter also outlines the research plan to answer the research questions. The study was conducted in three phases; the first phase dealt with the construction of the research instrument, the second phase involved the pilot study to assess the reliability and validity of the instrument and the final phase was explanation of the analysis method to obtain accurate results from the study. This study employed a survey research methodology in order to examine the causal-effect of the faculty members' social - psychical perceptions on perceived usefulness and perceived ease of ICT use and their attitudes and intentions toward use of technology between faculty members of IAU.

3.2 Research Design

Based on manipulation of research variables it is possible to classify research into two kinds: experimental and non-experimental researches. If the independent variable is manipulated and it is possible to change it, we will deal with the group of experimental,

semi-experimental and pre-experimental researches. But if it is impossible to manipulate the independent variable, descriptive research plans are used. The objective of this researcher is to perform descriptive researches in order to obtain an objective, real and regular description of characteristics of a situation or a subject. In other words, the researcher tries in such researches to report "what exists" without any interference or mental inference and gains objective conclusions from the situation (Naderi & Seif Naraghi, 2003).

The basic aim of survey research that is placed in the scope of descriptive researches is to describe and explain statistically the variability of certain features of a population (Delavar, 2007).

Surveys also are amenable to rapid statistical analysis. The design of the research does not allow any manifestations or manipulations of the independent variables nor the dependent variables since "their manifestations have already occurred or they are inherently not manipulated" (Kerlinger & Lee, 2000, p. 558). Therefore, inferences about the characteristics of the population were made based on the natural behavior of the variables.

Among the assumptions of survey research we can refer to discovering the relation among various variables, so that survey research is used to discover data or information through which we can study relations among the variables (Delavar, 2007).

It is believed that collective perceptions and attitudes of organizational members can be conveniently measured using a survey (Shaughnessy & Zechmeister, 1990). Leedy and Ormrod (2005) stated that "Survey research involves acquiring information about one or more groups of people – perhaps about their characteristics, opinions, attitudes, beliefs, personal, previous experiences, and social facts regarding certain issue– by asking them questions and tabulating their answers" (p. 183).

In this research, survey method was selected since it is considered best adapted to obtaining information on factors affecting ICT usage among the faculty members of the IAU. The nature of the private universities that was widely scattered over a broad area made survey the best method of study. Moreover, a survey method is useful in this context because:

a) a standardized format is used to collect information (Rodeghier, 1996)

b) a well-drawn sample can be performed to allow research results to be generalized to the population in a rigorous fashion (Fraenkel & Wallen, 1996)

c) questions can be asked systematically making it possible to describe relationship among variables (Shaughnessy & Zechmeister, 1990)

d) as Weisberg, Krosnick, and Bowen (1996) suggested, the survey method is suitable for testing a pre-established model. For survey research, varieties of statistical methods permit the empirical study of the adequacy of proposed models and advanced theory development (Raykov & Widaman, 1995).

e) survey research is concerned more on average responses or group measures than individual responses. The reliability of average responses is higher than the reliability of individual responses (Kerlinger & Lee, 2000).

Cross-sectional study which is the most commonly used survey method was applied because it can be used to assess interrelationships among variables within a population and is ideally suited for descriptive and predictive purposes (Shaughnessy & Zechmeister, 1990). This study was specifically designed to guide and obtain empirical evidence for the following conceptual framework:

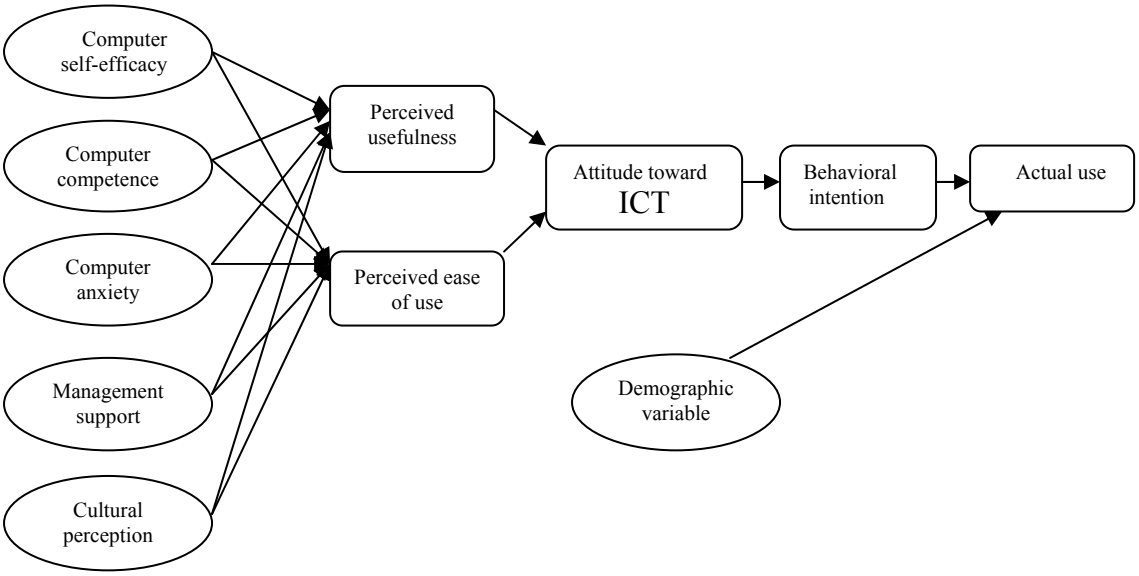


Figure 3.1. The proposed conceptual model.

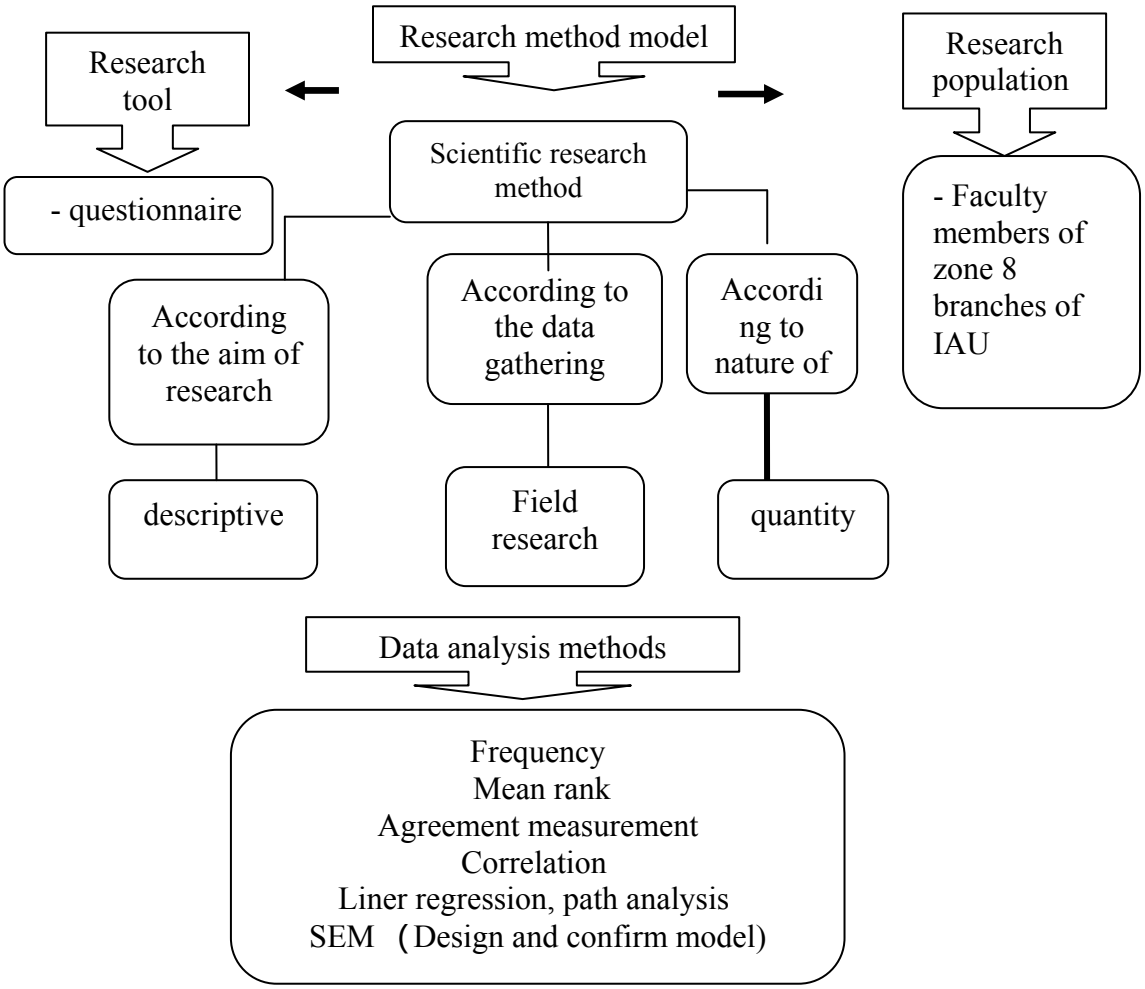


Figure 3.2. Research method model according to data gathering method.

3.3 Statistical Population of the Research

The statistical population of this study was all full-time faculty members who were working in a private university in Iran in Tehran province during semester 1 of the 2009-2010 academic year. Private universities in this study include zone 8 of branches of Islamic Azad Universities as it has been mentioned in the operational definitions section. Islamic Azad University was established in Iran after Imam Khomeini's order. In fact it is the biggest and oldest private university in terms of number of students, number of faculty members, educational facilities and different educational levels especially Master and PhD. There are 350 branches of Islamic Azad University in Iran distributed in fourteen (14) zones (Table 3.1).

Table 3.1

The Frequency of Faculty Members in Different Zones

The number of zones in Iran	The number of Full time Faculty members	Selected zone
1	2291	
2	1520	
3	2092	
4	2283	
5	1875	
6	1621	
7	977	
8	**3898**	**Zone 8**
9	1464	
10	1065	
11	871	
12	2486	
13	1847	
14	290	
-	23580	

Among those Tehran province as zone 8 with the population of 3898 has the highest number of full-time faculty members (ICT center of IAU, 2009) and the sampling frame of the respondents was obtained from IAU branches in the Zone.

Therefore, IAU branches of zone 8 have been selected as the unit of study in this survey. This zone includes: South of Tehran, Center of Tehran, North of Tehran, East of Tehran, West of Tehran, Tehran Medical, Islamshahr, Science and Research and Share-Rey branches that have five different faculties, namely: Engineering, Basic Science, Human Sciences, Medicine, Art & Architecture.

3.4 Sampling

Usually, a probability sample of the population is used because surveys strive for generalizability of sample statistics (external validity). The ultimate purpose of survey sampling is to select a set of elements from a population in such a way that descriptions of those elements accurately describe the total population from which they are selected. The researcher used simple random sampling method with proportional assignment in order to select the sample population.

The most popular and rigorous form of probability sampling from a population is simple random sampling. In this method, the researcher selects participants (or units) for the sampling, so that any individual has an equal probability of being selected from the population. The intent of simple random sampling is to choose individuals to be sampled who will be representative of the population. Any bias in the population will be equally distributed among the people chosen (Creswell, 2008, p. 153).

In random sampling method we can divide the sample volume (n) among various parts of the statistical population with different methods. The simplest method is equal division of sample number and proportional assignment is another method to determine sample volume in various parts of the statistical population. In proportional

assignment, sample volume is determined to the proportion of each branch's volume. Proportional assignment has been used in this survey to determine sample volume in each university branch given that number of faculty members was not similar in different university branches. Number of faculty members and sample size of each branch are given in Table 3.2 separately.

Table 3.2
Number of Faculty Members and Sample Size of Each Branch

Branches that selected in sampling	Number of Full time Faculty members in each branch	Sample size	Sampling method
Sciences and research	564	46	
South of Tehran	529	43	
North of Tehran	470	38	
Tehran Medical	309	25	Simple
Islamshahr	281	23	random sampling
West of Tehran	275	23	with proportional
East of Tehran	151	12	allocation
Center of Tehran	987	80	
Shahre- Rey	332	27	
Total	3898	316	

3.5 Sample Size

Determining sample volume and size of the sample group is one of the main problems researchers encounter in their research. So it is suggested to select as big a sample volume as possible (Cochran, 1997), because the mean and standard deviation of the sample group in the intended feature or variable are more similar to those of the population. Sample volume has a close relation with null hypothesis testing in the research. When the size of the sample group is bigger, the researcher rejects the null hypothesis with more certainty (Naderi & Seif Naraghi, 2003). Moreover, it is stated

that the greater the sample size, the lower the standard error. As a result, when sample size is very small it affects generalizability of the research to the total population (Moser & Kalton, 2001). A large sample of respondents was considered in this study in order to decrease the possibility of errors. Hence, because there are various methods to estimate sampling and sample size, and size of the sample has a high sensitivity; it is necessary to do it with ultimate accuracy and consider the most appropriate sampling.

In this study I used the Cochran formula to estimate sample volume of faculty members and by paying attention to variance, total number of the population, the confidence level or "d" of the table and probable accuracy or range of the acceptable error in sample choice (Naderi & Seif Naraghi, 2003); sample size was estimated sufficiently based on the following formula:

$$n = \frac{Nt^2S^2}{Nd^2 + t^2S^2} = \frac{(3898)(1.96)^2(0.21)}{(3898)(0.05)^2 + (1.96)^2(0.21)} = 316$$

$N = 3898$

$t = 1.96$

$S = 0.21$

$d = 0.05$

N = Target population

t = Value for selected alpha level of .025 in each tail

s = Estimate of *SD* in the population

d = Acceptable margin of error for proportion being estimated (error researcher is willing to except)

n = Sample size

Therefore, three-hundred and sixteen (316) professors of Zone 8 Azad Universities were selected by simple random sampling method. Among three-hundred and sixteen (316) sent questionnaires, two-hundred ninety one (291) of them were returned and respondents` viewpoints and opinions about effective factors on ICT usage among faculty members were studied. The results of Dillman et al. (1993) were

somewhat mixed in that they found that the initial middle-length form (micro) elicited the highest response rate differences were easily erased by simple rate (71.4%), followed by the shortest (roster) form follow up procedures. In the Sirken et al. (1999) study, the three groups (70.9%), did not produce indistinguishable results after a second mailing. Both yielded significantly higher response rates.

On the other hand, sample size plays an important role in almost every statistical technique applied in empirical research. Although there is universal agreement among researchers that the larger the sample relative to the population the more stable the parameter estimates, there is no agreement as to what constitutes large, due to the exceeding complexity of this matter. This topic has received a considerable amount of attention in the literature, but no easily applicable and clear-cut general rules of thumb have been proposed. To give only an idea of the issue involved, a cautious and simplified attempt at a rule of thumb might suggest that sample size would desirably be more than 10 times the number of free model parameters (Raykov & Marcoulides, 2006).

3.6 Research Variables

The researcher is facing with independent and dependent (or latent) variables in the present survey. Latent variables are unobservable or theoretical variables that are measured by manifest variables (or indicators). Dependent variables are often called internal because it is assumed that their reason is determined from inside of the model. Independent variables are often called external variables (i.e., their factor is determined from outside of the model). Each latent variable is determined by a number of measurable indicators. In this regard it should be considered that external variables are essentially independent variables and thus they should not be affected by any variable in

designing the model and drawing relations among the variables. On the other hand, internal variables are affected directly by other model variables and are determined by them. At the same time it must be considered that although internal variables are always regarded as dependent variables in the model, such variables could play their role as independent variables to describe other internal variables under certain conditions (Kalantari, 2009).

According to the Technology Acceptance Model (TAM), Technology acceptance consists of observable and provable inclination of a group of employees to apply a technology for an action where technology has been designed for their support (Dillon & Morris, 1996). The Classic information system model has been designed for describing the computer application behavior and related structures to technology acceptance (Davis, 1986, 1989). The technology acceptance model (Davis, 1989; Venkatesh, 1996) is designed to predict to whom the modern technology acceptance has the highest possibility in the working environment.

In regard to TAM, behavioral intention, attitude toward ICT, perceived usefulness and perceived ease of use as moderate- dependent variables were latent variables that help to realize actual use as final and latent dependent variable.

Other existing variables in the model (computer competence, cultural perception, management support, and computer self-efficacy and computer anxiety) as independent variables measured some personal and professional characteristics of individuals that were assessed impact of factors on the model. Each of the independent variables is measured by observable variables or indicators. All of these indicators have been measured through a five-point Likert type ordinal scale.

On the other hand demographic variables such as age, gender, educational level, marital status, professional rank, field of study, level of English proficiency, teaching

experience, working experience with ICTs, educational group, and faculty are the other variables that are measured for their impacts on the dependent variable.

3.7 Research Hypotheses

The main hypothesis of this study was investigated from the literature review and experience of field research, these include:

1. There is a significant difference among the demographic variables (age, gender, educational level, marital status, professional rank, field of study, level of English proficiency, teaching experience, and working experience with ICTs, educational group, and faculty) and actual use of ICT.

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4 \ldots$ v.s $H_1 : \mu_1 \# \mu_2 \# \mu_3 \# \mu_4 \ldots$

$H_1 : \mu_1 \# \mu_2 \# \mu_3 \# \mu_4 \ldots$

2. There is a significant relationship among the computer competence, cultural perception, management support, computer self-efficacy, computer anxiety and perceived usefulness.

$H_0: r = 0$ v.s $H_1: -1 < | r | \leq 1$

3. There is a significant relationship among the computer competence, cultural perception, management support, computer self-efficacy, computer anxiety and perceived ease of use.

$H_0: r = 0$ v.s $H_1: -1 < | r | \leq 1$

4. There is a significant relationship among the perceived usefulness, perceived ease of use and attitude toward ICT.

$H_0: r = 0$ v.s $H_1: -1 < | r | \leq 1$

5. There is a significant relationship among the perceived usefulness, perceived ease of use and behavioral intention.

H_0: $r = 0$ v.s H_1: $-1 < |r| \leq 1$

6. There is a significant relationship among the attitude toward ICT and behavioral intension.

H_0: $r = 0$ v.s H_1: $-1 < |r| \leq 1$

7. There is a significant relationship among the behavioral intention and actual use of ICT.

H_0: $r = 0$ v.s H_1: $-1 < |r| \leq 1$

8. All of significant variables have impact on the actual use of ICT.

9. H_0: $R = 0$ v.s H_1: $0 < R \leq 1$

10. Field model has fitted to the conceptual model.

3.8 Research Instrument

Given that the present survey has a descriptive-field plan the questionnaire is the most appropriate measurement tool in these researches. The intended factors were exploited to compile the questionnaire by referring to literature and background of accomplished researches in the field of effective factors on ICT usage and by emphasizing the proposed approaches and theories. Then indices related to the above mentioned factors were regulated as a questionnaire.

The survey instrument developed and used for this study was based upon the application of the parameters associated with the proposed model in the research. A large body of literature on similar subject was thoroughly examined. Some of the items in the studies were considered, modified and later refined through pilot test in order to achieve a robust and relevant research instrument to answer the research questions in this study.

A questionnaire as shown in Appendix A was the research instrument used for data collection. Besides the ten parts of this questionnaire, there were also a few single item responses eliciting simple concept on background and demographic information such as age, gender, educational level, marital status, and professional rank, field of study, level of English proficiency, teaching experience, and working experience with ICTs, educational group, and faculty. These constructs were collected in the questionnaire items as in Table 3.3.

Table 3.3

Name of Variables and Number of Items

No	Name of Variable	Number of items
1	Computer Self-efficacy	20
2	Computer Competence	31
3	Computer Anxiety	20
4	Management Support	18
5	Cultural Perception	25
6	Perceived Usefulness	22
7	Perceived Ease of Use	10
8	Attitude toward Using computer	28
9	Behavioral Intention to Use	10
10	Actual Use	18
11	Demographics	10
	Total	182

The structure of various parts of the questionnaire is as follows:

3.9 Pilot Study

I conducted a pilot study to examine the comprehensibility of the translated questionnaires and their capability of eliciting valid responses and to establish the reliability of the instruments. Mostly, "in quantitative studies and pre-testing, a pilot study is needed either to try out the instrument or to supply the findings for actual study" (Kerlinger, 1992, p. 648). Indeed the purposes of the pilot test were to:

1. Determine whether the variables were reliable,
2. Identify ambiguous items and suggest necessary changes in the questionnaires.
3. Further validate the instrument for content and clarity of instructions, and
4. Ensure that the subjects were able to understand the test items without any difficulties.

In this research, before conducting the main study, a pilot test was conducted to determine the validity and reliability of the instrument using Confirmatory Factor Analysis (CFA) and Cronbach's alpha respectively.

Thirty (30) persons responded to the pilot study in one participating university in Iran. The pilot test involved giving self-administered questionnaires to the participants. These respondents were selected to ensure that they had similar characteristics to the respondents in the target population. The questionnaires were distributed to the respondents and were collected a week later. The questionnaire was translated into Persian through the back translation procedure by two independent translators. The Persian version of the questionnaire showed the same factor structure as the original questionnaire.

3.10 Validity of the Instruments

In this study, the threats to validity are addressed to maximize the quality of the survey and improve the generalizability of the findings. Validity refers to the degree to

which a test measures what it is supposed to measure (Gay, 1997, p. 155). In another definition, validity is a matter of degree; it cannot be determined directly. Validity is part of a dynamic process that grows by accumulating evidence over time, and without it, all measurement becomes meaningless (Bohrnstedt, 1992, p. 2217).

This study entailed two types of validity, which are:

Content Validity or the degree to which a test measures the intended content area. Creswell (2008) defined content validity as: "the extent to which the questions on the instrument and the scores from these questions are representative of all the possible questions that could be asked about the content or skills" (p. 638).

Regarding the fact that the present research is about the effective factors in the ICT use among IAU faculty members in Tehran, I first prepared a review of the related literature of this subject, and then emphasized some approaches such as Diffusion of Innovation (DOI), Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Decomposed Theory of Planned Behavior (DTPB), and Technology Acceptance Model (TAM) in order to determine effective variables affecting ICT usage. The variables affecting ICT are as follows: personal characteristics, computer self-efficacy, computer anxiety, cultural perception, computer competences, management support, perceived usefulness, and perceived ease of use, attitude, and intention to use. Therefore, for each of the aforementioned scales, some indices are considered and some questions designed.

It is important to note that after designing questions related to each index, ten ICT experts and social psychologists were asked to validate the items of the instrument and then the questions were revised to strengthen the content validity of the questionnaire; to facilitate the process, a special form of analysis of the questions' characteristics was made.

Table 3.4 gives the indices for various characteristics explored in the survey questionnaire.

Table 3.4

Statistical Index Related to Content Validity of the Questionnaire

Index	Vali-dity	Accu-racy	Representa-tiveness	Appro-priateness	Clarity	Meaningful-ness	Usefulness
Self-Efficacy	5	5	4.80	5	4.80	4.40	4.40
Anxiety	4.80	4.60	4.60	4.80	4.80	4.60	4.80
Computer competence	4.80	4.60	4.80	4.80	4.80	4.80	4.80
Management Support	5	4.80	4.80	4.80	4.80	4.40	4.40
Use of IT	4.80	4.60	4.80	4.60	4.60	4.80	4.60
Attitude toward ICT	4.60	4.20	4.40	4	4.80	4.20	4.40
Perceived Usefulness	4.40	4.40	4.40	4.40	4.40	4.60	4.40
Intention to Use	4.60	4.60	4.60	4.60	4.80	4.40	4.60
Perceived Ease of Use	5	4.60	4.60	4.80	4.80	4.80	4.60
Cultural Perception	3.80	4	4	4	4.60	4	4.40
Total	4.86	4.54	4.58	4.58	4.72	4.50	4.54

Concerning Table 3.4 and the emphasis on the mean number obtained from the seven indices of validity, accuracy, representativeness, appropriateness, clarity, meaningfulness, usefulness and regarding the fact that all the numbers are more than 3 (assumed mean), we can claim that all the mean numbers of the indices were more than

3 and according to the experts (Delavar, 2007) this questionnaire has attained content validity.

Construct Validity is the degree to which a test measures an intended hypothetical construct (Gay, 1997). Construct validity seeks agreement between a theoretical concept and a specific measuring device or procedure. Evidence to support the construct validity of an instrument can take many forms and validity of such scales can be determined by statistical and non-statistical means (George & Mallery, 2007). In this research, the approach was used to demonstrate that the items within the scales were inter-related and therefore measure a single construct (Kline, 1994). Confirmatory Factor Analysis (CFA) was used to determine the construct validity of the instrument.

Factorial analysis related to each of the 10 exploited factors is illustrated in Appendix B and they are stated in the following:

Confirmatory Factor Analysis for Construct Validity (Computer Self-efficacy)

Confirmatory Factor Analysis (CFA) is a theory-driven, data reduction technique that uses either the correlation or covariance matrix to identify patterns or clusters within data. Researchers can specify a priori the number of factors that a scale should contain, as well as the items that should load on each factor.

The first action in the process of factor analysis that is considered as its first assumption too is dealing with missing data. Such data that is called lost data too can alter the process of factor analysis. It must be noted that factor analysis is the most sensitive statistical technique that gives importance to the missing data and it is not possible to be sure of the data obtained from it when such data is enhanced. Therefore, the first assumption is stated as minimum missing (less than .05).

In the process of dealing with missing data two methods are used and number .02 is considered. It means that if a specific examinable item has not answered to more

than .02 of questions, it must be put aside in the research process. No examinable item has left any question without answer in this section, thus none of them has been omitted from statistical analysis. Hence, assumption of factor analysis entitled minimum missing (.02) is observed in any examinable item. This action was done for each question too and their ambiguity coefficient was determined by referring to non-responding. It was determined that all questions had a high explicit coefficient so that ambiguity coefficient of all questions was lower than .02.

The second assumption of factor analysis is related to adequate sample volume. In this step amount of Kaiser- Meyer- Olkin (KMO) must be considered as sampling adequacy index. Most experts in the field of factor analysis recall KMO as the size of sampling adequacy index that has been calculated by three well-known persons -Kaiser-Meyer-Olkin- which could show the amount of sampling adequacy.

When the KMO index is lower than .80 it is not possible to rely on findings obtained from factor analysis. In other words, when KMO is between .80 and .90 we can state that it introduces appropriate adequate sample volume. Meanwhile, when KMO is more than .90, it is recalled as a totally desirable characteristic in sample volume. The following table shows amount of KMO and its interpretation in the field of sample volume adequacy:

Table 3.5

Kaiser- Meyer- Olkin (KMO) Test:

	KMO Test
Kaiser- Meyer- Olkin	0.856

The third assumption of factor analysis is recognized as multi-variable distribution normality. Normality characteristic in multi-variable distributions has been stated in another form and the term sphericity is used for it. Sphericity that is called multi-

variable distribution normality or co-variance matrices normality too has no concept by itself and mathematical distribution of chi-square approximation must be emphasized in identifying sphericity.

When amount of sphericity is significant in chi-square approximation, we can state that sphericity has become significant. Degree of freedom has been used to determine the corresponding point in chi-square approximation such that its amount has a close relation with sample volume. Complicated mathematical formulae are used to calculate it and stating them here is beyond the subject of the present discussion. Therefore it is mentioned that there are special tests for sphericity and in other words interpretation of amount of sphericity is accomplished in chi-square approximation and its significance shows sphericity. The Bartlett test, Hartley test and in rare cases Lion test are used to identify and study sphericity. Bartlett test is one of the most valid tests used for identifying sphericity by emphasizing chi-square approximation in the process of factor analysis. Table 3.6 shows multi-variable distribution normality:

Table 3.6
Bartlett's Test

Test	Characteristic	Value
Bartlett's Test of Sphericity	Approx. Chi- Square Df Sig.	3385 45 .000

Table 3.7
Studying Degree of Sphericity

Sphericity Test	Degree of chi-square approximation	Degree of freedom	Significance level	Interpretation
Bartlett test	6575.267	190	.001	Total sphericity (multi-variable distribution normality has been obtained)

The fourth assumption of factor analysis is to determine communality degrees. It means that correlation of each question with the whole test must introduce internal homogeneity of questions, that is, each question must have communality with the whole test. When communality of each question is less than .03, it is necessary to omit that question from the whole factor analysis and the whole scale. Table 3.8 shows communality values. The first column from the left shows the number of questions and the second column illustrates degree of extraction (degree of communality or loading scale):

Table 3.8
Communalities Extraction Method: Principal Component Analysis

	Initial	Extraction
Self- efficacy	1.000	.790
Anxiety	1.000	.716
Computer competency	1.000	.860
Management support	1.000	.622
Actual use	1.000	.854
Attitude toward ICT	1.000	.901
Usefulness	1.000	.923
Intention	1.000	.825
Ease of use	1.000	.725
Culture	1.000	.892

Therefore, given that all loading scales or communality coefficients of questions with the scale exceed .04, we can perform factor analysis by emphasizing all questions. Thus, the first assumption (minimum missing less than .02 in each examinable item and in each variable), the second assumption (adequate sample volume), the third

assumption (obtaining multi-variable distribution normality or sphericity) and fourth assumption (communality degree of each question with the whole test more than .04) have been obtained and all these assumptions show the researcher can proceed with performing the factor analysis.

The fifth assumption of factor analysis is explained variance higher than .60. Thus, minimum explained variance in the process of extraction of factors must be .60 by emphasizing 20 questions. When explained variance is more than .80, desirable psychometric conditions are performed to extract factors and reduction process of 20 questions to basic factors has been performed precisely. Table 3.9 shows explained variance that is designed by referring to the sum of squared factorial loads related to extraction of factors and is focused on portion of each factor in the whole explained variance of the scale. It is notable that the first column from the left shows number of factors, the second column shows eigenvalue, the third column shows variance or portion of each factor and the fourth column shows common explained variance:

Table 3.9

Total Variance Explained

Component	Extraction Sums of Squared Loading		
	Total	% of Variance	Cumulative %
1	43.909	43.909	4.391
2	81.074	37.165	3.716

Extraction Method: Principal Component Analysis

Since eigenvalue is defined as sum of squared factorial loads (Nunally, 1978) basic factors must be recognized.

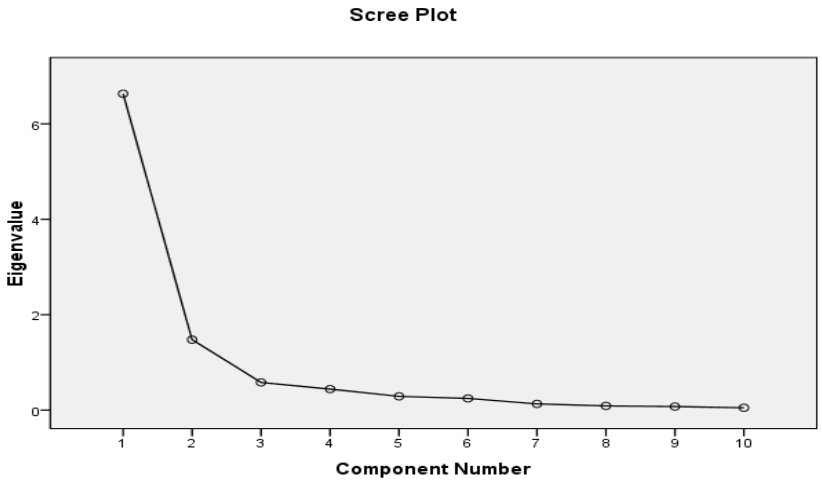


Figure 3.3. Scree plot.

By referring to the Scree plot, explained variance table and columns of initial eigenvalues (three left columns) and extraction sums of squared loadings (three middle columns) it is stated that three factors are maximally extracted among which the first factor has a high explained variance and this amount in Scree plot could be observed more precisely.

After precise studying of components' matrix, table rotation method is used to determine factorial load of each question through this by emphasizing the settlement of each question in one of the eight factors. Varimax rotation method is applied by stressing that exploratory factor analysis has been followed in this survey and principal components technique has been used from extraction of factors. Table 3.10 is proposed as a matrix of rotated components:

Table 3.10

Rotated Component Matrix

	Component	
	1	2
Computer Self- efficacy	.383	.802
Computer Anxiety	-.837	-.121
Computer competency	.347	.860
Management support	.055	.787
Actual use of ICT	.292	.877
Attitude toward ICT	.829	.463
Perceived Usefulness	.907	.317
Intention toward ICT	.790	.448
Perceived Ease of use	.583	.620
Cultural Perception	.928	.174

Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 3 iterations.

Finally, it has been determined that two factors are extracted from factor analysis rotation.

3.11 Reliability of the Instruments

Reliability is the extent to which measures are free from error (Litwin, 1995). Gay (1997) and MacMillan and Schumacher (1993) explain reliability as the degree to which a test consistently measures whatever it measures. Normally, reliability is established by determining how each item relates to all other items on the total test. In another definition by Neuman (1997), reliability deals with an indicator's dependability.

Thus, the information provided by indicators or questionnaire does not vary because of characteristic of the indicator, instrument, or measurement device itself. Besides, the reliability can be determined by conducting Cronbach alpha level calculation using the Statistical Package for the Social Sciences (SPSS) Program.

The aspect of reliability that is being stressed is homogeneity or internal consistency. Reliability assessed how well the various items in a particular scale reflect the attributes they are trying to measure. Reliability analysis was also used to determine that score of each item on a particular scale can be added to give the total score since the items are homogeneous.

According to Gay (1997), Cronbach alpha is the most appropriate way of establishing reliability. Cronbach's alpha was used to compute items' internal consistency. Evidently, it has been stated by Nunally (1978) and others that an item with alpha value of .70 and above is deemed as reliable and acceptable.

In order to determine reliability of the questionnaire based on completed questionnaires in PILOT and by means of SPSS software reliability coefficient (Cronbach's alpha) of research tools was equal to 87%. This coefficient was in the desirable range (Mansourfar, 2001). It is notable that items 2, 5, 7, 9, 13, 15, 17, 25, 26, 27 and 28 in the section related to attitude towards the questionnaire and questions 2, 3, 4, 6, 8, 11, 12, 13, 15, 17 and 25 in cultural perception section were reverse scored.

Reliability of the following scales was established in order to obtain meaningful results (Table 3.11):

Table 3.11

Name and Number of Questionnaire Items with Their Cronbach Alpha Values

No	Name of Variable	Number of items	Cronbach alpha
1	Computer Self-efficacy	20	.90
2	Computer Competence	31	.94
3	Computer Anxiety	20	.84
4	Management Support	18	.92
5	Cultural Perception	25	.76
6	Perceived Usefulness	22	.83
7	Perceived Ease of Use	10	.94
8	Attitude toward Using	28	.90
9	Behavioral Intention to Use	10	.83
10	Actual Use	18	.78
	Total	182	.87

3.12 Data Collection

This study employed self-administered questionnaires as a means of collecting data. The self-administered questionnaire was selected for two reasons. First, the respondents of the study had a relatively high level of education; therefore they understand the contents of the questionnaire. Secondly, the respondents would have more confidence and freedom to express their views than in the interview method.

Prior to data gathering, the researcher negotiated with the head of each university for the execution of the research, whereby the permission was obtained to perform the study. An introductory letter from the researcher's university introduced the researcher and explained the purpose of the study. The letter was then sent from the head of university to the head of security in IAU, explaining the purpose of the study. A subsequent letter from the security department was sent to the managers and faculty members explaining the purpose of the research and requesting their cooperation in the data collection. The respondents were given one week to complete the questionnaire.

Collection of questionnaires was performed in one step. So the researcher distributed questionnaires by referring to the faculty members in all branches of zone 8 through the mail because the number of faculty members in all branches is almost equal and the study will be faced with bias if only some of them were selected.

3.13 Data Analysis

Data analyses were carried out in several phases. The first phase used data from the pilot study for analysis. This was to determine the initial validity and reliability of the scales before proceeding to the main study. The second phase of data analysis determined the construct validity and reliability of the scales using merged data from the pilot study. Before the analyses were carried out, the data were screened to explore the data characteristics (Coakes & Steed, 1999). Data collected were analyzed using two statistical software; Statistical Package for the Social Sciences (SPSS) and Linear Structural Relationships (LISREL). Both software were run on windows XP.

In this study, two types of analysis were conducted; descriptive and inferential analysis. Descriptive statistics were used to describe the feature of the samples in terms of variables or combination of variables (Tabachnick & Fidell, 1983). Descriptive statistics were central tendency measures (mean, mode, median), disparity measures (range, variance, and standard deviation) and distribution measures (standard error, skewness and kurtosis coefficients) besides frequency and percentage. In this research all variables were screened for normality, homogeneity of variance and outliers. The results of the descriptive statistics for selected variables are described in the next chapter.

One group *t*-test (to study the existing situation of professors' viewpoint towards evaluation of effective factors on ICT usage), one-variable and multi-variable regression (to study the relation between variables and predict dependent variables through

independent variables), *t*- test of two independent groups (to study the relation between some personal and professional characteristics of professors such as gender, education, marriage status and scientific rank with research variables) and one-sided variance analysis (to compare professors' viewpoint by emphasizing educational major and university) and Pearson correlation coefficient (for the relation between age and experience of professors with research variables) have been used in the inferential statistics section.

To assess direct and indirect relationships among variables, I followed a procedure using SPSS and Structural Equation Modeling (Anderson & Cerbing, 1988).

3.13.1 Data Screening

Data screening is important to ensure that the data were correctly entered and the distributions of the variables did not deviate much from normality. The assumption of normality is a prerequisite for many inferential statistical techniques (Coakes & Steed, 1999). Histogram, skewness and kurtosis of the variables were examined using the command Explore in SPSS to confirm whether the data approximate a normal distribution.

The "Frequency" command of SPSS was used to detect errors in data entry and any error detected was replaced in the data file with the correct values. Data screening was also conducted to locate missing values and outliers, both of which can affect data analysis (Tabachnick & Fidell, 1983). Missing values were generated by participants who failed to respond to a question in the questionnaire. It can influence the analysis in a number of undesirable ways besides making the data file more difficult to work with. In some cases, the missing values were dealt with using the SPSS missing-value default system and during the data coding and data-entry phase whereby errors were corrected manually.

3.14 Structural Equation Modeling

Structural Equation Modeling (SEM) is a multivariate technique which combines components of multiple regression and factor analysis (Hair, Anderson, Tatham, & Black, 1998). SEM has been increasingly used to analyze non experimental data (Bentler & Dudgeon, 1996; Bollen, 1990). This is because most non experimental data as commonly observed are multivariate. A model specified in SEM is characterized by multiple and interrelated dependence relationships which can be estimated concurrently using SEM. Kaplan (2000) proposed SEM as a statistical methodology which should be used to validate theoretical predictions and understand the actual process that generates the observed data.

SEM has two parts: a measurement model and a structural model. Both constitute the overall model. The two-step process of SEM suggests that the measurement model should be estimated first before testing for the overall model fit (Hair et al., 1998). SEM has the ability to perform confirmatory factor analysis where the number of factors or constructs and their indicators in the measurement models are validated. The measurement model defines relations between observed variables or indicators and unobserved hypothetical constructs or factors (Byrne, 2001). SEM can play a confirmatory role because the researcher has complete control over the specification of indicators for each construct (Hair et al., 1998). Moreover, SEM allows for a statistical test of the goodness-of-fit for the proposed confirmatory factor solution, which is not possible with factor analysis. A satisfactory fit of the measurement model must be obtained before proceeding to test the general model as a whole (Mulaik & James, 1995).

The CFA approach in SEM begins with a measurement model specification that has to be identified. Confirmatory factor analyses make use of only the measurement

model component of the general structural equation model (Hoyle, 1995). The main purpose of CFA is to confirm the factor structure of the measurement model.

SEM is a preferred data analysis technique because of the following advantages (Statistical Support, 2001):

- Flexible assumptions, that is, it allows interpretation even in the face of multi-collinearity.
- It does not test the path coefficients individually but tests the model as a whole
- Interactions of variables can be modeled using SEM
- Model can be stated graphically to be tested
- The ability to test model with multiple dependent variables
- The ability to model mediating variables

Basically, SEM tests whether the pattern of variance and covariance in the data are consistent with the proposed model. If it is found to be inconsistent, the proposed model will be modified based on changes suggested by SEM modification indexes and tested again. The suggested changes will only be accepted if they are theoretically justified (Statistical Support, 2001). A model that is accepted through SEM analysis is a disconfirmed model: Data failed to disconfirm or reject the model (Maruyama, 1998; Mulaik & James, 1995), therefore it is accepted as true. There may be other unexamined models that may fit the data. One disadvantage of the SEM approach is that the model confirmed in this manner is unstable; meaning it may not fit new data since it is created based on the uniqueness of the initial dataset. However, this problem can be overcome by using cross-validation (Camstra & Boomsma, 1992; Mosier, 1951).

In this research, a model proposed and Structural Equation Modeling (SEM) analysis was carried out on the proposed model using the LISREL software.

3.14.1 Evaluation of Overall Model Fit: Goodness-of-Fit Test

The evaluation of the results involve several procedures; the results were inspected for "offending estimates" such as negative error variances and standardized coefficients exceeding 1.0, then the overall model fit with more than one goodness-of-fit measures were assessed. The overall goodness-of-fit statistics assess the degree the covariance matrix the model implied is equivalent to the observed covariance matrix (i.e., elements of the residual matrix are near zero) (Bollen, 1990). These overall fit tests do not establish that particular paths within the model are significant. “Significant” path coefficients in poor fit models are not meaningful. A “good fit” is not the same as strength of relationships among variables. In fact, the lower the correlation stipulated in the model, the easier it is to find a “good fit”.

3.14.2 Measures of Overall Model Fit

A Confirmatory Factor Analysis generates various fit indices that show how well the hypothesized structure can reproduce the data. The traditional fit index is the chi-square statistic.

SEM has no single index that best describes the “strength” of the model’s prediction. The overall goodness of fit test statistics will determine if the model being tested should be accepted or rejected (Bentler & Dudgeon, 1996). Several kinds of indices can be used to determine the overall fitness of models such as:

a) The chi-square goodness-of-fit index: This tests the null hypothesis that the hypothesized correlation or covariance matrix does not differ from the observed matrix. A good fit thus requires a non-significant chi-square value.

b) Root Mean Square Error of Approximation (RMSEA)

c) Root Mean Residual (RMR)

d) Goodness of Fit Index (GFI)

e) Adjusted Goodness of Fit Index (AGFI)

f) Normed Fit Index (NFI)

g) Non-Normed Fit Index (NNFI)

h) Increasing Fit Index (IFI)

i) Comparative Fitness Index (CFI)

Each index has both its advantages and disadvantages, and a combination of indices should be used (Anderson & Gerbing, 1988; Brian & Bruce, 1998). An adjunct discrepancy-based fit index may serve as the ratio of chi-square to degrees of freedom (X^2/df). A X^2/df ratio value less than 5 indicates an acceptable fit between a hypothesized model and sample data (MacCallum, Browne, & Sugarwara, 1996). In the other indices for model-fit evaluation, values ranging from 0.05 to 0.08 are indicative of a reasonable fit, and values 0.09 are indicative of a poor fit (Browne & Cudeck, 1993; MacCallum et al., 1996). The present study used the above indices which represent each type of goodness-of-fit measure to determine model fit in this research (Table 3.12).

Table 3.12

Data Research Analysis

Number question research	First research variable (independent variables)	Variable scale	Second research variable (dependent variables)	Variable scale	Data analysis method	Statistical test
1, 3	Gender	Nominal	Use of ICT	Ordinal	Sig* difference	*t* test
1, 3	Marital status	Nominal	Use of ICT	Ordinal	Sig difference	*t* test
1, 3	Educational group	Nominal	Use of ICT	Ordinal	Sig difference	*F* test
1, 3	Field of study	Nominal	Use of ICT	Ordinal	Sig difference	*F* test
1, 3	Age	Ratio	Use of ICT	Ordinal	Sig correlation	mean, *SD*, Pearson
1, 3	Professional rank	Ordinal	Use of ICT	Ordinal	Sig correlation	mean, *SD*, Pearson
1, 3	Educational level	Ordinal	Use of ICT	Ordinal	Sig correlation	mean, *SD*, Pearson
1, 3	Level of English proficiency	Ordinal	Use of ICT	Ordinal	Sig correlation	mean, *SD*, Pearson
1, 3	Teaching experience	Ratio	Use of ICT	Ordinal	Sig correlation	mean, *SD*, Pearson
1, 3	Working experience with ICTs	Ratio	Use of ICT	Ordinal	Sig correlation	mean, *SD*, Pearson
1, 3	computer competence	Ordinal	perceived usefulness, perceived ease of use	Ordinal	Sig correlation, mean rank,	mean, *SD*, Pearson
2,4	Cultural Perception	Ordinal	perceived usefulness, perceived ease of use	Ordinal	Sig correlation mean rank	mean, *SD*, Pearson
2,4	Management Support	Ordinal	perceived usefulness, perceived ease of use	Ordinal	Sig correlation mean rank	mean, *SD*, Pearson
2,4	Computer Self-efficacy	Ordinal	perceived usefulness, perceived ease of use	Ordinal	Sig correlation ,mean rank	mean, *SD*, Pearson
2,4	Computer Anxiety	Ordinal	perceived usefulness, perceived ease of use	Ordinal	Sig correlation mean rank	mean, *SD*, Pearson
2,4	Perceived Usefulness	Ordinal	attitude toward ICT	Ordinal	Sig correlation ,mean rank	mean, *SD*, Pearson
2,4	Perceived Ease of Use	Ordinal	attitude toward ICT	Ordinal	Sig correlation ,mean rank	mean, *SD*, Pearson
2,4	Attitude Toward ICT	Ordinal	behavioral intention	Ordinal	Sig correlation ,mean rank	mean, *SD*, Pearson
2,4	Behavioral Intention	Ordinal	Use of ICT	Ordinal	Sig correlation mean rank	mean, *SD*, Pearson
5	Sig. variable	scale	Use of ICTs	Ordinal	Analytical statistics	Line Regression, path analysis, SEM*

CHAPTER 4

RESEARCH RESULTS

4.1 Introduction

In this chapter, effective factors on use of ICT among faculty members of Islamic Azad Universities (IAU) in Tehran were studied and the data were analyzed using SPSS and LISREL Programs. The first part of the results, demographic features of research samples (age, gender, education level, marital status, field of study, professional rank, proficiency level of English language, faculty, educational group, working experience, working experience with ICT) were described and then frequency distribution and percentage tables were depicted. Finally coefficient of skewness and kurtosis were calculated as distribution indices.

To answer the research questions, statistical models of multi-variable regression (to predict the effective variables), Pearson correlation coefficient (to study the correlation among research variables), independent *t*-test of two groups (to compare the viewpoint of research samples by putting emphasis on gender, educational level, and marital status), Kruskal-Wallis test (to compare the viewpoint of respondents by putting emphasis on professional rank) and one way ANOVA (to compare the viewpoint of research samples by putting emphasis on field of study) were used and at last two by two comparison of averages was done by means of Tamhane's test.

4.2 Results

4.2.1 Research Question 1:

What are the personal and professional characteristics of faculty members in this research?

In order to respond to the first question related to personal and professional characteristics (or demographic characteristics) of the studied population, they have been studied in the form of variables such as participant's age, gender, educational level, marital status, professional rank, field of study, level of language proficiency, experience in teaching, educational group, faculty, and working experience with ICTs. The results could be observed in the following tables.

4.2.1.1 Age

As Table 4.1 shows, the majority of participants (156 individuals) or 53.6 percent are in age range of 36 to 40 years, 18.3 percent (54 individuals) in age range of 41 to 45 years and 14.1 percent (41 individuals) are in age range of 35 years and less. Also the average age of research sample was about 42 years old.

Table 4.1

Frequency Distribution of Respondents According to Age

Levels	Frequency	Percent	Valid percent
35 years and lower	41	14.1	15.7
36 to 40 years	156	53.6	57.1
41 to 45 years	54	18.6	22.1
46 and higher	10	3.4	5.1
No response	30	10.3	
Total	291	100.0	

Note. Mean: 41.83 *SD*: 6.80 Max: 65 Min: 29

4.2.1.2 Gender

According to Table 4.2, more than one half of the respondents (145 individuals) or 52.6 percent were women and the rest (135 individuals), or 47.4 percent were men.

Table 4.2

Frequency Distribution of Respondents According to Gender

Gender	Frequency	Percent	Valid percent
Female	145	49.8	52.6
Male	135	46.4	47.4
No response	11	03.7	
Total	291	100	

4.2.1.3 Education Level

From Table 4.3, the majority of research samples (162 individuals) representing. 57.9 percent had Ph.D degree and 118 individuals or 42.1 percent had M.Sc. degree.

Table 4.3

Frequency Distribution of Respondents According to Education Level

Levels	Frequency	Percent	Valid percent
M.Sc	118	40.5	42.1
Ph.D.	162	55.7	57.9
No response	11	3.8	
Total	291	100	

4.2.1.4 Marital Status

According to Table 4.4 the majority of research samples (161 individuals or 59.5 percent) were married and the rest (108 individuals or 40.1 percent) were single.

Table 4.4

Frequency Distribution of Respondents According to Marital Status

Levels	Frequency	Percent	Valid percent
Married	161	55.3	59.9
Single	108	37.1	40.1
No response	22	7.6	
Total	291	100	

4.2.1.5 Field of Study

Table 4.5 shows that the majority of the respondents (102 individuals) or 36.4 percent had studied in the human science field; 65 individuals or 22.6 percent had studied basic sciences, 14.9 percent medical science, 14.2 percent technical-engineering and the rest (11.8 percent) art and architecture.

Table 4.5

Frequency Distribution of Respondents According to Educational Field

Levels	Frequency	Percent	Valid percent
Human Science	102	35.0	36.4
Basic Sciences	65	22.3	22.6
Medical Science	43	14.8	14.9
Technical-Engineering	41	14.1	14.2
Art and Architecture	34	11.7	11.8
No response	6	2.0	
Total	291	100.0	

4.2.1.6 Professional Rank

As Table 4.6 shows, the majority of research samples (47.9 percent) were Instructors, 87 individuals (i.e., 33.1 percent) were Assistant Professors and the rest (19 percent) were Associate Professors and Professors.

Table 4.6

Frequency Distribution of Respondents According to Professional Rank

Levels	Frequency	Percent	Valid percent
Instructor	126	43.3	47.9
Associate professor	87	29.9	33.1
Assistant professor	35	12.0	13.3
Professor	15	5.2	5.7
No response	28	9.6	
Total	291	100.0	

4.2.1.7 English Language Proficiency

Given the following Table 4.7, the majority of research samples (166 individuals or 42.3 percent) have stated their proficiency of English language as being at a moderate level, 82 individuals (i.e., 29.3 percent) at a high level and 17 individuals (i.e., 6.1 percent) at a low level.

Table 4.7

Frequency Distribution of Respondents According to Proficiency in English

Levels	Frequency	Percent	Valid percent
Very low	-	-	-
Low	17	5.8	6.1
Moderate	166	57.0	59.3
High	82	28.2	29.3
Very high	15	5.2	5.4
No response	11	3.8	
Total	291	100.0	

4.2.1.8 Educational Group

The majority of the respondents (about 35 percent) were teaching in different educational groups of the Human Science faculty.

Table 4.8

Frequency Distribution of Respondents According to Educational Group

Faculty	Educational Group	Frequency	Percent	Valid
Human Science	Educational science	19	6.3	6.4
	Primary education	16	5.5	5.6
	Counseling	12	4.1	4.0
	Educational management	14	4.8	4.7
	Law	13	4.7	4.6
	Teacher training	11	3.8	3.7
	English translation	10	3.4	3.4
	Literature	5	1.7	1.7
Basic Science	Mathematics	22	7.5	7.3
	Chemistry	11	3.8	3.7
	Geography	5	1.7	1.7
	Agriculture	6	2.0	2.0
	Biochemistry	11	3.8	3.7
	Plant Biology	10	3.4	3.4
Medical Science	Pathology	9	3.1	3.1
	Dentistry	6	2.0	2.0
	Nursing science	10	3.4	3.4
	Pharmacy	7	2.4	2.4
	Medicine	11	3.6	3.6
	Physiology	3	1.1	1.1
Technical-Engineering	Mechanics	18	6.1	6.2
	Electricity	13	4.9	4.8
	Civil engineering	12	4.6	4.5
Art & Architecture	Architecture	14	4.9	5.0
	Graphics	12	4.6	4.5
	Art	6	2.0	2.0
	No response	6	1.8	
	Total	291	100.0	

4.2.1.9 Working Experience

Table 4.9 shows that about 40 percent of respondents reported that they have taught at the university between 6–10 years. About 32 percent of them indicated having 5 years and less of working experience. The smallest number of respondents (3.4 %) reported

16-20 years of teaching experience. The mean value for years of working experience of respondents was 9.55.

Table 4.9

Frequency Distribution of Respondents According to Working Experience

Levels	Frequency	Percent	Valid percent
5 years and lower	81	27.8	31.9
6 to 10 years	102	35.1	40.2
11 to 15 years	45	15.5	17.7
16 to 20 years	10	3.4	3.9
21 years and more	16	5.5	6.3
No response	37	12.7	
Total	291	100.0	
Note. Max: 34.0	Min: 1.0	Mean: 9.55	*SD*: 8.02

4.2.1.10 Working Experience with ICTs

Table 4.10 shows that 31.4% of respondents reported that they have used the computer for 2-4 years. About 31% of respondents indicated 4-6 years of computer use. The smallest number of respondents (6.3%) reported 8 years and less of computer use. The mean value for years of experience with ICT by respondents was 5.1.

Table 4.10

Frequency Distribution of Respondents According to Working Experience with ICTs

Levels	Frequency	Percent	Valid percent
1 years and lower	36	13.4	15.7
2 to 4 years	81	27.8	31.4
4 to 6 years	78	26.8	30.7
6 to 8 years	43	14.8	15.9
8 years and more	16	5.5	6.3
No response	37	12.7	
Total	291	100.0	
Note. Max: 10	Min: 0.5	Mean: 5.1	*SD*: 6.42

4.2.2 Research Question 2:

What are the effective psycho-social factors on usage of ICT by faculty members in this research?

4.2.2.1 Computer Competence

The data were calculated for valid percent, mean scores and standard deviations to determine respondents' rating of computers and the related ICT competences. Table 4.11 presents the frequency distribution of the respondents' self-rated ability for each computer and ICT competence. An examination of the mean of computer competence in Table 4.11 shows that the mean values of computer competence ranged from 2.87 to 3.66, indicating that respondents' ratings for their computer competence were between

"low" to "moderate". The mean values of computer competence for faculty members of the 31 items was 3.25 (refer to Table 4.21), indicating that overall, faculty members` ratings for their computer competence was "moderate".

Table 4.11
Frequency Distribution for Computer Competence

Computer Competence	n	V.H.	H.	M.	L.	V.L.	Mean	*SD*
		%	%	%	%	%		
I can use email to communicate with others.	291	13.7	7.2	18.6	20.3	40.2	3.66	1.41
I can use cable modems in order to have access to higher speeds for the Internet.	291	5.2	17.2	27.5	27.1	23.0	3.45	1.16
I can use external facilities of the computer such as scanner, printer, and external memory, and so on.	291	8.9	22.3	17.5	18.2	33.0	3.43	1.37
I can use the Internet in order to register for educational workshops.	291	10.3	17.9	22.7	18.9	30.2	3.41	1.35
I can use the Internet in order to exchange data electronically and participate in the workshops.	291	12.0	16.5	22.0	17.2	32.3	3.41	1.39
I can present the sources to the others.	291	8.6	13.1	26.1	33.0	19.2	3.41	1.18
I can use laptop computers in order to facilitate moving and carrying.	291	8.6	18.6	24.1	23.7	25.1	3.38	1.27
I can use the computer to facilitate the administration affairs of the university.	288	18.2	7.2	24.1	19.6	30.9	3.37	1.44
I can use special software.	286	10.7	16.8	23.7	22.0	26.8	3.37	1.32
I can make slides in PowerPoint.	291	12.4	18.9	23.0	11.3	34.4	3.36	1.43
I can use the Internet to get access to the electronic sources and participate in the workshops.	291	10.3	18.2	26.1	15.1	30.2	3.36	1.35
I can update my knowledge and skill using the developments of technology.	281	10.7	14.4	27.8	23.7	23.4	3.35	1.27
I can use data banks.	291	5.2	22.3	28.5	21.3	22.7	3.34	1.19
I can use the Internet to be informed about educational workshops.	291	10.3	16.2	28.2	20.6	24.7	3.33	1.29
I can use the internet to judge academic papers.	283	10.3	24.1	18.9	17.9	28.9	3.31	1.37

I can use the internet in order to participate in on-line educational courses.	285	8.6	25.8	22.3	12.7	30.6	3.30	1.36
I can discuss service delivery.	276	7.2	13.1	37.5	29.2	13.1	3.28	1.07
I can use the Internet to chat.	277	5.5	31.6	18.6	20.3	24.1	3.25	1.28
I can use my personal home page.	278	12.7	24.1	20.6	15.8	26.8	3.19	1.39
I can use the Internet in order to communicate with scientific institution.	291	13.7	23.0	19.6	17.2	26.5	3.19	1.40
I can solve trivial software and hardware problems in the computer.	291	11.0	15.5	33.7	22.7	17.2	3.19	1.21
I can classify and place information in the computer to improve its security.	291	8.9	23.0	26.8	23.7	17.5	3.18	1.22
I can use backup system in teaching.	287	8.9	20.6	32.6	23.0	14.8	3.14	1.17
I can guide my learning process.	287	7.2	19.2	40.2	20.6	12.7	3.12	1.08
I can use the computer to analyze my data.	283	18.2	19.6	23.4	13.1	25.8	3.08	1.44
I can create my personal home page.	273	12.7	28.5	22.0	17.5	19.2	3.02	1.32
I can use local radio.	289	11.0	25.4	29.2	21.3	13.1	3.00	1.19
I can create and spread my learning network.	276	12.7	25.4	28.9	18.6	14.4	2.96	1.23
I can use Internet telephone.	282	17.2	16.8	34.7	14.4	16.8	2.96	1.29
I can take part in the current decision making.	291	8.6	13.1	26.1	33.0	19.2	2.91	0.98
I can use satellite in order to exchange information.	269	15.5	24.7	27.1	22.0	10.7	2.87	1.22

V.H. = Very High H = High M = Moderate L = Low V.L. = Very Low

4.2.2.2 Computer Self-efficacy

In this study, faculty members were asked to rate their self-efficacy through 20 items in a Likert scale. The frequency distributions were calculated to identify the respondents' self -efficacy. The mean and standard deviations of faculty members` self -efficacy for each item in the scale are presented in Table 4.12. An examination of the means show that the mean ratings range from 2.81 to 3.74, indicating that faculty members` rating of their self- efficacy mentioned in the items ranged from "disagree" to "no opinion". The mean for respondents` ratings of self-efficacy in the scale was 3.65, indicating that

overall, faculty members' ratings of their self-efficacy was "no opinion" (See Table 4.21).

Table 4.12
Frequency Distribution for Computer Self-efficacy

Computer Self-Efficacy	n	T.A.	A.	N.O.	D.	T.D.	Mean	*SD*
		%	%	%	%	%		
I can easily receive and send my required information by flash memory and so on.	291	49.5	14.8	13.4	5.2	17.2	3.74	1.52
I can easily receive and send my required information by email.	291	44.0	22.0	11.3	6.9	15.8	3.71	1.47
I can easily search needed information in the Internet.	291	36.1	25.8	15.5	13.7	8.9	3.66	1.32
I can obtain good information through Internet in my own special field of study.	291	34.0	24.4	18.6	14.1	8.9	3.60	1.32
I can solve my trivial hardware problems without help of others.	291	1.7	24.1	27.1	26.1	21.0	3.59	1.11
I can type and print things easily and without the help of the others.	291	32.6	20.3	24.1	16.2	6.9	3.55	1.28
I can scan pictures and written documents and transfer it to the computer independently and without anybody's helped.	291	38.1	12.7	20.3	18.6	10.3	3.49	1.41
I can easily increase my computer literacy in comparison to the students.	291	23.0	25.8	32.0	12.4	6.9	3.45	1.17
It is difficult for me to learn all the computer competences.	291	1.7	22.0	32.0	29.6	14.8	3.36	1.03
I am quite sure that I can teach special courses to the students using computer and special software.	291	21.0	29.9	24.4	14.4	10.3	3.36	1.25
I don't have any problem in using computer language in dealing with errors or the messages the computer sends.	291	20.6	26.5	25.8	20.3	6.9	3.33	1.20
I can easily make use of software such as Word, PowerPoint, and Excel.	291	24.7	24.4	16.5	24.1	10.3	3.29	1.34
I can minimize the problems of teaching by using the computer.	291	19.2	27.5	25.8	16.8	10.7	3.27	1.25
I can easily install new software on my computer.	291	17.5	27.5	25.4	22.3	7.2	3.25	1.19

I can solve my trivial software problems without help of others.	291	16.8	25.1	30.6	18.9	8.6	3.22	1.18
I can easily change graphic files into films.	291	14.4	12.4	32.0	20.6	20.6	3.19	1.30
I can easily install secondary accessories to my computer and use them.	291	17.2	25.8	24.1	22.0	11.0	3.16	1.25
I sure can solve students' problems using special software.	291	11.3	16.8	46.4	18.2	7.2	3.06	1.04
I can easily design graphic files like pictures by computer.	291	14.8	16.2	34.0	20.6	14.4	2.96	1.24
The older I become, the more I fear the problems involved in learning about computers.	291	19.6	12.7	22.0	20.6	25.1	2.81	1.44

T.A. = Totally Agree A = Agree N.O. = No Opinion D = Disagree T.D. = Totally Disagree

4.2.2.3 Computer Anxiety

In this study faculty members were asked to rate their computer anxiety through 20 items in the Likert scale. The frequency distribution was calculated to identify the respondents' computer anxiety. The mean and standard deviations of faculty members` computer anxiety for each item in the scale are presented in Table 4.13. An examination of the means show that the mean ratings range from 2.18 to 2.97, indicating that faculty members' rating of their anxiety mentioned in the items ranged from "low" to "moderate". The mean for respondents' ratings of their anxiety in the scale was 2.56 (See Table 4.21), indicating that overall, faculty members' ratings of their anxiety was "low".

Table 4.13
Frequency Distribution for Computer Anxiety

Computer Anxiety	N	V.H.	H.	M.	L.	V.L.	Mean	*SD*
		%	%	%	%	%		
For fear of not losing my information I copy and back them up several times.	291	13.4	20.6	33.3	18.6	14.1	2.97	1.01
After using the computer for a long time I become confused and forget the details.	291	39.9	25.4	17.2	6.9	10.7	2.97	1.06
Using the computer disturbs me.	291	11.3	18.2	35.1	26.5	8.9	2.96	1.19
In dealing with something new about the computer I'm usually afraid of not knowing how to use the required software.	290	8.6	20.6	40.2	21.3	9.3	2.84	1.20
Using computer for a long time makes me concerned about my physical health.	287	12.0	11.0	24.4	24.1	28.5	2.71	1.30
After using the computer for a long time I fear being blamed by the others.	291	33.7	31.3	8.9	8.9	17.2	2.58	1.47
After using the computer for a long time I feel tired.	291	26.5	32.3	19.9	10.7	10.7	2.58	1.44
After using the computer for several hours I get headache and nausea.	288	22.3	23.0	27.5	14.8	12.4	2.55	1.28

After using the computer for a long time I can't make my mind for other things.	291	23.0	35.1	15.8	15.8	10.3	2.54	1.38
After using the computer for a long time I can't tolerate others and become very touchy.	291	32.3	26.1	18.6	8.6	14.4	2.54	1.50
I am usually worried that someone else comes and uses my information after working with the computer.	291	8.9	25.4	20.3	32.0	13.4	2.53	1.31
After using the computer for a long time I get sore and don't want to see anyone.	287	45.7	22.3	12.4	7.2	12.4	2.49	1.21
After using the computer for a long time I become sleepless.	291	32.0	25.4	10.7	16.2	15.8	2.46	1.27
After using the computer for a long time I lose my appetite.	290	32.3	22.7	13.1	18.2	13.7	2.46	1.39
After using the computer for a long time I sweat a lot.	291	34.7	22.3	16.5	6.9	19.6	2.46	1.40
After using the computer for a long time I regret spending my time on it.	291	33.0	29.9	11.0	14.1	12.0	2.44	1.46
After using the computer for a long time I feel guilty.	286	53.3	13.4	5.5	10.7	17.2	2.42	1.38
After using the computer for a long time I become dissatisfied with myself.	291	28.5	28.5	18.6	8.9	15.5	2.25	1.58
After using the computer for a long time I get tensed and stressed.	291	28.5	17.9	38.1	6.9	8.6	2.23	1.32
After using the computer for a long time I become nervous.	291	34.7	21.6	20.6	8.9	14.1	2.18	1.39

V.H. = Very High H = High M = Moderate L = Low V.L. = Very Low

4.2.2.4 Management Support

The data were calculated for valid percent, mean scores and standard deviations to determine respondents' ratings of management support. Table 4.14 presents the frequency distribution of the respondents' self-rated rating for each management support item. An examination of the mean of management support in Table 4.14 shows that the mean values of management support ranged from 2.92 to 3.41, indicating that respondents have "no opinion" on management support. The mean values of management support for faculty members of the 18 items was 3.17 (refer to Table 4.21),

indicating that, overall, faculty members' ratings for management support was "no opinion".

Table 4.14
Frequency Distribution for Management Support

Management Support	N	T.A	A.	N.O	D.	T.D	Mean	*SD*
		%	%	%	%	%		
The managers of my university emphasize on using the computers in administration.	291	5.2	10.3	42.3	21.3	21.0	3.42	1.08
The managers of my university are fully aware of the advantages of using computers.	291	7.6	10.3	35.7	26.1	20.3	3.41	1.15
The managers of my university encourage the employees to use computers.	291	1.7	15.8	40.9	28.5	13.1	3.35	0.95
The managers of my university use the Internet in order to improve university schedules.	291	5.2	15.8	41.9	14.1	23.0	3.34	1.14
In my university advanced courses of teaching ICT are supported.	291	3.8	19.6	45.0	16.8	14.8	3.30	1.13
The managers of my university use the Internet in order to see the circulars.	291	6.9	18.2	31.6	23.7	19.6	3.30	1.17
Recruiting experts is done using the Internet.	291	8.9	13.1	37.8	25.4	14.8	3.24	1.13
The managers of my university are determined to satisfy the employees by using the computer.	291	3.8	19.6	45.0	16.8	14.8	3.19	1.03
The managers of my university have Gantt charts.	291	6.9	12.7	49.8	16.8	13.7	3.17	1.04
The managers of my university emphasize the professors' satisfaction from the software and hardware used in the university.	291	7.2	19.6	36.4	23.7	13.1	3.15	1.10
The managers of my university respect the professors' opinions about teaching ICT.	291	11.0	12.4	42.6	22.7	11.3	3.11	1.11
The managers of my university encourage the professors in using the data banks.	291	7.6	15.8	51.9	13.1	11.7	3.05	1.02
Internet network and data banks	291	11.3	19.2	36.4	20.3	12.7	3.03	1.16

are in good condition in my university.								
Required facilities and sources for using the computers are available in my university.	291	13.4	21.0	34.4	12.7	18.6	3.02	1.27
The university managers notify the professors and the employees of the circulars by using email.	291	18.6	10.7	36.1	21.6	13.1	3.00	1.26
The managers of my university send the professors' job description using emails.	291	11.7	21.6	37.1	14.4	15.1	2.99	1.19
The managers of my university support the professors' participation in computer courses.	291	9.3	18.2	45.7	18.9	7.9	2.97	1.03
The managers of my university provide new software for the professors.	291	11.7	23.4	40.5	9.3	15.1	2.92	1.18

T.A.= Totally Agree A = Agree N.O. = No Opinion D = Disagree T.D = Totally Disagree

4.2.2.5 Attitude Toward Use of ICT

The frequency distribution was calculated to identify the attitude of respondents toward computers and related ICT. The mean and standard deviations of faculty members' attitude for each item in the scale are presented in Table 4.15. An examination of the means show that the mean ratings range from 2.48 to 4.01, indicating that faculty members' rating of their attitude toward usage of computer and other ICTs mentioned in the items ranged from "disagree" to "agree". The mean for respondents' ratings of their attitude in the scale was 3.98 (See Table 4.21), indicating that overall, faculty members' ratings of their attitude was "positive".

Overall, faculty members of IAU in Iran tend to hold positive attitudes toward using ICTs in educational and research activities.

Table 4.15

Frequency Distribution for Attitude toward Use of ICT

Attitude toward use of ICT	N	T.A	A.	N.O	D.	T.D	Mean	*SD*
		%	%	%	%	%		
Using computer should increase students' motivation for studying.	291	18.9	3.4	8.9	15.5	53.3	4.01	1.55
Universities are useful places even without the computer.	291	15.5	3.8	10.3	29.9	40.5	3.89	1.41
Using computer increases the level of learning.	291	22.7	1.7	7.2	24.1	44.3	3.85	1.58
I don't like using the computer for teaching.	288	13.7	12.7	11.0	20.3	42.3	3.74	1.46
Learning ICT should be compulsory for all the faculty members.	291	15.5	10.7	11.0	20.3	42.6	3.73	1.49
I don't like using the computer.	291	14.4	7.6	16.5	23.7	37.8	3.62	1.41
Computer training is a waste of time.	290	13.7	3.8	23.0	28.2	31.3	3.59	1.33
Obtaining information from the Internet costs more than going to the library.	291	13.7	8.6	16.2	27.1	34.4	3.59	1.38
I usually write things rather than using the computer.	291	15.5	3.4	22.0	33.7	25.4	3.50	1.32
I don't usually use computer if possible.	291	19.6	5.2	12.7	31.6	30.9	3.49	1.46
The students are recommended to use computers in their studies.	291	10.7	14.1	21.6	25.1	28.5	3.46	1.32
Computers are quick and useful systems in getting information.	291	15.8	7.2	16.2	37.5	23.4	3.45	1.34
I am always looking for a chance to use the computer.	290	14.1	14.4	17.5	21.3	32.6	3.43	1.42
Using the computer saves time and energy.	291	10.3	8.9	36.1	17.2	27.5	3.42	1.26
I don't plan to use computer more in the future.	291	19.2	6.9	16.8	27.8	29.2	3.40	1.45
I am glad there are a lot of computers nowadays.	287	15.8	7.6	25.8	23.7	27.1	3.38	1.37
I try to get more information about computers.	291	15.8	16.2	20.3	10.7	37.1	3.37	1.50
Using the Internet is addictive.	291	17.5	12.7	16.2	32.6	21.0	3.26	1.38
The content of electronic texts is much better than written ones.	291	11.0	18.2	31.3	16.8	22.7	3.21	1.28
If I have money, I will prefer to improve my computer system.	291	14.8	16.8	34.4	15.1	18.9	3.06	1.29
Using It can lead educational practices towards advanced international practices.	288	14.4	12.7	40.5	22.7	9.6	3.00	1.14

Table 4.15 Continued

Using computers increases the quality of university projects.	291	14.4	16.8	39.5	17.5	11.7	2.95	1.17
When you become busy with computer, you become cut out from the world.	291	12.0	15.1	46.7	22.3	3.8	2.90	1.00
Using computer and the Internet makes you lethargic and inactive.	291	11.0	13.1	55.3	18.9	1.7	2.87	.90
Using computers and computer games results in confusion and loss of attention.	291	12.0	28.2	38.5	14.4	6.9	2.75	1.06
Using computer increases plagiarism among the professors.	291	23.7	28.9	21.3	12.0	14.1	2.63	1.34
Using the computer is the reason for students' weakness in their lessons.	291	23.7	36.8	17.9	11.0	10.7	2.48	1.26

T.A = Totally Agree A = Agree N.O = No Opinion D = Disagree T.D = Totally Disagree

4.2.2.6 Perceived Usefulness

Faculty members were asked to indicate their level of perceived usefulness for 22 statements. Results indicate that for all items of perceived usefulness the mean values tended to cluster around 4.37 to 3.77 which indicate "no opinion" to "agree" of the response scale. Table 4.16 summarizes the overall mean and standard deviations for all statements. The mean for respondents' ratings of their perceived usefulness in the scale was 4.12 (See Table 4.21), indicating that, overall, faculty members' rating for perceived usefulness was "agree".

Table 4.16
Frequency Distribution for Perceived Usefulness

Perceived usefulness	n	T.A	A.	N.O	D.	T.D	Mean	*SD*
		%	%	%	%	%		
We can use computers to classify information.	291	12.0	6.9	10.7	32.3	38.1	4.37	1.34
Using computers reduces time of doing things.	291	10.3	10.7	12.4	28.5	38.1	4.23	1.33
Computers and the Internet facilitate visual communication with other countries.	291	17.2	3.4	8.9	31.3	39.2	4.11	1.44
If a faculty member knew how to use the Internet, s/he could be more successful in educational practices.	289	15.5	5.2	11.0	30.9	37.5	3.96	1.41
Gathering information and sources from the Internet is cost-effective.	291	17.2	3.4	11.0	36.1	32.3	3.72	1.40
Using the computer, we can exchange information.	288	12.0	8.9	16.2	30.2	32.6	3.62	1.33
Computers and the Internet update people's information.	291	17.2	3.4	11.0	36.4	32.0	3.62	1.40
We can develop research practices of the students using ICT.	291	17.2	5.2	11.3	35.7	30.6	3.57	1.41
Computers analyze data more precisely.	291	13.7	10.3	15.1	26.5	34.4	3.51	1.40
Using computer helps me get things done more quickly.	291	13.7	6.9	14.8	38.1	26.5	3.56	1.32
Computers and the Internet facilitate communicating with other countries.	291	15.5	7.2	18.9	23.4	35.1	3.55	1.42
ICT use can increase communication with other research institutions.	291	15.5	6.9	8.9	45.0	23.7	3.54	1.33
Using computer solves some of my educational problems.	291	13.7	5.2	18.9	41.9	20.3	3.49	1.26
We can usually get useful information from the Internet.	288	18.9	5.2	14.8	30.6	30.6	3.48	1.45
Using computers helps me be more effective in education.	291	15.5	5.5	14.8	45.4	18.9	3.46	1.29
Computers and the Internet substitute mails and mailmen.	291	15.8	10.3	12.7	34.0	27.1	3.46	1.39
We can use computers as a kind of educational material.	290	13.7	8.6	14.8	45.0	17.9	3.44	1.26
Computers reduce our need for man power.	290	17.9	10.3	14.8	33.3	23.7	3.34	1.40

Table 4.16 Continued

Computers can be good retainers of information.	287	6.9	12.7	35.7	33.7	11.0	3.29	1.04
Computers can do whatever we want.	290	10.7	15.8	22.3	41.2	10.0	3.24	1.15
Using computers won't help me increase my work rate.	291	13.4	34.7	18.9	14.1	18.9	2.90	1.33
Using computer won't help me in my educational practices.	290	15.1	34.4	15.1	19.6	15.8	2.86	1.32

T.A = Totally Agree A = Agree N.O = No Opinion D = Disagree T.D = Totally Disagree

4.2.2.7 Intention to Use

Table 4.17 presents the frequency distribution of the respondents' self- rated scores for each behavioral intention to use computer and other related ICTs item. An examination of the mean in Table 4.17 shows that the mean values of intention to use ranged from 4.24 to 3.33, indicating that respondents "agree" to or had "no opinion" on their behavioral intention to use.

The mean values of this construct for faculty members of the 10 items was 4.04 (refer to Table 4.21), indicating that, overall, faculty members "agree" on their behavioral intention to use ICTs.

Table 4.17
Frequency Distribution for Intention to Use

Intention to use	n	T.A	A.	N.O	D.	T.D	Mean	*SD*
		%	%	%	%	%		
I plan to increase the use of computer in education in the future.	291	5.2	12.0	20.6	37.1	25.1	4.24	1.13
I'll use ICT if I have access to it.	291	5.2	8.9	25.1	41.2	19.6	4.11	1.05
I prefer to use computer to see films and visual files.	291	8.6	12.4	17.5	34.0	27.5	3.97	1.24
I like to have new and up-to-date computer items.	289	12.4	6.9	15.8	40.9	24.1	3.87	1.21
I like using computer and the Internet, even when I'm tired.	291	5.2	12.7	27.5	36.8	17.9	3.79	1.08
I like to do all my educational duties with computer.	291	10.7	15.8	22.3	41.2	10.0	3.68	1.08
I like using scanner and printer.	288	3.8	13.1	37.5	34.0	11.7	3.66	.97
I'd prefer to use the Internet to get access to new educational sources.	291	1.7	16.8	37.5	32.3	11.7	3.55	.95
I am very eager to use new software.	291	5.5	9.3	37.5	39.9	7.9	3.51	.95
I like to type my class notes.	290	2.1	18.2	35.1	33.3	11.3	3.33	.97

T.A = Totally Agree A = Agree N.O. = No Opinion D = Disagree T.D.= Totally Disagree

4.2.2.8 Perceived Ease of Use

Faculty members were asked to indicate their level of perceived ease of use for 10 statements. Results indicate that for all items of perceived ease of use the mean values tended to cluster around 3.91 to 3.71 which indicate about agree on the response scale. Table 4.18 summarizes the overall mean and standard deviations for all statements. The mean for respondents' ratings of their perceived ease of use in the scale was 3.74 (See Table 4.21), indicating that, overall, faculty members' ratings of their perceived ease of use was "no opinion".

Table 4.18
Frequency Distribution for Perceived Ease of Use

Perceived ease of use	n	T.A %	A. %	N.O %	D. %	T.D %	Mean	*SD*
Learning by computer is easy for me.	290	15.5	3.4	12.4	32.0	36.8	3.91	1.39
Computer software is easily accessed.	285	17.2	5.2	15.1	35.4	27.1	3.80	1.39
Using software such as Power Point in teaching is easy.	291	8.9	9.6	24.7	36.1	20.6	3.79	1.18
We can easily communicate using emails.	289	14.1	7.2	19.9	33.7	25.1	3.68	1.32
I don't have a serious problem using the Internet.	291	12.0	14.1	16.8	28.5	28.5	3.57	1.35
Using computer training classes is easy.	290	10.7	11.0	22.0	33.7	22.7	3.46	1.25
Using educational programs in the net is easy.	291	14.1	9.3	22.0	31.3	23.4	3.40	1.32
We can use educational sites on the Internet easily.	291	18.2	12.4	14.4	29.6	25.4	3.31	1.43
I'll connect to the net whenever I wish.	286	12.0	12.7	22.0	39.2	14.1	3.30	1.21
I don't have any problem learning computer programs.	290	17.9	5.5	27.5	29.6	19.6	3.27	1.33

T.A = Totally Agree A= Agree N.O. = No Opinion D = Disagree T.D. = Totally Disagree

4.2.2.9 Cultural Perception

Table 4.19 presents the frequency distribution of the respondents' self- rated scores for each cultural perception item. An examination of the mean in Table 4.19 shows that the mean values of cultural perception ranged from 2.48 to 4.01, indicating that respondents "disagree" or "agree" for cultural perception. The overall mean value of this construct for faculty members of the 25 items was 3.82 (refer to table 4.21), indicating that overall, faculty members were almost agree for cultural perception.

Table 4.19

Frequency Distribution for Cultural Perception

Cultural Perception	n	T.A	A.	N.O	D.	T.D	Mean	*SD*
		%	%	%	%	%		
Computers and the Internet are signs of cultural invasion.	291	15.8	6.9	16.2	15.5	45.7	4.01	1.49
The Internet increases our awareness of the world news.	290	17.2	5.2	5.2	41.9	30.6	4.00	1.40
It is necessary to teach using the computer from childhood.	291	8.6	12.7	28.9	36.8	13.1	3.96	1.33
Using ICT in educational places helps keep information up-to-date.	291	18.9	3.4	10.7	40.2	26.8	3.92	1.41
Computers can increase standard level of life.	291	6.9	14.8	22.0	32.0	24.4	3.82	1.20
Nowadays, computers are among necessary furniture in the house.	291	12.4	10.3	14.4	34.4	28.5	3.78	1.36
Using computer is in no contrast with Iranian traditions of doing things.	291	8.6	16.2	16.5	38.1	20.6	3.66	1.22
Quick developments in ICT make life easier.	288	10.3	8.6	21.6	43.3	16.2	3.60	1.16
Computers do not have a great influence on education of people's lives.	291	12.4	8.9	21.3	36.1	21.3	3.55	1.26
Computer literacy increases the students' salaries.	291	5.2	11.3	36.1	34.7	12.7	3.48	1.01
Computers encourage unmoral behaviors.	290	5.2	10.7	40.2	32.6	11.3	3.34	0.98
Computers results in more dependence on foreign countries.	291	6.9	22.0	27.8	16.5	26.8	3.34	1.27
Using the Internet is a sign of development.	291	19.9	33.3	32.0	7.6	7.2	3.32	1.12
The Internet is the most important social medium.	291	12.0	16.8	19.9	29.2	22.0	3.32	1.31
Computers kill people's feelings.	290	14.1	14.4	33.7	24.7	13.1	3.19	0.97
Using computers do not decrease social communication.	291	5.8	14.1	41.9	30.6	7.6	3.19	0.95
Without the computer social life is in danger.	291	3.4	20.6	36.8	31.6	7.6	3.19	0.96
The disadvantages of using the net for the students exceed the advantages.	291	10.3	14.4	34.4	31.3	9.6	3.15	1.11

Table 4.19 Continued

Computer literacy increases the person's social status.	290	7.2	16.2	37.1	35.7	3.8	3.12	0.97
Not using the Internet endangers our work life and our education.	291	14.1	14.4	33.7	24.7	13.1	3.08	1.21
Sources and information obtained from the net are not reliable.	291	6.9	22.0	49.8	15.1	6.2	2.91	0.94
There are more important matters than ICT which should be considered in computer learning.	287	7.6	28.9	50.9	10.7	2.1	2.70	0.83
Acceptance of ICT does not correspond with development rate of computers.	287	12.7	33.7	35.7	8.9	8.9	2.67	1.09
Students had better learn their lessons from the computer than the professors.	289	9.6	35.7	40.5	8.9	5.2	2.64	0.95
Not using the computers means illiteracy.	291	3.4	16.2	48.5	21.0	11.0	2.48	1.12

T.A. = Totally Agree A= Agree N.O. = No Opinion D = Disagree T.D. = Totally Disagree

4.2.2.10 Actual Use of ICT

Faculty members were asked to indicate their actual use of ICT for 18 statements. Results indicate that for all items of actual use of ICT the mean values are around 4.19 to 2.57 which indicate "low" to "high" of the response scale. Table 4.20 summarizes the overall mean and standard deviations for all statements. The mean values of actual use of ICT by faculty members of the 18 items was 3.96 (refer to table 4.21), indicating that, overall, faculty members highly use the computer and other related ICTs.

Table 4.20
Frequency Distribution for Actual Use of ICT

Actual Use of ICT	n	V.H. %	H. %	M. %	L. %	V.L. %	Mean	*SD*
I use the Internet to access authentic papers from academic journals.	291	14.1	11.0	21.3	27.8	25.8	4.19	1.38
I use the Internet in order to become familiar with new researches and developments.	291	10.3	12.4	25.1	16.5	35.7	4.04	1.35
I use the Internet to get more information about educational activities.	290	12.0	7.2	32.6	17.5	30.6	3.87	1.32
I use the Internet in order to facilitate administration affairs.	287	7.2	7.6	37.8	28.9	18.6	3.73	1.09
I use the Internet to become notified about the national and international conferences.	291	14.1	13.1	22.0	18.2	32.6	3.62	1.41
I use computer in lectures.	291	14.1	11.0	21.3	27.8	25.8	3.54	1.35
I use the Internet to write and edit papers and books.	291	12.4	16.2	19.2	23.7	28.5	3.49	1.37
I use the Internet to exchange information more quickly and precisely.	290	12.4	14.8	23.7	25.8	23.4	3.32	1.31
I use the Internet in receiving news.	291	13.1	12.4	30.9	22.3	21.3	3.26	1.28
I use the Internet to communicate with other universities and professors.	291	15.1	13.7	24.4	26.1	20.6	3.23	1.33
I use the Internet to solve organizational problems.	288	11.7	15.1	33.0	20.3	19.9	3.21	1.25
I use the Internet to check my bank account.	290	9.6	24.4	21.0	25.4	19.6	3.20	1.27
I use the Internet to design syllabus.	291	17.2	12.4	24.4	25.8	20.3	3.19	1.35
I use the Internet to receive and save audio, graphic and visual files.	289	16.2	11.3	31.3	22.3	18.9	3.16	1.31
I use external facilities of the computer in teaching.	291	14.4	12.7	37.8	15.8	19.2	3.12	1.27
I use the Internet to take part in on-line international conferences.	291	21.6	12.7	29.2	14.8	21.6	3.02	1.41
I use the Internet to participate in on-line classes.	291	18.6	23.0	29.2	15.1	14.1	2.83	1.29
I use the Internet to teach on-line classes.	287	17.5	24.7	32.6	14.8	10.3	2.75	1.20

V.H. = Very High H = High M = Moderate L= Low V.L. = Very Low

Table 4.21 presents the mean, standard deviation, and coefficient of skewness and kurtosis of all psycho-social factors.

Table 4.21
Mean, Standard Deviation and Coefficient of Skewness and Kurtosis of Effective Factors

Factors	Mean	*S.D*	Coefficient of skewness	Coefficient of kurtosis
Computer self-efficacy	3.65	0.79	- 0.319	- 0.64
Anxiety	2.56	1.01	0.646	- 0.567
Computer competence	3.25	0.93	- 0.220	- 0.668
Management support	3.17	0.84	- 0.220	- 0.668
Attitude	3.98	0.72	- 0.845	- 0.066
Perceived usefulness	4.12	1.03	- 0.949	- 0.475
Intention to use	4.04	1.10	- 0.592	- 0.523
Perceived ease of use	3.78	0.81	- 0.534	0.124
Cultural perception	3.82	0.64	- 0.619	- 0.157
Actual use of ICT	3.96	0.89	0.458	-0.748

According to Table 4.21 and by emphasizing on the point that amounts of skewness and kurtosis coefficients are lower than ±1, it is stated that distribution of all above variables has the assumption of normality and it is possible to use parametric statistical models. It is notable that with reference to the histograms with normal curve which are presented in the Appendix, distribution of all variables is “normal” and assumptions of normal distribution (being quantitative and continuous, interval variable and normality variable of curve peak) have been observed.

4.2.3 Research Question 3:

What are the differences in the personal and professional characteristics of faculty members with psycho-social factors and actual use of ICT by them?

4.2.3.1 Test of differences between gender and psycho-social factors and actual use of ICT

By emphasizing on amount of the obtained *t* it is stated that there is a significant difference among means of effective factors of ICT usage in self-efficacy and intention to use factors between female and male faculty members of the university.

Table 4.22

Differences between Gender and Psycho-social Factors and Actual Use of ICT

Dependent variable	Levels	Mean	*SD*	*t*	Sig.
Computer Self-efficacy	Female	62.49	15.49	2.10	.036*
	Male	66.45	15.98		
Computer Anxiety	Female	52.00	20.80	.75	.065
	Male	50.16	19.91		
Computer competences	Female	98.77	7227	- .64	.517
	Male	101.03	30.54		
Management support	Female	55.22	16.14	1.57	.117
	Male	58.01	13.19		
Attitude	Female	90.29	20.35	1.41	.159
	Male	93.74	20.49		
Perceived usefulness	Female	74.01	22.87	1.62	.106
	Male	78.43	22.87		
Intention to use	Female	32.36	10.67	2.82	.005**
	Male	36.10	11.43		
Perceived ease of use	Female	33.97	6.92	0.95	.340
	Male	34.90	9.13		
Cultural perception	Female	80.04	15.51	0.68	.496
	Male	81.37	16.91		
Actual Use of ICT	Female	56.61	16.43	1.62	.105
	Male	59.68	15.10		

Thus by referring to means of both groups it is announced that male faculty members have more computer self-efficacy and intention to use than female faculty members. It should be noted that no significant difference was observed between the two groups in other factors.

4.2.3.2 Test of differences between education level and psycho-social factors and actual use of ICT

By emphasizing on amount of the obtained *t*, it is stated that there is a significant difference among means of effective psycho-social factors such as attitude towards ICT between faculty members with PhD and M.A degrees in the university. Thus by referring to means of both groups it is noted that faculty members with M.A degree show more attitudes towards ICT than faculty members with PhD. It should be noted that no significant difference was observed between the two groups in other factors.

Table 4.23

Differences Between Education Level and Psycho-social Factors and Actual Use of ICT

Dependent variable	Levels	Mean	*SD*	*t*	df	Sig.
Computer Self-efficacy	M.A	66.17	14.31	1.60	278	.110
	PhD	66.11	16.77			
Computer Anxiety	M.A	49.13	19.36	1.39	278	.166
	PhD	52.55	21.01			
Computer competences	M.A	98.33	27.18	.75	278	.454
	PhD	100.98	30.43			
Management support	M.A	57.16	15.03	.57	278	.563
	PhD	56.12	14.71			
Actual use of ICT	M.A	56.83	13.63	1.18	278	.238
	PhD	59.01	17.27			
Attitude toward ICT	M.A	95.44	18.69	2.50	278	.013**
	PhD	89.41	21.35			
Perceived usefulness	M.A	76.81	16.89	.44	278	.656
	PhD	75.65	26.53			
Behavioral Intention to use	M.A	34.63	8.94	.59	278	.551
	PhD	33.82	12.54			
Perceived ease of use	M.A	34.27	7.14	.26	278	.791
	PhD	34.53	8.69			
Cultural perception	M.A	80.45	13.34	.21	278	.834
	PhD	80.85	18.02			

4.2.3.3 Test of differences between marital status and psycho-social factors and actual use of ICT

With reference to Table 4.24, by emphasizing on amount of the obtained *t* it is stated that there is a significant difference among means of effective factors on information technology application such as computer anxiety and management support between married and single faculty members of the university.

Table 4.24
Differences Between Marital Status and Psycho-social Factors and Actual Use of ICT

Dependent variable	Levels	Mean	*SD*	*t*	df	Sig.
Computer Self-efficacy	Married	63.77	15.21	.74	267	.455
	Single	65.25	16.98			
Computer Anxiety	Married	48.11	19.20	2.71	267	.007**
	Single	54.63	19.50			
Management support	Married	58.56	12.78	2.46	267	.009**
	Single	53.72	17.53			
ICT application	Married	58.56	14.67	.33	267	.736
	Single	57.92	16.07			
Attitude toward ICT	Married	93.49	20.22	1.21	267	.226
	Single	90.45	20.10			
Perceived usefulness	Married	78.45	23.37	1.67	267	.095
	Single	73.79	20.69			
Behavioral Intention to use	Married	34.29	11.50	.05	267	.958
	Single	34.22	9.32			
Perceived ease of use	Married	34.42	7.97	.32	267	.744
	Single	34.10	7.74			
Cultural perception	Married	81.11	17.88	.32	267	.745
	Single	80.46	13.18			

Thus by referring to means of both groups it is announced that single faculty members have more anxiety than the other group and married faculty members enjoy more management support. It should be noted that no significant difference was observed between the two groups in other factors.

4.2.3.4 Comparative Analysis of faculty members with different field of study according to psycho-social and actual use of ICT

Referring to Table 4.25, by emphasizing over obtained amounts, we can state that there is a significant difference among faculty members with different field of study according to mean of "computer self-efficacy, management support, perceived ease of use and actual use of ICT" at the significance level of $\alpha = .01$.

Table 4.25

Differences Between Field of Study and Psycho-social Factors and Actual Use of ICT

Variable	Levels	n	Mean	*F*	Sig.
Self-efficacy	Human Science	100	62.17	5.415	.000**
	Basic Science	64	63.15		
	Technical-engineering	40	72.17		
	Art & Architecture	35	71.11		
	Medical Science	43	60.83		
Anxiety	Human Science	101	48.22	1.157	.330
	Basic Science	63	51.06		
	Technical-engineering	40	51.85		
	Art & Architecture	33	54.34		
	Medical Science	41	55.04		
Management support	Human Science	99	54.67	8.02	.000**
	Basic Science	64	52.50		
	Technical-engineering	40	67.55		
	Art & Architecture	34	55.82		
	Medical Science	43	55.83		

Actual use of ICT	Liberal arts	101	57.80	7.528	.000**
	Basic sciences	61	55.21		
	Technical-engineering	40	69.10		
	Art and architecture	34	51.63		
	Medical science	43	60.00		
Attitude	Liberal arts	100	88.50	3.180	.140
	Basic sciences	64	93.26		
	Technical-engineering	39	93.92		
	Art and architecture	34	89.56		
	Medical science	42	89.37		
Perceived usefulness	Liberal arts	102	75.17	.405	.805
	Basic sciences	63	76.83		
	Technical-engineering	40	79.47		
	Art and architecture	34	78.02		
	Medical Science	43	74.16		
Intention to use	Human Science	102	31.74	3.055	.17
	Basic Science	63	34.90		
	Technical-engineering	40	36.73		
	Art & Architecture	34	38.22		
	Medical Science	43	33.93		
Perceived ease of use	Human Science	99	33.59	1.335	.017*
	Basic Science	61	35.96		
	Technical-engineering	41	35.85		
	Art & Architecture	34	35.00		
	Medical Science	43	33.46		
Cultural perception	Human Science	100	75.17	.739	.567
	Basic Science	65	76.83		
	Technical-engineering	40	79.47		
	Art & Architecture	34	78.03		
	Medical Science	43	74.16		

Given the Table 4.26 and by putting emphasis on the obtained amounts between faculty members' mean scores it can be concluded that faculty members with technical-engineering field of study have the most "self-efficacy, actual use of ICT, and

management support" among all other faculty members. Faculty members from the basic sciences field have the most perceived ease of use among other faculty members.

Table 4.26
Tamhane's Post hoc Test

Factors	Field of study	Human Science	Basic Science	Techni-cal-Engi-neering	Art & architecture	Medical science
CSE	Human Science			.001**	.043*	
	Basic Science					
	Technical-engineering	.001**				.001**
	Art & Architecture	.043*				.024*
	Medical Science			.001**	.024*	
MS	Human Science			.001**		
	Basic Science			.000**		
	Technical-engineering	.001**	.000**		.014*	.026*
	Art & Architecture			.014*		
	Medical Science			.026*		
AU	Human Science			.000**		
	Basic Science			.000**		
	Technical-engineering	.000**	.000**		.000**	.016*
	Art & Architecture			.000**		
	Medical Science			.016*		
PEU	Human Science				.012*	
	Basic Science					
	Technical-engineering					
	Art & Architecture	.012*				
	Medical Science					

*. The mean difference is significant at the .05 level
**. The mean difference is significant at the .01 level

4.2.3.5 Test of differences between professional rank and psycho-social factors and actual ICT use

As shown at Table 4.27, and by emphasizing on amount of significance level, it can be concluded that there is a significant difference among different professional rank and means of effective psycho-social factors and actual use of ICT such as management support, perceived usefulness, perceived ease of use and actual use of ICT by faculty members.

Table 4.27

Differences Between Professional Rank and Psycho-social Factors and Actual Use of ICT

Variables	Ranks	n	Mean rank
Computer self-efficacy	Instructor	126	131.21
	Assistant professor	87	125.22
	associate professor	35	139.70
	Professor	15	159.97
Computer anxiety	Instructor	126	129.45
	Assistant professor	87	141.24
	associate professor	35	107.51
	Professor	15	157.00
Management support	Instructor	126	125.73
	Assistant professor	87	146.28
	associate professor	35	102.90
	Professor	15	169.70
Attitude toward ICT	Instructor	126	131.10
	Assistant professor	87	129.88
	associate professor	35	135.77
	Professor	15	143.03
Perceived usefulness	Instructor	126	114.55
	Assistant professor	87	164.10
	associate professor	35	124.36
	Professor	15	110.23
Behavioral Intention	Instructor	126	125.68
	Assistant professor	87	140.98
	associate professor	35	133.64
	Professor	15	129.13
Perceived ease of use	Instructor	126	122.55
	Assistant professor	87	140.38
	associate professor	35	137.96
	Professor	15	148.87
Cultural perception	Instructor	126	119.64
	Assistant professor	87	151.73
	associate professor	35	133.57
	Professor	15	117.70
Actual use of ICT	Instructor	126	119.64
	Assistant professor	87	137.74
	associate professor	35	135.20
	Professor	15	156.20

By emphasizing over obtained amounts, it is stated that there is a significant difference among faculty members with different professional rank and "management support", "cultural perception" and "perceived usefulness".

Table 4.28

Results of Kruskal-Wallis Test Between Professional Rank and Psycho-social Factors

	Management support	Perceived usefulness	Cultural perception
Chi-Square	12.75	23.74	9.73
df	3	3	3
Asymp. Sig.	.005**	.000**	.021*

4.2.3.6 Relationship between age and psycho-social factors and actual ICT use

Analysis of the results in Table 4.29 and emphasizing on obtained amounts of correlations between age and psycho-social and actual use of ICT variables, shows the existence of a negative significant relationship between age and "self-efficacy, and cultural perception". Also there is a positive significant relationship between age and "perceived usefulness". Thus it is stated that by increasing of age, self-efficacy, and cultural perception are decreased while perceived usefulness is increased. In other words, self-efficacy, and perceived usefulness are increased by decreasing of age, but perceived usefulness is decreased.

Table 4.29

Relationship Between Age and Proposed Model Variables

	Pearson Correlation Coefficient	**Sig.**	**N**
Computer Self-efficacy	-.280	.004**	258
Computer Anxiety	.170	.088	260
Management Support	-.019	.910	243
Cultural Perception	-.319	.001**	259
Perceived Usefulness	.210	.032*	255
Perceived Ease of Use	.034	.743	260
Attitude toward ICT	-.180	.066	254
Behavioral Intention to use	-.171	.086	260
Actual Use of ICT	-.101	.289	253

* $p < .05$ ** $p \leq .01$

4.2.3.7 Test of Relationship between working experience and psycho-social factors and actual use of ICT

Given Table 4.30 and emphasizing on the correlations between working experience and psycho-social and actual use of ICT variables, it is observed that there is a negative significant relationship between working experience and the following: self-efficacy, intention to use, perceived ease of use and cultural perception. Thus it is stated that by increasing of working experience, self-efficacy, attitude toward ICT, intention to use, perceived ease of use and cultural perception are decreased. Reversely self-efficacy, attitude toward ICT, intention to use, perceived ease of use and cultural perception are increased by decreasing of working experience.

Table 4.30

Relationship Between Working Experience and Psycho-social Factors and Actual Use of ICT

	Pearson Correlation Coefficient	**Sig.**	**N**
Computer Self-efficacy	-.19	.002**	250
Computer Anxiety	.05	.392	253
Management Support	.05	.412	250
Cultural Perception	-.22	.001**	251
Perceived Usefulness	-.06	.277	254
Perceived Ease of Use	-.19	.002**	253
Attitude toward ICT	.017	-0.14	249
Behavioral Intention to use	-.12	.053*	254
Actual Use of ICT	.05	.385	252

* $p < .05$ ** $p \leq .01$

4.2.3.8 Test of Relationship between proficiency level of English language and psycho-social factors and actual use of ICT

Given the results in Table 4.31 there is a negative significant relationship between proficiency level of English language and computer anxiety. Also there is a positive significant relationship between proficiency level of English language and computer self-efficacy, actual use of ICT and perceived usefulness. Thus it is stated that by increasing of proficiency level of English language, computer anxiety is decreased while self-efficacy, use of ICT, and perceived usefulness are increased. Reversely computer anxiety is increased by decreasing of proficiency level of English language; while computer self-efficacy, use of ICT and perceived usefulness are decreased.

Table 4.31

Relationship Between Proficiency Level of English Language and Psycho-social Factors and Actual Use of ICT

	Pearson Correlation Coefficient	**Sig.**	**N**
Computer Self-efficacy	.17	.003**	276
Computer Anxiety	-.17	.003**	276
Management Support	.08	.143	279
Cultural Perception	.488	.056	271
Perceived Usefulness	.058	.011*	280
Perceived Ease of Use	.180	.083	279
Attitude toward ICT	.260	.066	278
Behavioral Intention to use	.918	.067	279
Actual Use of ICT	.260	.012*	274

4.2.3.9 Test of Relationship between computer competence and psycho-social factors and actual ICT use

As shown in Table 4.32, computer competence variable has negative significant relation with computer anxiety; but it has positive significant relation with self-efficacy, management support, cultural perception, perceived usefulness, perceived ease of use, attitude towards ICT, behavioral intention and actual use of ICT.

Table 4.32

Relationship Between Computer Competence and Proposed Model Variables

	Pearson Correlation Coefficient	**Sig.**	**N**
Computer Self-efficacy	.642	.000**	276
Computer Anxiety	-.309	.000**	260
Management Support	.554	.000**	267
Cultural Perception	.211	.000**	259
Perceived Usefulness	.234	.000**	261
Perceived Ease of Use	.550	.000**	260
Attitude toward ICT	.458	.000**	254
Behavioral Intention to use	.434	.000**	260
Actual Use of ICT	.803	.000**	253

* $p < 0.05$ ** $p \leq 0.01$

4.2.3.10 Test of Relationship between years of experience with ICT and psycho-social factors and actual use of ICT

Given the following Table 4.33, it is observed that there is a negative and significant relationship between years of experience with ICT and attitude toward ICT, perceived

ease of use, perceived usefulness and behavioral intention to use, and there is a positive and significant relationship between years of experience with computer self-efficacy. Thus it is stated that by increasing of working experience with ICT, self-efficacy is increased and attitude toward ICT, intention to use, perceived ease of use and perceived usefulness are decreased.

Table 4.33

Relationship Between Years of Experience with ICT and Psycho-social Factors and Actual Use of ICT

	Pearson Correlation Coefficient	**Sig.**	**N**
Computer Self-efficacy	.196	.002**	250
Computer Anxiety	.057	.392	253
Management Support	.052	.412	250
Cultural Perception	-.224	.089	251
Perceived Usefulness	-.065	.001**	254
Perceived Ease of Use	-.190	.002**	253
Attitude toward ICT	-.026	.014*	249
Behavioral Intention to use	-.126	.053*	254
Actual Use of ICT	.058	.385	252

* $p < .05$ ** $p \leq .01$

4.2.4 Research Question 4

What are the relationships between psycho-social factors of the respondents with the ICT usage by faculty members?

Correlation test is used to respond to this question given the fact that it is intended to determine relations among all psycho-social variables with each other and actual use of ICT. The results are illustrated in Table 4.34.

Table 4.34

Correlation Matrix Between Psycho-social Variables with Each Other and Actual Use of ICT

		CSE	CA	MS	CP	PU	PEOU	AT	BI	AU
CSE	Pearson Correlation	1	-.145*	.577**	.181**	.229**	.459**	.546**	.462**	.639**
	Sig. (2-tailed)	.	.013	.000	.002	.000	.000	.000	.000	.000
	N	291	291	291	291	291	291	291	291	291
CA	Pearson Correlation	-.145(*)	1	-.165(**)	-.461**	-.497**	-.400**	-.347**	-.266**	-.263**
	Sig. (2-tailed)	.013	.	.005	.000	.000	.000	.000	.000	.000
	N	291	291	291	291	291	291	291	291	291
MS	Pearson Correlation	.577(**)	-.165(**)	1	.160**	.317**	.432**	.442**	.305**	.633**
	Sig. (2-tailed)	.000	.005	.	.006	.000	.000	.000	.000	.000
	N	291	291	291	291	291	291	291	291	291
CP	Pearson Correlation	.181(**)	-.461(**)	.160(**)	1	.595**	.521**	.408**	.562**	.234**
	Sig. (2-tailed)	.002	.000	.006	.	.000	.000	.000	.000	.000
	N	291	291	291	291	291	291	291	291	291
PU	Pearson Correlation	.229**	-.497**	.317**	.595**	1	.452**	.221**	.539**	.251**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000	.000
	N	291	291	291	291	291	291	291	291	291
PEOU	Pearson Correlation	.459**	-.400**	.432**	.521**	.452**	1	.507**	.685**	.540**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000	.000
	N	291	291	291	291	291	291	291	291	291
AT	Pearson Correlation	.546**	-.347**	.442**	.408**	.221**	.507**	1	.552**	.401**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.	.000	.000
	N	291	291	291	291	291	291	291	291	291
BI	Pearson Correlation	.462**	-.266**	.305**	.562**	.539**	.685**	.552**	1	.430**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.	.000
	N	291	291	291	291	291	291	291	291	291
AU	Pearson Correlation	.639**	-.263**	.633**	.234**	.251**	.540**	.401**	.430**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.
	N	291	291	291	291	291	291	291	291	291

** Correlation is significant at the .01 level (2-tailed). * Correlation is significant at the .05 level (2-tailed).

As a result, Table 4.34 shows:

A) Computer Self-efficacy

Self-efficacy variable has negative significant relation with anxiety but it has positive significant relation with management support, cultural perception, perceived ease of use, attitude towards ICT, behavioral intention and actual use of ICT.

B) Computer Anxiety

Computer anxiety variable has negative significant relation with self-efficacy, management support, cultural perception, perceived usefulness, perceived ease of use, attitude towards ICT, behavioral intention and actual use.

C) Management Support

Management support variable has a negative significant relation with computer anxiety but it has positive significant relation with self-efficacy, cultural perception, perceived usefulness, perceived ease of use, attitude towards ICT, behavioral intention and actual use.

D) Cultural Perception

Cultural perception variable has negative significant relation with computer anxiety but it has positive significant relation with self-efficacy, management support, computer competence, perceived usefulness, perceived ease of use, attitude towards computer, behavioral intention and actual use.

E) Perceived Usefulness

Perceived usefulness variable has a negative significant relation with computer anxiety but it has positive significant relation with self-efficacy, cultural perception, management support, perceived ease of use, attitude towards computer, behavioral intention and actual use.

F) **Perceived Ease of Use**

Perceived ease of use variable has negative significant relation computer anxiety but it has positive significant relation with self-efficacy, cultural perception, management support, perceived usefulness, attitude towards computer, behavioral intention and actual use.

G) Attitude toward ICT

Attitude towards ICT has negative significant relation computer anxiety but it has positive significant relation with self-efficacy, cultural perception, management support, perceived usefulness, perceived ease of use, behavioral intention and actual use.

H) Behavioral Intention

Behavioral intention variable has negative significant relation with computer anxiety but it has positive significant relation with self-efficacy, cultural perception, perceived usefulness, perceived ease of use, behavioral intention and actual use of ICT. Meanwhile it does not have any significant relation with age and teaching experience variables.

I) Actual Use of ICT

Actual use variable has negative significant relation with computer anxiety but it has positive significant relation with self-efficacy, cultural perception, perceived usefulness, perceived ease of use, attitude and behavioral intention towards ICT.

4.2.5 Path Analysis

4.5.2.1 Prediction of effective variables on perceived ease of use

Given the following Table 4.35 and by focusing on amount of the obtained *F* value, it is stated that there is significant relationships between computer self-efficacy, computer competence, cultural perception, management support and computer anxiety with perceived ease of use at the level of $\alpha = .01$. In other words there is capability to predict perceived ease of use through self-efficacy, computer competences, cultural perception, management support and anxiety. Therefore, it is necessary to state regression coefficient correlation in order to determine and explain regression coefficients.

Table 4.35
Multiple Regression to Predict Perceived Ease of Use

Source of changes	Sum of squares	df	Mean of squares	*F*	Sig.
Regression	12684.91	7	2536.98	108.81	.001**
Residue	6644.43	281	23.31		

With due attention to multivariate regression coefficients with Enter method and obtained regression coefficients, it is observed that there is a positive significant relationship between self-efficacy, computer competence, cultural perception and perceived ease of use. Thus self-efficacy, computer competences and cultural perception

are increased by increasing of perceived ease of use; by decreasing any of them perceived ease of use will be decreased too.

Table 4.36

Multiple Regression Explaining Perceived Ease of Use

Dependent Variable	Predicting Variables	B	Beta	*t*	Sig.
Perceived ease of use	Self-efficacy	.17	.33	4.91	.001**
	Computer competences	.06	.21	2.98	.003**
	Cultural perception	.18	.35	6.85	.001**
	Management support	.03	.06	1.63	.103
	Anxiety	-.01	- .01	- .02	.981

4.2.5.2 Prediction of effective variables on perceived usefulness

By emphasizing on the obtained amounts, it is stated that there is a significant relationship between "self-efficacy, computer competence, cultural perception, management support and computer anxiety" with "perceived usefulness" at the level of $\alpha = .01$. It is possible to predict self-efficacy through perceived usefulness, computer competences, cultural perception, and management support and computer anxiety. Therefore, it is necessary to state that regression coefficient correlation in order to determine and explain regression coefficients.

Table 4.37

Multiple Regression to Predict Perceived Usefulness

Model	Sum of squares	df	Mean of squares	*F*	Sig.
Regression	131637.8	7	26327.55	420.36	.001**
Residue	149487.4	281	62.63		

Given the obtained regression coefficients, it is stated that there is a positive significant relationship between self-efficacy, computer competence, cultural perception and

management support and there is a negative significant relationship between anxiety and perceived usefulness. So self-efficacy is increased by increasing of perceived usefulness, cultural perception and management support and it is decreased by decreasing any of them. By decreasing anxiety, perceived usefulness is increased and it is increasing of computer anxiety will decrease perceived usefulness.

Table 4.38

Multiple Regression Coefficients Related to Perceived Usefulness

Dependent variable	Predicting variables	B	Beta	*t*	Sig.
Perceived usefulness	Computer self-efficacy	.11	.08	1.99	.047*
	Computer competences	.01	.01	.14	.882
	Cultural perception	.97	.68	22.05	.001**
	Management support	.20	.13	5.43	.001**
	Anxiety	- .23	- .21	-6.83	.001**

4.2.5.3 Prediction of effective variables on attitude toward ICT

By emphasizing on amount of the obtained *F* value, it is stated that there is a significant relationship between perceived usefulness, perceived ease of use with attitude toward ICT at the level of $\alpha = .01$. In other words, there is the capability to predict attitude toward ICT through perceived usefulness and perceived ease of use. Therefore, it is necessary to state regression coefficient correlation in order to determine and explain regression coefficients.

Table 4.39

Multiple Regressions to Predict Attitude toward ICT

Source of changes	Sum of squares	Degree of freedom	Mean of squares	*F*	Significance level
Regression	95194.84	4	47597.42	614.04	.001**
Residue	22324.24	287	77.51		

Given the obtained regression coefficients it is stated that there is a positive significant relationship between perceived usefulness and perceived ease of use with attitude towards ICT. By increasing perceived usefulness and perceived ease of use, attitude towards ICT is increased; and by decreasing them, attitude towards ICT is decreased too.

Table 4.40

Multiple Regression Coefficients Related to Perceived Usefulness

Dependent variable	Predicting variables	B	Beta	*t*	Sig.
Attitude	Perceived usefulness	.65	.73	20.67	.001**
	Perceived ease of use	.53	.21	6.13	.001**

4.2.5.4 Prediction of Behavioral Intention to Use ICT

By emphasizing on amount of the obtained *F* it is stated that there is a significant relationship between attitude towards ICT and intention to use at the level of $\alpha = .01$. In other words there is the capability to predict intention to use through attitude toward ICT. Therefore, it is necessary to state regression coefficient correlation in order to determine and explain regression coefficients.

Table 4.41

Multiple Regression to Predict Behavioral Intention toward ICT

Source of changes	Sum of squares	Degree of freedom	Mean of squares	*F*	Significance level
Regression	29220.13	2	29220.13	1346.06	.001**
Residue	6273.56	289	21.70		

Given the obtained regression coefficients we can state that there is a positive significant relation between intention to use and attitude towards ICT. By increasing of

attitude towards computer, intention to use is increased and by decreasing of this attitude it is decreased too.

Table 4.42

Multiple Regression Coefficients Related to Behavioral Intention to Use ICT

Standard variable	Predicting variables	B	Beta	*t*	Sig.
Intention to use	Attitude	.49	.90	36.68	.001**

4.2.5.5 Prediction of Actual Use of ICT

By emphasizing on the amount of the obtained *F* it is stated that there is a significant relationship between intention to use and ICT use at the level of $\alpha = .01$. In other words there is the capability to predict information technology use through intention to use. Therefore, it is necessary to state the regression coefficient correlation in order to determine and explain regression coefficients.

Table 4.43

Multiple Regression to Predict Actual use of ICT

Source of changes	Sum of squares	Degree of freedom	Mean of squares	*F*	Sig.
Regression	27377.05	2	27377.05	167.24	.001**
Residue	47308.03	289	163.69		

By paying attention to obtained regression coefficients, it is stated that a positive significant relationship between intention to use and information technology use is observed. So by increasing of intention to use, actual use of information technology is increased and by decreasing of it information technology use is decreased too.

Table 4.44

Multiple Regressions to Predict Actual Use of ICT and Intention to Use

Standard variable	Predicting variables	B	Beta coefficient	*t*	Sig.
Use of ICT	Intention to use	.87	.60	12.93	.001**

4.2.5.6 Prediction of Actual use of ICT through all variables of proposed Model

Table 4.45
Amount of R, R^2 and Effects of Independent Variable on Actual Use of ICT

Dependent variable	Independent variables	*R*	R^2	Direct effects	Indirect effects	Total effects
(AU) (R^2= .84)	Behavioral Intention	.430	.184	.87		.87
	Attitude toward ICT (AT)	.401	.161	-	.85	.85
	Perceived usefulness (PU)	.251	.063	-	.17	.17
	Perceived ease of use (PE)	.540	.292	-	.62	.62
	Age (AGEFACTOR)	.078	.006	-	.06	.06
	Computer Self-efficacy (CSE)	.639	.409	-	.13	.13
	Computer Anxiety (CA)	.263	.069	-	.09	.09
	Computer Competence (CC)	.803	.644	-	.69	.69
	Management Support (MS)	.633	.400	-	.03	.03
	Cultural Perception (CP)	.234	.055	-	.51	.51
	Work Experience (EXPERIENCE)	.006	.000	-	.23	.23

As observed in Table 4.45, computer competence with R^2 = .644 was recognized as the strongest predictor for use of ICT among effective variables on the dependent variable. Then computer self-efficacy with R^2 = .409 and management support with R^2 = .400 were recognized as the second and third strongest predictors for usage of ICT respectively. But in terms of effect on the dependent variable of ICT usage, variables of

attitude toward ICT, behavioral intention and computer competence were the most important and the most effective variables with regard to use of ICT.

Multiple regression results indicate that 84 percent of the variance in the dependent variable was explained by the linear combination of the predicting variables. This shows high predicting power of variables of the recommended model.

4.2.6 Analysis of Structural Equation Model (SEM)

Two main applications of the structural equations model have been considered in this research. In the first application, structural equations model is regarded as a method to study tools' validity that is called confirmatory factor analysis and is applied to examine the structure of effective factors on ICT usage among faculty members of zone 8 branches of IAU in Tehran. The second application is regarded as a strong technique to analyze simultaneous regression equations and is used in the form of path analysis in studying the causal relation among variables of effective factors' model on ICT usage in this research.

Attention is focused on relations among latent variables and indicators in measurement models. By latent variables we mean a variable which cannot be measured directly and it should be measured through indicators or observable variables that are measured directly. Originally confirmatory factor analysis is a method of hypothesis testing and states whether the intended indicators actually introduce a structure of latent variables or not. It also specifies how accurate selected indicators define or fit the latent variables. Concept of validity answers to this question that measurement tools examine the intended attribute to what extent (Kalantari, 2009). In this phase confirmatory factor analysis is used to study the power of latent attributes indicators of effective factors on ICT usage.

In order to test significance of the intended parameters, Statistical index "*t*" is used in the structural equations model, so parameters with amounts of higher than 2 are significant statistically. Given the results of Table 4.47 and reported "*t*" amounts for each one of the standard parameters, it is possible to consider results of this table valid for all reported parameters. Standard parameters are higher than 2 (Table 4.47).

4.2.7 Research Question 5:

Is the represented conceptual model an appropriate model in perceiving relations between effective factors on the actual use of ICT by faculty members of IAU?

In order to respond to the fifth question whether the recommended model is a useful and acceptable tool for perceiving of relations among effective variables on ICT usage we should examine whether the above model has the necessary goodness of fit or not, because goodness of fit of the model shows that the model is confidential to what extent. Various standards are used for model's goodness of fit that will be calculated in the following and results are illustrated in Table 4.46. As the results of this table show, the model has a suitable goodness of fit given standards and consequently it could be used as an appropriate tool to perceive relations among effective variables on ICT usage. Of course it should be noted that obtained experimental model is different from the recommended theoretical model in Chapter Two to some extent and age variable is not confirmed in this model.

4.2.7.1 Goodness of Fit

Generally there are several goodness of fit indices for evaluation of confirmatory factor analysis model. In order to evaluate confirmatory factor analysis model in this research, x^2 indices, Root Mean square Residual (RMR), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Incremental Fit Index (IFI), Comparative Fit Index (CFI) and very important index of Root Mean Square Error of Approximation (RMSEA) have been used.

Ratio of Chi- square to degree of freedom is much dependent on the sample size and increases the large sample of Chi-square quantity more than what could be attributed to the model's erroneousness. Ideal is that significance level of Chi-square is more than .05 or amount of Chi-square divided by degree of freedom is between 1 and 2 or smaller than 3. With due attention to the reported amount in Table 4.46, amount of Chi-square is significant and its significance level is equal to .000. Given that sample size of this research is more than 300 individuals, we have used other indices for fitting of model's goodness. Amount of Goodness of Fit Index (GFI) is reported equal to 0.90 and as this index has more validity than Chi-square index, so the researcher relies on this index and has evaluated the goodness of the model appropriately.

GFI and AGFI standards show a relative value of variances and co-variances that are explained by the model. Both of these standards are changeable between 0 and 1 that the more they are closer to number 1, the higher the model's goodness of fit with observed data. Amounts of reported GFI and AGFI for this model are higher than .8; that confirms the results of the Chi-square test. Square root of Root Mean Residual

(RMR) or difference between elements of the observed matrix in the sample group and elements of the estimated or predicted matrices is along with the assumption of the intended model's correctness. The more the Root Mean Residual (RMR) for the testing model is closer to 0, the better the goodness of the model. Insignificant amount of RMR in this research (.05) shows suitable explanation of covariance amounts. We have used amounts of Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Incremental Fit Index (IFI) and Comparative Fit Index (CFI) in order to study the level of performance of a model especially in comparison with other possible models in terms of explaining of a group of observed data. According to Gefen, Straub, and Bourea (2000), values of the first two indices are higher than .8 and the two second indices are higher than .9 which reflect very close goodness of fit of the designed model than other possible models.

Finally we used the strongest index of Root Mean Square Error of Approximation (RMSEA) to study how the intended model combines goodness and saving with each other. RMSEA index is the root mean of approximation squares. This index for good models is equal to .05 and lower. When this amount is equal to .10 or higher, the model has a weak goodness. The very insignificant amount of this index (.042) for confirmatory factor analysis model of effective factors' model on ICT usage demonstrates the relative fit goodness and appropriate research design.

Table 4.46

Goodness Indices of the Research Model

Index	Standards	The reported amount
Chi square/df	3	1077.63/721
Root Mean Residual(RMR)	< 0.05	.05
Goodness of Fit Index (GFI)	> 0.85	.90
Adjusted Goodness of Fit Index (AGFI)	> 0.80	.88
Normed Fit Index(NFI)	> 0.80	.92
Non-Normed Fit Index(NNFI)	> 0.80	.98
Increasing Fit Index (IFI)	> 0.90	.99
Comparative Fitness Index (CFI)	> 0.90	.99
Root Mean Square Error of Approximation(RMSEA)	< 0.08	.042

As goodness features of Table 4.46 shows, the research data has fit goodness with factorial structure and theoretical infrastructure of variables of effective factors on ICT usage and this reveals harmonization of questions with theoretical structure.

4.2.7.2 Structural model of effective factors' model on ICT usage

As pointed out, the second application of the structural equation model in this research is regarded as a strong technique for analyzing of simultaneous regression equations that has been used in the form of path analysis to study the causal relation among variables of effective factors' model on ICT usage. Structural equation map is illustrated in Figure 4.2 that has been extended based on results obtained from confirmatory factor analysis. According to obtained results of Tables 4.46, 4.47 and Figure 4.2 which shows testing of the model map we can conclude that this structure is fit.

Now we can test hypotheses through studying of the structural model with a suitable measurement model. Figure 4.1 shows standardized path coefficients and their significance level in the structural model for each of the latent variables. Standardized

path coefficients demonstrate strength of relations among independent and dependent variables. Coefficients of determination (R^2) show the explained variance amounts by independent variables about the dependent variable are calculated too.

In Figure 4.2 all variables with "*t*" parameters higher than 2 have been confirmed. Based on obtained results of path coefficients, attitude (AT), behavioral intention (BI) and computer competences (CC) variables have the highest effect on the dependent variable of actual utilization (AU). Management support (MS) variables have the lowest effect (Table 4.47).

Table 4.47

Causal Relations Among the Existent Independent and Dependent Variables in Effective Factors' Model on ICT Application

dependent variable	independent variable	Direct effects	Indirect effects	Total effects	Standard deviation	*t*-value
Perceived usefulness (PU) (R^2= 0.93)	Computer Self-efficacy (CSE)	.31	-	.31	.04	7.71*
	Computer Anxiety (CA)	.28	-	.28	.01	7.02*
	Computer competence (CC)	.48	-	.48	.09	12.50*
	Management support (MS)	.18	-	.18	.05	4.06*
	Cultural perception (CP)	-.10	-	-.10	.10	-2.87*
Perceived ease of use (PE) (R^2= 0.29)	Computer Self-efficacy (CSE)	.08	-	.08	.01	3.21*
	Computer Anxiety (CA)	.09	-	.09	.03	3.66*
	Computer competence (CC)	.30	-	.30	.10	7.96*
	Management support (MS)	-.07	-	-.07	.01	-2.36*
	Cultural perception (CP)	.96	-	.96	.10	17.04*
Attitude toward ICT (AT) (R^2= 0.43)	Perceived usefulness (PU)	.54	-	.54	.06	11.07*
	Perceived ease of use (PE)	.46	-	.46	.11	10.00*
	Computer Self-efficacy (CSE)	-	.08	.08	-	-
	Computer Anxiety (CA)	-	.09	.09	-	-
	Computer competence (CC)	-	.30	.30	-	-
	Management support (MS)	-	-.07	-.07	-	-
	Cultural perception (CP)	-	.95	.95	-	-
Behavioral Intention (BI) (R^2= 0.98)	Attitude toward ICT (AT)	.99	-	.99	.11	21.81*
	Perceived usefulness (PU)	-	.53	.53	-	-
	Perceived ease of use (PE)	-	.45	.45	-	-
	Computer Self-efficacy (CSE)	-	.08	.08	-	-
	Computer Anxiety (CA)	-	.09	.09	-	-
	Computer competence (CC)	-	.30	.30	-	-
	Management support (MS)	-	-.07	-.07	-	-
	Cultural perception (CP)	-	.95	.95	-	-
Actual Use (AU) (R^2= 0.84)	Behavioral Intention	1.02		.13	.13	24.07*
	Attitude toward ICT (AT)	-	.99	.99	-	-
	Perceived usefulness (PU)	-	.55	.55	-	-
	Perceived ease of use (PE)	-	.47	.47	-	-
	Computer Self-efficacy (CSE)	-	.08	.08	-	-
	Computer Anxiety (CA)	-	.09	.09	-	-
	Computer competence (CC)	-	.30	.30	-	-
	Management support (MS)	-	-.07	-.07	-	-
	Cultural perception (CP)	-	.96	.96	-	-

* Significant at the .01 level ns: not significant

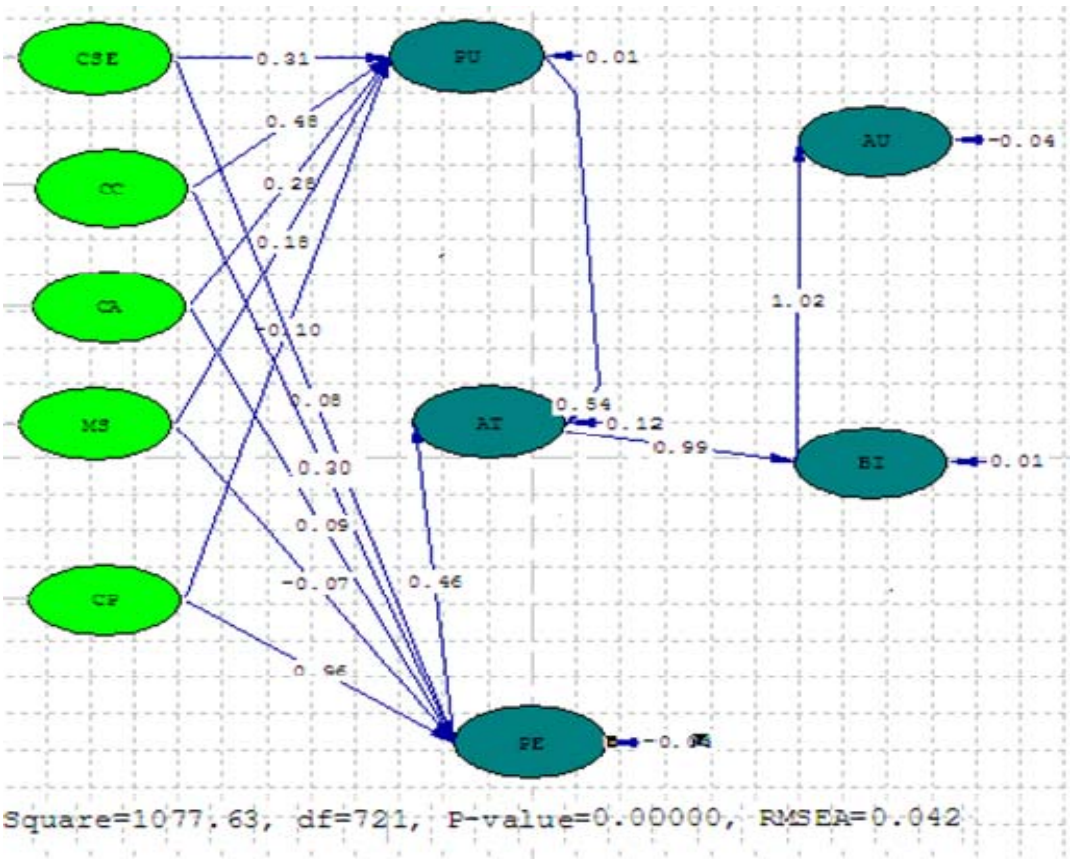
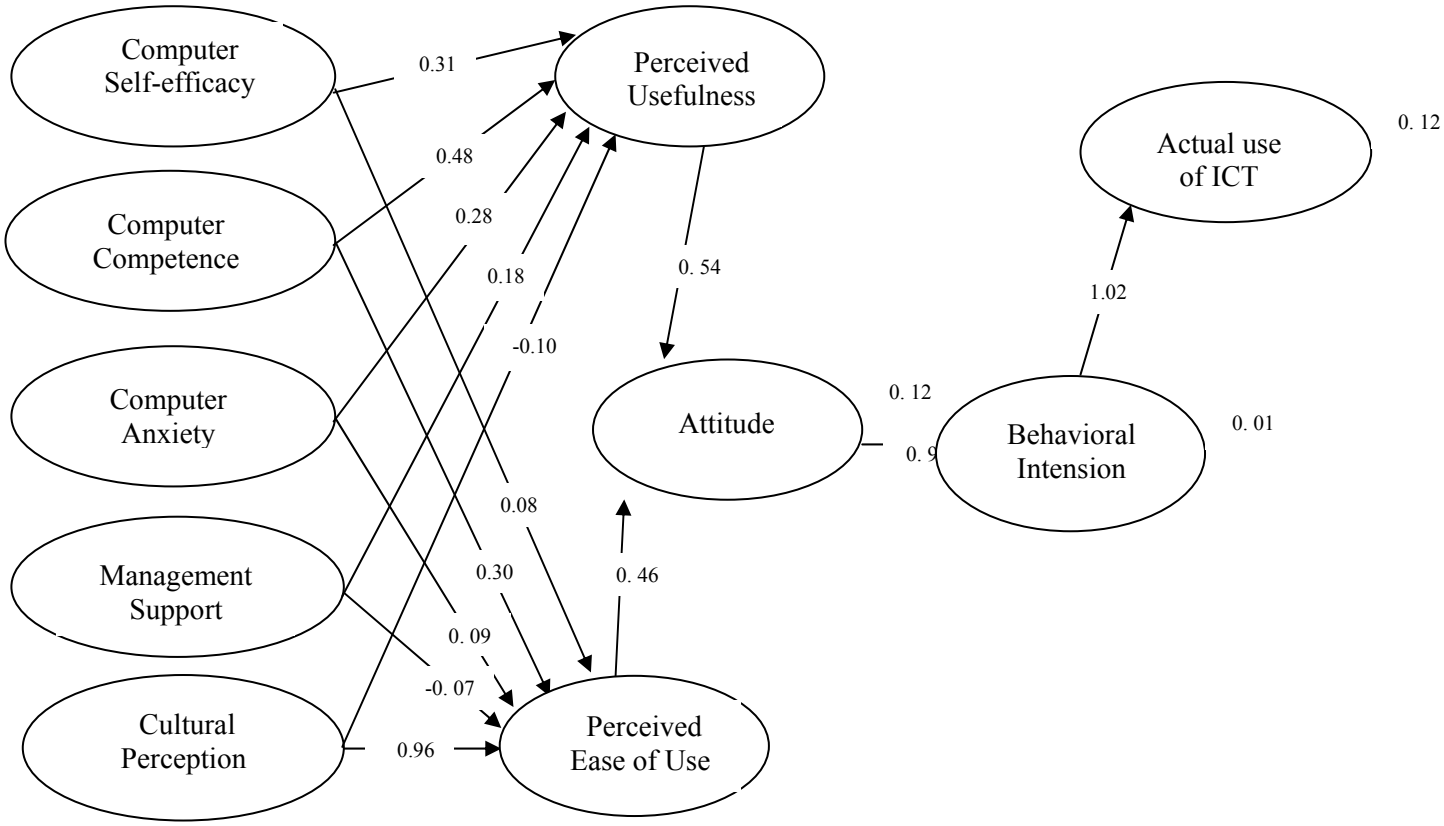


Figure 4. 1 Structural equation model with path (Standardized) coefficients (LISREL output).



Structural equation model with path (Standardized) coefficients

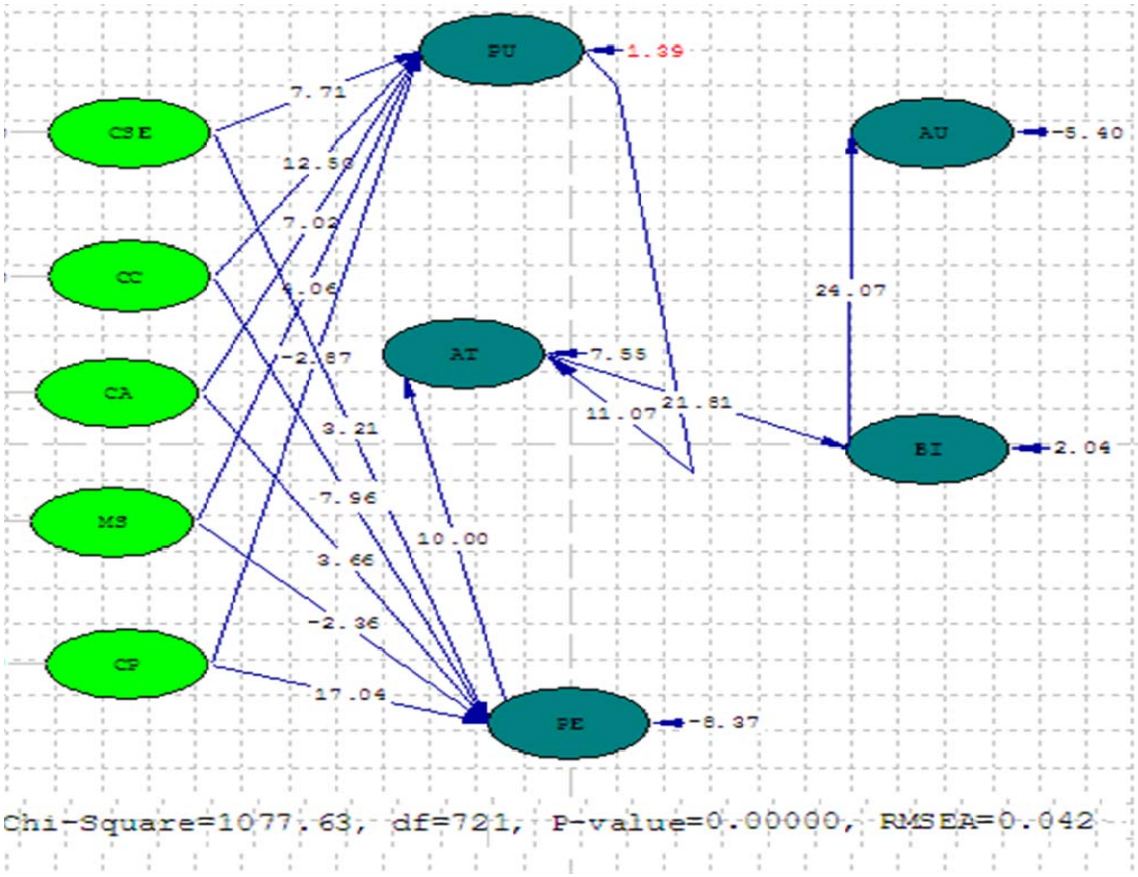


Figure 4.2. Structural equation model with amounts of *t*-value (LISREL output).

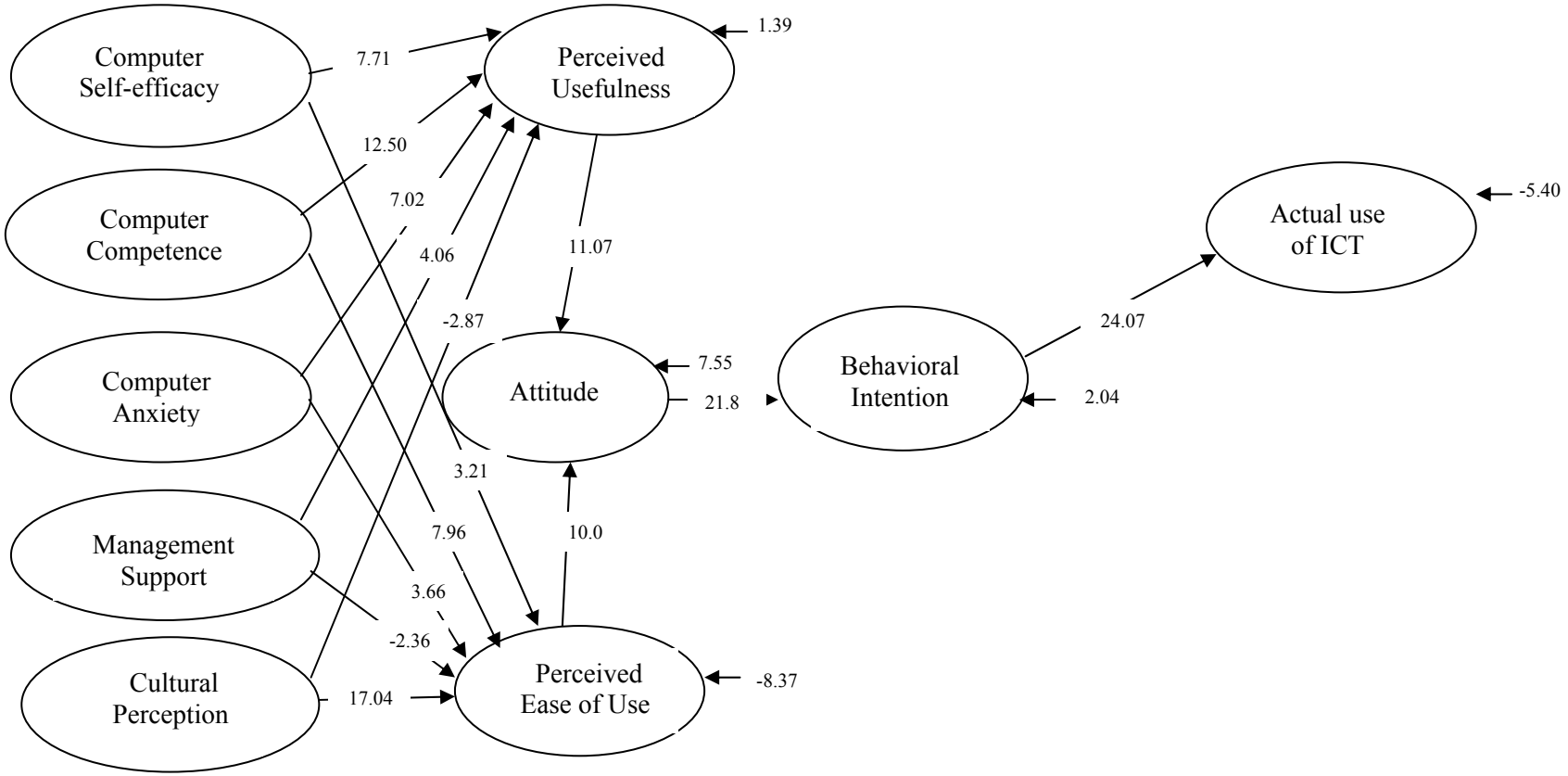


Figure 4.3. Structural equation model with amounts of ***t***-value

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Ever-increasing growth of ICT today affects all aspects of human life; hence it has been exposed to change and transition. Meanwhile, universities as the most important developmental tools are gradually becoming obvious in socio-economic, cultural and scientific realms. The world's educational systems have been affected severely with the advancement of scientific, technical and technological domains. Presently, ICT, as one of the valuable solutions to the ever-increasing educational needs, has received global acceptance. In this regard, Iran as developing country faces many problems in the field of ICT such as lack of cultural foundation for ICT adoption, lack of skilled human force, unfamiliarity with foreign languages, lack of motivation and investigation spirits, lack of inclination to work, effort and operation and in one word, decreasing capability of life skill are the outcomes of inability of the traditional higher educational system in responding to the changing social needs. The main aim of this survey is to identify and determine the effective factors on acceptance and use of ICT between faculty members of zone 8 branches universities in Tehran from IAU.

The researcher used simple random sampling method in this research. Given that the present survey has a descriptive-field plan and questionnaire is the most appropriate measurement tool that reliability and validity of this tool was confirmed. Findings of the study showed that faculty members of zone 8 branches universities in Tehran from IAU given to the importance of studying use of ICT in universities. The final result of this survey was access to an use of ICT model in IAU. According to the

obtained model, nine (9) variables affect the actual use of ICT. These variables clarify 84 percent of the dependent variable's variance totally and there are still unrecognized variables. Computer competence, computer self-efficacy, management support and perceived ease of use of computer were recognized as strong predictors of ICT application. Hence more attention must be focused on these four components in order to enhance the use of ICT in universities. Necessary education with regard to using modern information and communication technologies must be represented for faculty members and students in order to increase computer competence and computer self-efficacy. Management support is necessary to increase accessibility to hardware and software in the university; therefore managers play a significant role in universities in order to encourage ICT usage.

5.2 Discussion

The rationale for using technology in education, according to Roblyer and Edwards (2000), is related to the following elements: (1) motivation of learners; (2) unique instructional capabilities such as linking learners to information sources and learning tools, helping learners to visualize problems and solutions; (3) support for new instructional approaches such as cooperative learning, shared intelligence, and problem-solving; (4) increased teacher productivity; and (5) required skills for an information age such as technology literacy, information literacy, visual literacy, and helping students become lifelong learners. Yang (2007) noted that technology has become an integral part of higher education, enabling users to access information rapidly and visually (Smith et al., 2005). Information and communications technology includes both information systems (software platforms and databases), as well as communication media. Unless teachers develop positive attitudes toward the new machines, they may simply ignore them (Albirini, 2004a). An individual's initial attitude regarding a

computer's ease of use and computer's usefulness may influence attitudes towards use; training was found to significantly improve computer self-efficacy for both males and females. According to Young (2007) the impact of technology on higher education, the workplace and our personal lives highlights the importance of understanding the technology acceptance process of individuals because success increasingly depends on adapting new technologies on an ever-increasing basis at an ever-increasing rate.

ICT is employed as any new technology, including computer hardware and software, telecommunication tools, and information networks that allow users to transmit, process, store, organize, and retrieve information for problem solving or decision making and teaching and learning in educational systems. It is essential for all students and future teachers to use and understand computers and implement technology for career success (Rizza, 2000). Computers and technology are becoming a necessity in all aspects of everyday life. Technology of the 21st century has had an impact on everybody; thus, teachers need to become more proficient end-users of various software applications (Magliaro, 2006). In this research ICT means any type of technology such as computer hardware and software, telecommunication tools and information networks that allow the possibility of transferring, processing, storage, organization, information retrieval and making relation with the aim of solving problems, decision-making (Abdollah, 2007), education and learning in an educational environment.

Analysis of literature relative to the purpose of study found not much has been researched on computer use among faculty members or on factors affecting faculty members' use of computers and ICT. A thorough search of the relevant literature found that most of the studies were conducted in the U.S. and only a limited number of studies have focused on technology acceptance outside North America (McCoy & Everard, 2000). More importantly, there has been no published model of technology acceptance

focused on the computer/Internet usage by faculty members. In addition, no evidence has been found in the research literature related to a model of technology acceptance being developed in the context of the Islamic Azad University Sector by using faculty members as subjects and the computer /Internet as the technology context. Some researchers such as Ball (2008) and Atashak (2010) have studied ICT usage in universities but their research was done without any developed theory or model. This study put forward a model of ICT use based on the Davis Technology Acceptance Model (TAM), Rogers Diffusion of Innovation model, extended ATM model, and the unified theory of acceptance and use of technology (UTAUT) which is often used in information systems research. These theories were applied in this study to an educational setting to measure university members' perceptions of their intentions to use ICT.

The graphical representation of the model was formulated using path diagram and it showed variables are in the model whose relationship is recognized. The proposed model was evaluated using structural equation modeling (SEM) to determine whether it fits with the data collected from faculty members from Islamic Azad University of Iran. The proposed model was rejected; it was modified whereupon an alternative model was put forward to help explain the process that generated the data. This alternative model fits the data and was labeled as a "Modified Model".

This study aimed at answering general questions on which factors have significant effects on faculty members' use of ICT to support their teaching. The study intends to provide an understanding of the computer use phenomenon among faculty members. The study also hopes to provide some baseline information to this issue so that universities can use the information to create an effective and efficient system of computer and internet use. Totally, the study sets the following objectives:

1. Develop an appropriate conceptual model to determine effective factors on use of ICT by faculty members.

2. Describe personal and professional characteristics of the proposed samples.

3. Identify effective psycho-social factors on use of ICT between faculty members of IAU in zone 8 branches in Tehran.

4. Determine the relationships between personal and professional characteristics of faculty members and their ICT use.

5. Determine the relationships between effective factors on use of ICT and the ICT use by faculty members.

11. Examine proportionality of the predicted model with regard to ICT acceptance and usage between faculty members in zone 8 branches of IAU in Tehran.

Data were collected using survey questionnaires. The sampling frame of the study was 3898 faculty members but only 291 faculty members responded and this constituted the main data for analysis. The respondents were from Islamic Azad University zone 8 in Iran. A statistical procedure, SEM, was used to establish the plausibility of the theoretical model fit to data and to estimate the degree to which the various explanatory variables seem to be influencing the dependent variables under study. I used SEM as a data analysis technique because it was appropriate for this research. It can be used to formulate explanations to establish interrelationship between variables. LISREL was the computer software used to analyze the model. The proposed model based on theoretical prediction was rejected by the data; this implies that the proposed model cannot be used to explain computer use as predicted by the theory. The proposed model was then modified. A modified model was proposed and fit using indicators of fitness determination. The following sections summarize the findings of the research.

5.3 Findings

The respondents for this study constituted an almost equal number of males and females. Most of them had PhD degree. The average age of the respondents was about 42 years old. Most of the respondents were married and most of them had studied in the human science field. A majority of them were instructors and have stated their proficiency of English language at a moderate level. On average, the respondents had about 10 years' experience in teaching and 5 years of working with ICT.

5.3.1 Relationship Between Proposed Model Variables

Results demonstrate that older faculty members have lower self-efficacy and cultural perception and they usually have more negative attitude towards computers. They have lower self-efficacy, cultural perception, perceived ease of use and behavioral intention to use computers.

Also results indicate whenever computer anxiety is higher, self-efficacy, computer competence, management support, cultural perception, perceived usefulness and perceived ease of use will be lower. As a result, attitude towards computer is more negative and intention to use (behavioral intention) and actual use of ICT is lower.

Whenever computer self-efficacy is higher, computer competence, management support, cultural perception and perceived ease of use will be more and attitude towards computer is more positive; consequently intention to use (behavioral intention) and actual use of computer will be higher.

When computer competence is higher, management support, cultural perception, perceived usefulness and perceived ease of use are higher and attitude

towards computer is more positive and thus intention to use (behavioral intention) and actual use of computer will be greater.

If higher management support exists, attitude towards computer is more positive and intention to use (behavioral intention) and actual use of ICT will be higher.

Whenever cultural perception is higher, computer competence, perceived usefulness and perceived ease of use are greater, thus attitude towards computer is more positive and intention to use (behavioral intention) and actual use of ICT will be higher.

Also, whenever perceived ease of use and perceived usefulness are higher, attitude towards computer is more positive and hence intention to use (behavioral intention) and actual use of ICT will be greater.

Finally, when attitude towards computer is more positive and intention to use is higher, actual use of ICT will be greater.

5.3.2 Prediction of actual use of ICT through proposed model variables

Results show that computer competence with $R^2 = .644$ is the strongest predictor for use of ICT among the effective variables on ICT usage. After that computer self-efficacy ($R^2 = .409$) and management support ($R^2 = .400$) are recognized as the second and third strong predictors of ICT usage respectively. Generally, the sum of independent variables of the proposed model predict 84 percent of changes of the dependent variable, i.e. actual use of ICT which show high predicting power of variables of the proposed model.

5.3.3 Comparative Analysis

Results of this study reveal that men had more computer self-efficacy and intention to use computer than women but no difference was observed among men and women with regard to other effective variables on ICT usage. Also faculty members having PhD had a more positive attitude towards computer and using of it than those with M.A. degree. On the other hand, a significant difference was observed among opinions of the faculty members with various ranks including instructor, assistant professor, associate professor and professor with regard to perceived usefulness, management support, cultural perception and actual use of ICT.

Also results revealed that all variables of the ICT usage model including computer self-efficacy, computer competence, management support, cultural perception, perceived ease of use and perceived usefulness have had higher effect than other variables. Attitude towards computer, intention to use (behavioral intention) and actual use of computer were different among various academic fields, so that professors of technical-engineering majors have had more appropriate situation than other majors in terms of the above variables.

5.3.4 Structural Equation Model (SEM)

The Modified Model of ICT usage was found to fit the model ($\chi^2 = 833.07$, $p = .000$, RMSEA = .035). The significant predictors of ICT use were Computer competence (CC), Management support (MS) and Computer Self-efficacy (CSE). Nevertheless, 84% of the variance in ICT use can be explained by the predictors. This implies that about 16% of the variance in internet use cannot be determined.

5.4 Discussion of Results

5.4.1 Predictors of ICT Usage

There were 9 predictors for ICT use based on the underlying theories. They were Intention to use (BI), Attitude toward ICT (AT), Perceived usefulness (PU), Perceived ease of use (PE), Computer Self-efficacy (CSE), Computer Anxiety (CA), Computer Competence (CC), Management Support (MS), Cultural Perception (CP).

The predicted factors that have significant relationships with internet use were Computer competence, Computer Self-efficacy, Management support and Perceived ease of use. There was a positive relationship between computer competence and actual use of ICT. The implication is that respondents spent more time with the computer if they could work with the computer perfectly.

Computer competence (CC) had a significant impact on ICT use which supported studies by Hardy (1998), Karimi-Alavije et al. (2007), Knezek (2000) and Siegel (1995) that indicated a positive relationship between Computer competence and computer use.

Certainly those individuals who have a high computer competence and are able to perform various actions with the computer use it more, because they have more need to use computers in order to perform their activities. They try to allocate more time to use computers and other ICT since they can work with it.

Another significant predictor of ICT usage in this research was Computer Self-efficacy. The study found that as the Computer Self-efficacy of the respondents increased, the use of ICT will increase too. ICT is usually used more by those individuals who can enjoy such technologies for their daily activities alone, thus ICT usage is increased by enhancement of computer self-efficacy.

The third significant predictor of ICT use was Management support. According to this study, there was a positive significant relationship between Management support and ICT use. This finding confirmed Rizvi (2005) indicating the positive effect of Management support on the amount of time spent using the Internet. In fact, top management commitment and support can help shape the individual's beliefs that ICT is useful and instrumentally rewarding (Purvis, Sambamurthy, & Zmud, 2001).

This study found that the last important predictor of ICT use was Perceived ease of computer use; as Perceived ease of use increases, the use of ICT will increase too. This result was supported by studies of Karimi-Alavije et al. (2007) that revealed a positive significant relationship between Perceived ease of computer use and ICT usage. Legris et al. (2003) also stated that perceived ease of use has been considered important in understanding the individual's acceptance and use of technology.

Perceived ease of use creates positive attitude towards computer use and since positive attitude towards ICT increases applying of it perceived ease of use will increase ICT usage.

5.4.2 A Model for ICT use Among Faculty Members

Based on the obtained ICT application model from the proposed theories and previous studies some relations were exploited among ICT usage and other variables. Each of these relations was proposed as result that are:

- ICT usage will be enhanced by increasing of intention to use of these technologies.

- Increasing positive attitude towards computer will lead to enhanced intention to use ICT.

- Attitude towards computer will be more negative as age increases.

- Gender affects attitude towards computer.

- Attitude towards computer will be more positive by increasing of work experience.

- Attitude towards computer will be more positive by increasing perceived ease of use of ICT.

- Attitude towards computer will be more positive by increasing perceived usefulness of ICT.

- Computer competence increases both perceived ease of use of ICT and perceived usefulness of these technologies.

- Computer self-efficacy increases both perceived ease of use and perceived usefulness of ICT.

- Management support increases both perceived ease of use and perceived usefulness of ICT.

- Cultural perception increases both perceived ease of use of ICT and decreases perceived usefulness of these technologies.

The model based on theories was proposed as a plausible explanation to the use of ICT phenomenon among faculty members. The initial proposed model was rejected implying that it was not fit to explain the data collected to explain the phenomenon. The model was rejected since it was partially mis-specified because only the outcome part needed to be modified to make it fit the data. During modification there was no new parameter added to the model; instead there were rearrangements of the parameter

paths. This implies that theories remain intact but the interpretation of relationship between variables needed to be reviewed.

The final modified model shows that some existing relations in the initial model do not hold true in conditions of the proposed statistical population, so that gender has no impact on the variable of attitude towards computer. This finding is consistent with results related to studies of Loyd and Gressard (1986), Kendel (1995) and Woodrow (1992) who have found no gender difference in attitude towards computers in their studies. The above results illustrate that men and women have a similar tendency in attitude towards computers. Other factors such as perceived ease of use or perceived usefulness affect more positive attitude towards computers.

Also the final modified model shows that work experience has a direct relationship with perceived usefulness and perceived ease of use and it has indirect relationship with attitude towards computer, intention to use and actual use of computer. This is while experience has direct impact on attitude towards computer and computer anxiety in the proposed model. The obtained result is consistent with results of studies by Soltaani (2005) who showed existence of a negative and significant relation between high work experience with perceived usefulness and perceived ease of use. Faculty members who have worked for several years in the university usually adapt themselves with conditions when confronted with modern technological changes. Thus perceived usefulness is less important to them.

Other existing relations in the modified model were consistent with existing relations in the initial proposed model. Computer competence, computer self-efficacy, computer anxiety, management support and cultural perception have direct relationship with perceived ease of use and perceived usefulness. Perceived ease of use and perceived usefulness along with age variable affect attitude towards computer. Attitude

has a direct impact on intention to use and intention to use has a direct impact on actual use of information technology.

5.4.3 Outcome of ICT Usage

Results of ICT use consequence showed that perceived usefulness and perceived ease of use are two major components that increase intention and actual use of ICT by changing of attitude towards ICT use. According to the Davis TAM model (1986, 1989) technology acceptance has two significant dimensions that are perceived ease of use and perceived usefulness.

Many studies stated that perceived usefulness and perceived ease of use are two crucial beliefs for computer acceptance behaviors in TAM (Davis, 1989; Davis et al., 1989). Results of Sheykh Shoaee and Olumi (2007) showed that Perceived usefulness and ease of use were important factors influencing ICT acceptance. In other words, faculty members who perceive easiness and usefulness of computer use more have a more positive attitude and intention to use it; as a result they will use of ICT more.

Also results revealed the effective factors on increasing perceived ease of use and perceived usefulness of computer. Computer competence, computer self-efficacy, computer anxiety, management support and cultural perception affect perceived usefulness and perceived ease of use directly, so that whenever faculty members have more computer competence and computer self-efficacy, they have less anxiety in working with computers, enjoy more management support and do not consider computer use as an obstacle culturally. Consequently they believe that computer use is easier and more useful.

In a study designed to investigate the inter-dependence between EUT, CSE, and CA, Doyle et al. (2005) found similar results. Results indicated that as EUT

increased, CSE also increased. Moreover, as EUT increased, CA decreased. Yang et al. (1999) found a significant relationship between EUT and CA. Also, top management commitment and support can help shape the individual's beliefs that ICT is useful and instrumentally rewarding (Purvis et al., 2001). Researchers have highlighted the importance of teachers' computer competency in order to utilize computers as an educational tool in their classrooms (Hardy, 1998; Karimi-Alavije et al., 2007; Knezek & Christensen, 2000; Siegel, 1995).

5.5 Practical and Theoretical Achievements

A number of findings derived from this study may have theoretical and practical achievements for individuals and universities and other institutes involved in ICT usage.

The expansion of Davis's Development of technology Acceptance model (TAM) to 9 by adding 3 more components are achievements of this study from a theoretical dimension. Given that there are only six components in the TAM model, the additional 3 more components observed in the model used in this study were carefully weighted and considered after laboriously examining previous studies and theories and consequently testing of the model in the field. The 3 components namely effective components on perceived ease of use and perceived usefulness and attitude towards computer were added to enrich the model and make it more comprehensive. These results have appropriated with findings that were studied by Albirini (2004b), Tezci (2009), Korukonda (2006), and Georgia et al. (2011).

Therefore, this model improves on previous theories making it more robust and inclusive in describing human behavior of using ICT. By definition a model is a logical framework intended to represent reality, and since theories relating to use of ICT are ever evolving due to the nature of constant improvements in technology, it is thrust

upon researchers to consistently improve and successively modify theories so their predictive accuracy, and consequently relevance, can be better achieved.

The dynamic process of information in the proposed model in this study has a practical dimension to it as well. Because of its comprehensive nature, the model could be applicable to encourage faculty members and students to use ICT both in private and public universities. Each faculty member or student must have a positive attitude towards ICT in order to use it, preceded by perceived easiness and usefulness of technology use. However, in order to perceive easiness and usefulness of technology use one must have sufficient capability and self-efficacy, observe management support, not have anxiety in working with computer and perceive technology application from the cultural aspect. These results are consistent with findings by Thatcher, Gundlach, McKnight, and Srite (2007), Ryckman (2000), Grandon, Alshare, and Kwun (2005), and Bandura (1997).

These conditional factors can be easily identified and established in any university, institution or organization so as to enhance ICT use among faculty members and students. So it is sufficient to pay attention to these components and if these components are considered completely, the use of ICT in universities and organizations will be greatly enhanced.

5.6 Conclusion

Today, ICT is developed with considerable speed in the world and millions of people are interacting with each other by advancement of information technology. Also, productivity of many activities has been increased much following advances in information technology, computer growth and development of the Internet. Many countries such as Iran are trying to develop human resources by educating people in

using modern technologies. One of the significant places in this regard is universities, because international relations across the universities are very high and thus equipping of universities with information software and hardware and capability of using such technologies by faculty members and students are very important.

Using ICT seems necessary in universities for several reasons. First, ICT is very essential for better teaching by professors and more learning by students like representation through PowerPoint. Second, faculty members and students have an urgent need for an ICT system especially Internet in order to exchange their scientific ideas and receive or send their scientific articles. Third, saving and keeping records of faculty members, students and easy access to such records enhance the necessity of ICT usage.

This survey has been performed in IAU branches in Tehran given to the importance of studying use of ICT in universities. The final result of this survey was access to an ICT usage model in IAU. It will be possible to use this model in other universities, institutions and countries by more studies and testing of the above model in other situations.

According to the obtained model, affects the use of ICT in IAU in Iran. These variables clarify 84 percent of the dependent variable's variance totally and there are still unrecognized variables. Computer competence, computer self-efficacy, management support and perceived ease of use of computer were recognized as strong predictors of ICT usage among the above variables. Hence more attention must be focused on these four components in order to enhance ICT usage in universities. Necessary education with regard to using modern information and communication technologies must be represented for faculty members and students in order to increase computer competence and computer self-efficacy. Management support is necessary to

enhance accessibility to hardware and software in the university; therefore managers play a significant role in universities in encouraging ICT usage.

Finally, according to the TAM and findings, could be seemed that finding of study adapted to upgrade theory, knowledge and application domains of it.

Theory aspect:

If the ICT usage was considered as an innovation in the educational field, the research result showed that behavioral intention about ICT had the most impact on it this means that had behavioral intention about ICT could be added in the theoretical aspect.

Knowledge aspect:

In the other hand, according to the study, results could be improved knowing about what factors assessment to ICT usage indirectly such as computer competence, computer self-efficacy and management support. This study could be gave options of this factors that increase knowledge about it in the educational field.

Application aspect:

Furthermore, usage of these option and elimination or decrease the obstacle front of actual use would be reinforced the application aspect.

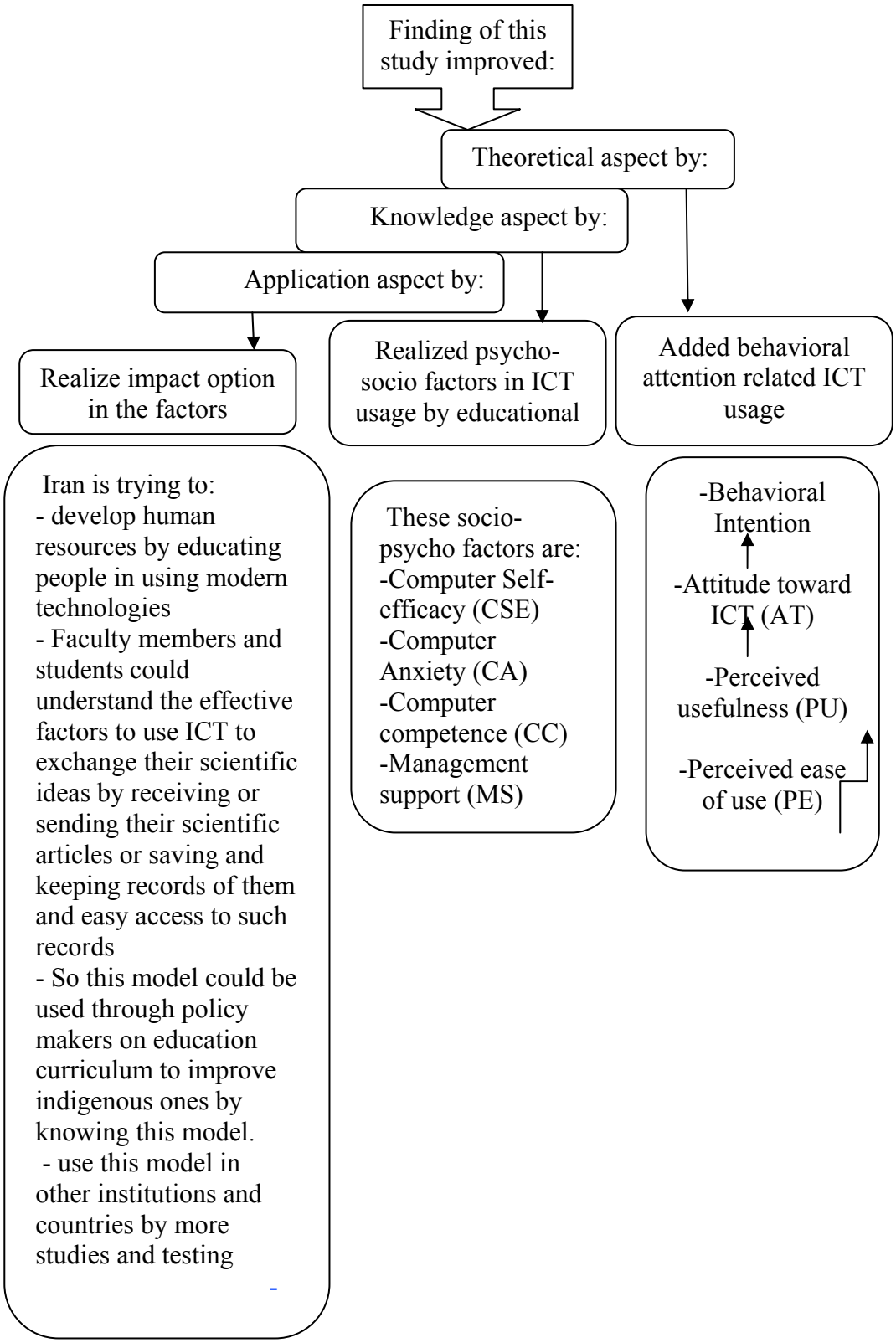


Figure 5.1. Specific condition model of research.

5.7 Suggestions for Further Research

This study is representative of many studies about ICT acceptance and use. Repeating this study in different contexts with diverse participants would be necessary in order to generalize the findings to other users of ICT.

In this study, a model was formulated. Its explanatory power is good. It can explain about 84% of the variance in ICT usage among faculty members in the University. From a research point of view, attempts should be made to gain a better understanding of about 16% of the variance not accounted for by these variables. Such an investigating might include a more comprehensive listing of variables not investigated under this study. The present model should also be tested for fit among races and place of residence for universities versus other organizations.

A number of questions concerning information and communication using computer and Internet require further attention. Among these, it is suggested that future researches look into the following cases of inquiry:

a) What is the impact of academic performance and job satisfaction on computer or Internet use and which components affect these two components?

b) What is the impact of computer or Internet on academic advancement of students or improvement of faculty members?

c) How could cultural perception affect ICT usage or not using of it? Or which cultures use ICT more and which cultures use these technologies later?

d) What is the impact of place dimension on accepted model of technology use in this survey? In other words are effective components on technology use in Iran or Asia different from European countries or African, American societies?

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APPENDIX A

QUESTIONNAIRE

In the name of GOD

Dear Faculty Member;

Along with the development of information and communications technology (ICTs) in early third millennium, a novel revolution is seen in the world as well. The impacts of this phenomenon have appeared not only in one field, but in every possible field you may imagine. It goes without saying that higher education is no exception.

Concerning the special significance of these technologies in production, transference, and management of information and its influence on educational and research conducts, the faculty members and researchers decided to embark on a research regarding "the effective factors in the use of ICT among the faculty members of the zone 8 branches of Islamic Azad University" in order to study some of the important factors affecting this case. They hope that the results obtained from this research could be helpful in creating good chances and conditions to improve ICT use among the faculty members of all the universities.

Therefore, the present study attempts to investigate "the effective factors in the use of ICT among the professors of the Islamic Azad University as the biggest private Universities in Iran". Thus, this research asks you to read the effective factors in the following questionnaire and add some other factors which you deem important and are absent in this questionnaire.

There is no doubt that this research project will not yield useful constructive results without the help of you academicians. Therefore, I thank you in advance for the attention you pay to this questionnaire. For each item, please tick (√) or cross (X) the part which is the closest to your opinion. It is important to add that your responses are exclusively used for the purpose of this research and are then kept confidential with the researcher.

Thank you

Batoul Faghiharam

Age:

Sex: a) female b) male

Education: a) MA/MS b) PhD

Marital status: a) married b) single

Field of study: a) human sciences b) basic sciences
c) engineering d) art and architecture

Academic class: a) teacher b) assistant professor c) professor d) lecturer

Language proficiency: a) very weak b) weak c)average d) good e) very good

Educational group:

Professional background:

Faculty:

No.	Self-Efficacy	Totally agree	Almost agree	No opinion	disagree	Totally disagree
1	I can obtain good information through internet in my own special field of study.					
2	I can type and print things easily and without the help of the others.					
3	I can scan pictures and written documents and transfer it to the computer independently and without anybody's help.					
4	I can easily search needed information in the Internet.					
5	I can solve my trivial software problems without help of others.					
6	I can solve my trivial hardware problems without help of others.					
7	I can easily install secondary accessories to my computer and use them.					
8	I can easily receive and send my required information by email.					
9	I can easily receive and send my required information by flash memory and so on.					
10	I can easily make use of software such as Word, PowerPoint, and Excel.					
11	I can easily design graphic files like pictures by computer.					
12	I can easily change graphic files into films.					
13	I can easily install new software on my computer.					
14	I can minimize the problems of teaching by using the computer.					
15	It is difficult for me to learn all the computer competences.					
16	I can easily increase my computer literacy in comparison to the students.					
17	The older I become, the more I fear of the problems involved in learning computer.					
18	I don't have any problem in using computer language in dealing with errors or the messages the computer sends.					
19	I am quite sure that I can teach special courses to the students using computer and special software					
20	I sure can solve students' problems using special software.					

No.	Computer Anxiety	Very low	Low	Moderate	High	Very High
1	For fear of not losing my information I copy and back them up several times.					
2	In dealing with something new about the computer I'm usually afraid of not knowing how to use the required software.					
3	I am usually worried that someone else comes and uses my information after working with the computer.					
4	Using the computer disturbs me.					
5	Using computer for a long time makes me concerned about my physical health.					
6	After using the computer for several hours I get headache and nausea.					
7	After using the computer for a long time I can't make my mind for other things.					
8	After using the computer for a long time I become dissatisfied with myself.					
9	After using the computer for a long time I feel guilty.					
10	After using the computer for a long time I regret spending my time for it.					
11	After using the computer for a long time I fear being blamed by the others.					
12	After using the computer for a long time I become sleepless.					
13	After using the computer for a long time I feel tired.					
14	After using the computer for a long time I lose my appetite.					
15	After using the computer for a long time I can't tolerate others and become very touchy.					
16	After using the computer for a long time I sweat a lot.					
17	After using the computer for a long time I become nervous.					
18	After using the computer for a long time I get sore and don't want to see anyone.					
19	After using the computer for a long time I get tensed and stressed.					
20	After using the computer for a long time I become confused and forget the details.					

No.	Computer Competences	Very Low	Low	Moderate	High	Very High
1	I can use email to communicate with others.					
2	I can use the internet to judge academic papers.					
3	I can use the computer to facilitate the administration affairs of the university.					
4	I can use my personal home page.					
5	I can create my personal home page.					
6	I can use the internet in order to participate in on-line educational courses.					
7	I can use the Internet in order to communicate with scientific institution.					
8	I can use the Internet to chat.					
9	I can use the computer to analyze my data.					
10	I can make slides in PowerPoint.					
11	I can use special software.					
12	I can use external facilities of the computer such as scanner, printer, and external hard drive, and so on.					
13	I can solve trivial software and hardware problems in the computer.					
14	I can classify and place information in the computer to improve its security.					
15	I can use the Internet to be informed about educational workshops.					
16	I can use the Internet in order to register for educational workshops.					
17	I can use the Internet in order to exchange data electronically and participate in the workshops.					
18	I can use the Internet to get access to the electronic sources and participate in the workshops.					
19	I can create and spread my learning network.					
20	I can update my knowledge and skill using the developments of technology.					
21	I can guide my learning process.					
22	I can discuss service delivery.					
23	I can present the sources to the others.					
24	I can take part in the current decision making.					
25	I can use Internet telephone					
26	I can use local radio.					
27	I can use cable modems in order to have access to higher speeds for the Internet.					
28	I can use satellite in order to exchange information.					
29	I can use laptop computers in order to facilitate moving and carrying.					
30	I can use backup system in teaching					
31	I can use data banks					

No.	Management support	Totally agree	Almost agree	No opinion	Disagree	Totally disagree
1	The managers of my university are fully aware of the advantages of using computers.					
2	The managers of my university encourage the employees to use computers.					
3	Required facilities and sources for using the computers are available in my university.					
4	The managers of my university are determined to satisfy the employees by using the computer.					
5	In my university advanced courses of teaching IT are supported.					
6	Internet network and data banks are in good condition in my university.					
7	The managers of my university emphasize using the computers in administration.					
8	The managers of my university use the Internet in order to see the circulars.					
9	The managers of my university notify the professors and the employees of the circulars by using email.					
10	Recruiting experts is done using the Internet.					
11	The managers of my university use the Internet in order to improve university schedules.					
12	The managers of my university emphasize the professors' satisfaction from the software and hardware used in the university.					
13	The managers of my university respect the professors' opinions about teaching IT.					
14	The managers of my university send the professors' job description using emails.					
15	The managers of my university have Gantt charts.					
16	The managers of my university support the professors' participation in computer courses.					
17	The managers of my university encourage the professors in using the data banks.					
18	The managers of my university provide new software for the professors.					

No.	(Actual Use of ICT)	Very Low	Low	Moderate	High	Very High
1	I use the Internet in receiving news.					
2	I use the Internet to write and edit papers and books.					
3	I use the Internet in order to get authentic papers from academic journals.					
4	I use computer in lectures.					
5	I use external facilities of the computer in teaching.					
6	If necessary, I use the Internet to receive and save audio, graphic and visual files.					
7	I use the Internet to get more information about educational activities.					
8	I use the Internet to check my bank account.					
9	I use the Internet to become notified about the national and international conferences.					
10	I use the Internet to participate in on-line classes.					
11	I use the Internet to teach in on-line classes.					
12	I use the Internet to take part in on-line international conferences.					
13	I use the Internet in order to get administration affairs done more quickly.					
14	I use the Internet to solve organizational problems.					
15	I use the Internet in order to exchange information more quickly and precisely.					
16	I use the Internet to communicate with other universities and professors.					
17	I use the Internet in order to become familiar with new researches and developments.					
18	I use the Internet to make to design syllabus.					

No.	Attitude toward ICT	Totally agree	Agree	No opinion	Disagree	Totally disagree
1	I am not afraid of using the computer.					
2	I don't like using the computer.					
3	I am always looking for a chance to use the computer.					
4	I am glad there are a lot of computers nowadays.					
5	I don't like using the computers for teaching.					
6	Using the computer saves time and energy.					
7	Universities are useful places even without the computer.					
8	The students are recommended to use computers in their studies.					
9	Computer training is a waste of time.					
10	Using computer should increase students' motivation for studying.					
11	Computers are quick and useful systems in getting information.					
12	Using computer increases level of learning.					
13	I usually write things rather than using the computer.					
14	If I have money, I will prefer to improve my computer system.					
15	I don't usually use computer if possible.					
16	I try to get more information about computer.					
17	I don't plan to use computer more in the future.					
18	The contents of electronic texts are much better than written ones.					
19	Using IT can lead educational practices towards advanced international practices.					
20	Learning IT should be compulsory for all the faculty members.					
21	Obtaining information from the Internet costs more than going to the library.					
22	Using the computer is the reason for students' weakness in their lessons.					
23	Using computer increases plagiarism among the professors.					
24	Using computers increases the quality of university projects.					
25	Using the Internet is addictive.					
26	Using computers and computer games results in confusion and loss of attention.					
27	When you become busy with computer, you become cut off from the world.					
28	Using computer and the Internet makes you lethargic and inactive.					

No.	Perceived usefulness	Totally agree	Agree	No opinion	Disagree	Totally disagree
1	Computers can do whatever we want.					
2	We can use computers as kind of educational material.					
3	Use of ICT can increase communication with other research institutions.					
4	We can usually get useful information from the Internet.					
5	If a faculty member knew how to use the Internet, s/he could be more successful in educational practices.					
6	Gathering information and sources from the Internet is cost-effective.					
7	We can develop research practices of the students using ICT.					
8	Using computer won't help me in my educational practices.					
9	Using computer helps me get things done more quickly.					
10	Using computer solves some of my educational problems.					
11	Using computers won't help me increase my work rate.					
12	Using computers helps me be more effective in education.					
13	Computers can be good retainers of the information.					
14	We can use computers to classify information.					
15	Using computers reduces time of doing things.					
16	Computers analyze data more precisely.					
17	Computers reduce our need for manpower.					
18	Using the computer, we can exchange information.					
19	Computers and the Internet substitute mails and mailmen.					
20	Computers and the Internet update people's information.					
21	Computers and the Internet facilitate communicating with other countries.					
22	Computers and the Internet facilitate visual communication with other countries.					

No.	Intention to use	Totally agree	Agree	No opinion	Disagree	Totally disagree
1	I like to do all my educational duties with computer.					
2	I'd prefer to use the Internet to get access to new educational sources.					
3	I like to type my class notes.					
4	I like using the scanner and printer.					
5	I am very eager to use new software.					
6	I like to have new and up-to-date computer items.					
7	I prefer to use computer to see films and visual files.					
8	I'll use ICT if I have access to it.					
9	I plan to increase the use of computer in education in the future.					
10	I like using computer and the Internet, even when I'm tired.					

No.	Perceived ease of use	Totally agree	Agree	No opinion	Disagree	Totally disagree
1	I'll connect to the net whenever I wish.					
2	Computer software is easily accessed.					
3	Using computer training classes is easy.					
4	We can use educational sites on the Internet easily.					
5	Using educational programs in the net is easy.					
6	We can easily communicate using emails.					
7	Using software such as PowerPoint in teaching is easy.					
8	Learning by computer is easy for me.					
9	I don't have a serious problem using the Internet.					
10	I don't have any problem learning computer programs.					

No.	Cultural perception	Totally agree	Agree	No Opinion	Disagree	Totally disagree
1	Using ICT in educational places helps keep information up-to-date.					
2	The disadvantages of using the net for the students are more than the advantages.					
3	Sources and information obtained from the net are not reliable.					
4	Computers do not have a great influence on education of people's lives.					
5	Computer literacy increases the students' salaries.					
6	Students had better learn their lessons from the computer than the professors.					
7	Computer literacy increases the person's social status.					
8	Computers encourage immoral behaviors.					
9	Computers can increase standard of living.					
10	Using computer is not in contrast with Iranian traditions of doing things.					
11	Acceptance of ICT does not correspond with development rate of computers.					
12	Computers results in more dependence on foreign countries.					
13	There are more important matters than ICT which should be considered in computer learning.					
14	Quick developments in ICT make life easier.					
15	Computers kill people's feelings.					
16	Using computers does not decrease social communication.					
17	Not using the computers means illiteracy.					
18	Using the Internet is a sign of development.					
19	It is necessary to teach using the computer from childhood.					
20	Nowadays, computers are among necessary furniture in the house.					
21	The Internet increases our awareness of the world news.					
22	The Internet is the most important social medium.					
23	Without the computers social life is in danger.					
24	Not using the Internet endangers our work life and our education.					
25	Computers and the Internet are signs of cultural invasion.					