AN INVESTIGATION OF FACTORS AFFECTING OMANI FACULTY MEMBERS' ADOPTION OF INFORMATION AND COMPUTING TECHNOLOGY

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The purpose of this study was to explore the factors influencing information and computing technology (ICT) adoption for Omani faculty members from a framework of Rogers' theory of diffusion of innovation. Three hundred Omani faculty members from Sultan Qaboos University (SQU) participated in the study. The survey consisted of five parts: (a) an 18-item questionnaire on ICT uses and skills, (b) a 1-item questionnaire on adopter category, (c) a 44-item self-constructed questionnaire on perception of barriers to adopting ICT, (d) a 50-item questionnaire on ICT attributes adapted from Moore and Benbasat, and (e) a 15-item questionnaire on demographic and job-related variables.

Descriptive statistics indicated that the faculty members overall used ICT at the "Sometimes" level and had ICT skills at the "Intermediate" level. The most frequently used and skillful ICT functional areas were Website browsing, Internet search engine, and word processing. One-way ANOVAs found significant group differences of ICT uses and skills, perception of barriers, and perception of ICT attributes in the category of adopter. Early adopters used ICT more, had higher ICT skills, perceived fewer barriers in the adopting process, and recognized higher values of ICT attributes than later adopters did. Multiple regression analysis showed the level of ICT uses could be predicted by ICT skills, adopter category, perception of barriers, ICT attributes, and the selected demographic and job-rated background variables, to a large magnitude with an adjusted R^2 value of .70. The level of ICT skills was the most salient predictor. Perception of ICT attributes and the number of traditional classes taught appeared to be important as well. Results supported Rogers' theory at the macro level but not at the micro level.

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CHAPTER I

INTRODUCTION

Background of the Study

The growth of informational and computing technology (ICT) has dramatically reshaped the teaching and learning processes in higher education in the past several decades (Pulkkinen, 2007; Wood, 1995). ICT for education is more critical today than ever before since its growing power and capabilities are triggering a change in the delivery means of education (Pajo & Wallace, 2001). The higher education institutions around the globe have increasingly adopted ICT as tools for teaching, curriculum development, staff development, and student learning (Kumpulainen, 2007).

Despite ICT having the potential to improve educational methods and the quality of teaching and learning, the diffusion of ICT for teaching and learning has not been widespread, nor has it become deeply integrated into the curriculum (Geoghegan, 1994). Faculty utilization of innovative technologies has remained low (Surry & Land, 2000). The adoption of ICT at universities is often badly done and based on ignorant optimism (Taylor, 1998). The advantages of ICT have been often under-realized in higher education (Surry & Farquhar, 1997).

There are many reasons for the above problems. Research has found various factors to be serious obstacles to fully integrating technology into the teaching and learning processes in higher education (Becta, 2004). Furthermore, there are no universal solutions to these problems as ICT adoption is not a merely technical issue. Instead, many factors affect ICT adoption, including the adopters' personal characteristics, attributes of technologies, and various economic, sociological, and organizational variables (Straub, Keil, & Brenner, 1997). For instance, in a cross-cultural study examining the validity of Davis et al.'s 1998 technology acceptance model

(TAM), Straub, Keil, and Brenner (1997) found that the TAM only held for the participants from the U. S. and Switzerland, but not for the Japanese. Such a finding indicated that the TAM model may not predict technology use across all cultures. Similarly, in another intercultural study, Pelgrum (2001) reported that there was a substantial variation between countries of the most significant barriers to ICT perceived by teachers. Thus, research on ICT adoption by educators in a specific culture, in this case by Omani faculty members, is meaningful and valuable.

The Sultanate of Oman is situated in the south-eastern part of the Arabian Peninsula. There are more than 30 public and private universities and colleges today. Omani's utilization of educational and information technology in higher education has proceeded rapidly in the past decade (Al Musawi & Abdelraheem, 2004). For instance, when Sultan Qaboos University (SQU), the nation's top public university, initially began to implement e-learning using WebCT in 2001, there were only 8 online courses and 981 users. By the end of autumn 2002, 40 courses were offered to different colleges at SQU with 3,001 students enrolled. In 2004, SQU implemented Moodle as another virtual learning environment. In the academic year of 2006-2007, the online courses at SQU had climbed to 387 with 268 WebCT and 119 Moodle courses and 20,409 available seats. Meanwhile, the faculty members at Omani universities seemed to be favorably disposed to the new technology (Akinyemi, 2003). Findings from the e-learning studies carried out in Oman have showed that well-designed web-assisted instruction is as equally effective as face-to-face instruction for students' achievements (Osman & Ahmed, 2003).

Nevertheless, informational and computing technology (ICT) in Omani higher education is often characterized with underutilization of advanced technology and unsatisfactory staff skills at the required level (Al Khawaldi, 2000). Research indicated that Omani faculty members were, in many instances, short of the required preparation time to apply the new educational innovations

(Abdelraheem & Al Musawi, 2003b). In addition, although some faculty members embrace informational and computing technology in their instructional process, others are reluctant to use or even resist the use of ICT. Al Musawi (2007) speculated that the possible explanations for such resistance included poorly designed software, technophobia, doubt that technology improves learning outcomes, and fear of redundancy. In the past several years, research interest in Omani faculty members' adoption of ICT, especially for web-based online teaching, has steadily grown. However, the factors differentiating the Omani faculty members on ICT adoption remain unclear.

Statement of the Problem

ICT has gradually become an integrated part of the higher education system in Oman in the past few years (Al Musawi, 2007; Al Musawi & Abdelraheem, 2004). With the nation's effort to build a digital society for Oman (Omani Ministry of Information, 2006), ICT will play an even more important role in Omani higher education. Thus, faculty members in Oman are under pressure of adopting ICT into their instructional processes. Nevertheless, empirical evidence of Omani faculty members' ICT adoption is still limited. Although there have been some studies on Omani faculty members' ICT adoption in the past, the current status of ICT uses and skills by Omani faculty members has basically remained unknown in the dynamic social and educational environment. The faculty members' perception of barriers to adopting ICT and perception of ICT attributes have been barely explored. In addition, ICT adoption happens at different rates for different users (Mitra, Steffensmeier, Lenzmeier, & Massoni, 1999; Rogers, 2003). Nevertheless, no studies have examined the relationship between adopter category and ICT uses and skills, perception of barriers to ICT adoption, and perception of ICT attributes for Omani faculty members. Moreover, little is known on the significant factors impacting Omani faculty members'

ICT adoption, especially with a concurrent consideration of multiple variables. Thus, to help Omani faculty members be proactively well-prepared for the digitalized era, it is necessary to understand their current level of ICT uses and skills, to know their perceptions of barriers to adopting ICT and perception of ICT attributes, and to examine whether the adopter category is related to theses variables. More importantly, it is critical to identify the salient factors influencing Omani faculty members' ICT adoption.

Research Hypotheses

The central interest of the present study was to investigate factors influencing the level of ICT uses by Omani faculty members. The predictor variables were faculty members' technical competency, their adopter category, their perception of barriers to adoption of ICT, and their perception of ICT attributes, in addition to some selected demographic and job-related variables. In other words, the main research question was whether the above variables could collectively predict the level of ICT uses. In addition, this study was also interested in whether different types of adopters vary on level of ICT uses and skills, perception of barriers to ICT adoption, and perception of ICT attributes. Hence, the research hypotheses, primarily driven by Rogers' theory of diffusion of innovations, were formulated as follows:

Hypothesis 1: There is a difference between different types of ICT adopters on the level of ICT uses. The earlier adopters use ICT more than the later adopters.

Hypothesis 2: There is a difference between different types of ICT adopters on technical skills. The earlier adopters are more technically skillful than the later adopters.

Hypothesis 3: There is a difference between different types of ICT adopters on perception of barriers to ICT adoption. The earlier adopters perceive lower level of barriers than the later adopters.

Hypothesis 4: There is a difference between different types of ICT adopters on perception of ICT attributes. The earlier adopters are more positive towards the ICT attributes than the later adopters.

Hypothesis 5: The level of ICT uses by Omani faculty members can be significantly predicted by (1) their technical skills, (2) adopter category, perception of barriers to ICT adoption, (3) perception of ICT attributes, and (4) the selected demographic and job-related variables.

Significance of the Study

This study was significant in several aspects. First of all, different from existing studies focusing on some specific areas of ICT adoption such as online learning in the Omani cultural context, this study took a board perspective with regard to ICT uses. It considered a wide range of possible ICT applications in today's technological and working environments in Oman. Such a scope was needed to provide an overall picture of ICT adoption by Omani faculty members. Secondly, many studies on ICT adoption conducted in Oman were a theoretical. This study, instead, was driven by Rogers' theory of diffusion of innovation. On one hand, it attempted to use Rogers' theory to explain ICT adoption by Omani faculty members. On the other hand, it provided empirical evidences to verify Rogers' theory. Thirdly, this study concurrently explored multiple factors which may affect the Omani faculty members' ICT adoption in regression models, in addition to presenting descriptive delineations and examining the group differences. Last but not the least, findings from this study may provide directions for the Omani universities to support and enhance their faculty members' adoption of ICT in the teaching-learning process.

The presentation of this study is organized into five chapters. Chapter I introduces the background information, presents the statement of problem, and lists the research hypotheses.

Chapter II reviews relevant literature on the theoretical models related to ICT adoption and the associated empirical studies. Chapter III focuses on the methodology including description of the participants, data collection and analysis procedures, variables and the measurement instruments, and the statistical analysis techniques. Chapter IV presents the results of the findings. The last chapter summarizes and discusses the findings, outlines the contributions and limitations, highlights theoretical and practical implications, and makes recommendations for future research.

Definition of Terms

Adopter: an individual in adopting innovations (Rogers, 2003).

Adopter categories: the classification system of members on the basis of their innovativeness. It includes five categories: innovators, early adopters, early majority, later majority, and laggards (Rogers, 2003, p. 22).

Adoption: a decision to make full use of an innovation as the best course of action available (Rogers, 2003, p. 21)

Attributes of informational and computing technology: the clustered characteristics of ICT. In Rogers' (2003) research, they refer to relative advantage, compatibility, complexity, trialability, and observability. In Moore and Benbasat's (1991) survey (used in the present study), they refer to relative advantage, image, compatibility, ease of use, trialability, visibility, demonstrability, and voluntariness.

Barriers: obstacles prohibiting faculty members from adoption of ICT in their academic job duties.

Blended learning: the combination of online and the traditional face-to-face learning.

Compatibility: the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 2003, p. 15).

Complexity: the degree to which an innovation is perceived as difficult to understand and use (Rogers, 2003, p. 16).

Demographic variables: refer to gender, age, academic rank, English language proficiency, ownership of a home computer, ownership of Laptop computer, and ownership of a mobile phone computer.

Diffusion: the process in which an innovation is communicated through certain channels over time between the members of a social system (Rogers, 2003, p. 5).

Ease of use: the antithesis of complexity. It refers to the degree to which an innovation is perceived as easy to understand and use.

E-learning: also known as distance learning, learning through the Internet (in the Omani educational context), and refers to any learning, training, or education that is facilitated by the use of well-known and proven computer technologies, specifically networks based on Internet technology (Fallon & Brown, 2003, p. 4; Omani Ministry of Education, 2008).

Faculty member: any instructor in a university or college who holds a master or doctorate degree.

Informational and computing technology (ICT): refers to the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware.

ICT adoption: Conceptually, it is defined as the self-perceived use of computers and the software program for the teaching tasks including lesson preparation, lesson delivery, evaluation, communication, and administrative record keeping. Operationally, it refers to the mean score across the 18 items on computer uses in Section 1 of the survey (see Appendix A).

ICT skills: Conceptually, it refers to the self-perceived personal efficiency and effectiveness when using computers and software for the teaching tasks. Operationally, it is defined as the mean score on computer skills across the same 18 items as for computer uses (see Appendix A).

Innovation: an idea, practice, or object that is perceived as new by an individual or other unit of adoption (Rogers, 2003, p. 12).

Job-related variables: descriptive data about a faculty member's educational activities and status including the number of traditional and blended classes being taught, credit hours teaching, working experiences in higher education, experiences with computers, number of students teaching, and number of graduate students supervising.

Observability: the degree to which the results of an innovation are visible to others (Rogers, 2003, p. 16).

Rate of adoption: the relative speed with which an innovation is adopted by members of a social system (Rogers, 2003, p. 23).

Relative advantage: the degree to which an innovation is perceived as better than the idea it supersedes (Rogers, 2003, p. 15).

Trialability: the degree to which an innovation may be experimented with on a limited basis (Rogers, 2003, p. 16).

CHAPTE II

LITERATURE REVIEW

Theoretical Models of ICT Adoption

With the ongoing development of informational and computing technology (ICT) and the diversification of the fields it affects, various theoretical models have been proposed for a better understanding concerning its diffusion, adoption, acceptance, and usage (Davis, 1989; Rogers, 2003; Surry, Ensminger, & Haab, 2005; Taylor & Todd, 1995; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003; Yi, Jakson, Park, & Probst, 2006). Among them, several theories have been especially influential: Davis and associates' technology acceptance model (Davis, Bagozzi, & Warshaw, 1989), Rogers' (2003) diffusion of innovation (DoI) theory, and Rieber and his associates' five-step hierarchical model of technology diffusion (Hooper & Rieber, 1995; Rieber & Welliver, 1989).

Davis et al. (1989) adapted Fishbein and Ajzen's (1975) theory of reasoned action (TRA) and developed the TAM to explain the behavioral intention and actual behavior of a person's computer usage. According to TRA, a person's specified behavior is determined by the person's attitude and subjective norm. Behavioral Intention (BI) is a prerequisite of the likelihood of performing a specific behavior (Ajzen & Fishbein, 1980). Hence, TAM postulates that a person's computer usage is mainly affected by his or her BI. Furthermore, TAM proposes the causal links among perceived usefulness (U), perceived ease of use (EOU), attitude (A), and BI. According to TAM, A is a major determinant of BI (A–BI link), which is influenced by U and EOU. U has also been linked to BI (U–BI link). Besides, the TAM proposed that U and EOU are affected by various external variables such as user characteristics and organizational factors. External variables are expected to influence BI by affecting beliefs (U and EOU) and attitudes (A) and then influencing actual behavior. For the past two decades, substantial empirical evidences have been accumulated on TAM. In a meta-analysis study on TAM with 88 published studies, King and He (2006) concluded the TAM is a valid and robust model.

Rogers' (1962, 1971, 1983, 1995, 2003) DoI Theory sets up another foundation for many studies related to technology adoption and diffusion in education. Due to its importance to the present study, this theory is independently described in detail in the next section.

Rieber and Welliver (1989) and Hooper and Rieber (1995) have proposed a five-step model to describe the stages of growth associated with infusing a new technology in teaching and learning: familiarization, utilization, integration, reorientation, and evolution. In the familiarization phase, the teacher simply learns how to use the technology. At the utilization phase, the teacher uses technology in the classroom but has little understanding of, or commitment to, the technology as a pedagogical and learning tool. During the integration phase, the technology becomes an integral part of the course in terms of delivery, learning, management, or other aspect of the class. In the reorientation phase, the teacher uses the technology as a tool to facilitate the reconsideration of the purpose and function of the classroom. Finally, teachers who reach the evolution phase are able to continually modify the classroom structure and pedagogy to include evolving learning theory, technologies, and lessons learned from experience.

According to Hooper and Rieber (1995), many teachers progress only to the integration phase and do not transform their philosophical orientation of how learning can occur in the classroom through technology. They further stated that each level on the hierarchy requires a different set of support services, funding, time, and administrative and student expectations. Mismatches in a teacher’s level of technology adoption with certain internal or external sources of potential barriers provide an almost certain failure to adopt a technology in the classroom.

Researchers adopting Rieber et al.'s model have reported that the potential barriers affecting an individual's technology adoption are often a combination of several factors - sociocultural factors such as economics and location (Bereiter, 1994), personological variables of the teacher such as age, gender, attitude, and beliefs (Bradley & Russell, 1997; European Commission, 2003), and exposure to and adoption of emerging technologies within the practice of teaching such as levels of technology acceptance and adoption (Anderson, 1993; Hooper & Rieber, 1995; Rieber & Welliver, 1989).

Besides the above three models, there are many other theories associated with ICT use. Surry and Farquhar (1997) summarized the major diffusion theories specific to instructional technology based on the dimensions of philosophy and goal as in Figure 1.

GOAL

PHILOSOPHY	**Systematic Change** (Macro)	**Product Unitization** (Micro)
Developer (Determinist)	Focus on the structure and establishment of an effective organizational framework. - Top Down Reform - New American Schools Development Corporation (NASDC) - Goals 2000	Focus on process of designing, developing, and evaluating effective instructional products. - ID Models - Needs Assessment - Formative Evaluation - Summative Evaluation
Adopter (Instrumentalist)	Focus on the social, political, and professional environment in specific organizations. - Bottom Down Reform - Hall and Hord's CBAM (1987) - Coalition of Essential Schools	Focus on the needs and opinions of potential adopters and characteristics of the adoption side. - Burkman's UOID (User-oriented Instructional Development) (1987) - Environment Analysis - Adoption Analysis - Stockdill and Morehouse's Adoption Checklist (1992)

Figure 1. Major theories of instructional technology diffusion research with examples. (Adopted from Surry & Farquhar, 1997)

It has been argued that there is no single, unified, universally accepted theory of adoption and diffusion. Each theoretical model addresses different aspects of the diffusion process or a different type of innovation or organization (Scurry, Ensminger, & Haab, 2005).

Rogers' Theory on Diffusion of Innovation

Rogers' theory originated from agricultural innovation in the late 1950s. Over the years, this model of diffusion of innovation has been applied to diverse fields including education. The key concept of the model is diffusion. Rogers defined diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 5). This definition implies there are four main elements in the diffusion process: innovation, communication channels, time, and the social system. An innovation is "an idea, practice or object that is perceived as new by the individual" (Rogers, 2003, p. 12). A communication channel is "the mean by which messages get from one individual to another" (Rogers, 2003, p. 36). The third element, time, gets involved in diffusion in three aspects: (a) the innovation-decision process by which an individual passes from first knowledge of an innovation to forming an attitude toward the innovation, (b) the innovativeness of an individual's relative earliness/lateness of adopting the innovation, and (c) the adoption rate in a system measured as the number of members of the system adopting the innovation in a given time. The last element, social system, is "a set of interrelated units that are engaged in joint problem solving to accomplish a goal" (Rogers, 2003, p. 37).The social and communication structure or the patterned arrangement of the units in the system facilitates or impedes the diffusion of innovations in the system. These four elements influence the adoption or rejection of an innovation in a complicated, interdependent way in a system.

Figure 2 shows the rates of successful adoption through time in a given population for an example of three different innovations. The rates of adoption tend to follow an S-shaped pattern. Diffusion is usually very slow in the beginning with only a few earlier adopters of the system. Then, it enters the “taking-off” or “tipping point” period of rapid spread. Rogers (2003) stated that the tipping point typically happens when the adoption rate is between 10-20% of the target population. Finally the adoption rate levels off at the “permanent” level as almost all of the members, including the later adopters, have adopted the innovation. Characteristics of innovations, communication channels, and social systems interact with one another affecting the slopes of adoption, as seen in Figure 2.

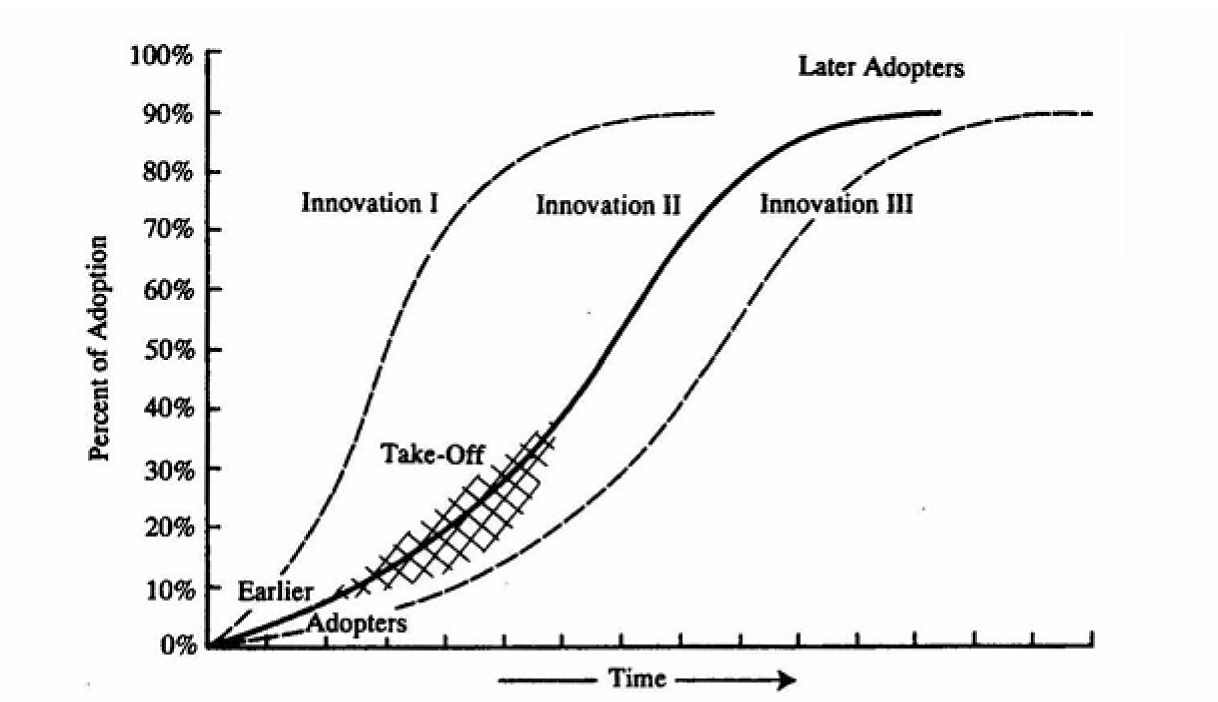

Figure 2. The diffusion process (Adapted from: Rogers, 2003, p. 11).

Rogers' theory contains four major parts: adopter categories, perceived attributes, diffusion process, and rate of adoption. First, members of a population vary greatly in their willingness to adopt a particular innovation. Individual characteristics such as socioeconomic features, personality traits, and communication behavior patterns can be used to divide the population into five categories - innovators, early adopters, early majority, late majority, and laggards. The frequencies of these five types of adopters closely form a normal distribution on the basis of the relative time at which an innovation is adopted, as shown in Figure 3. Innovators are active information seekers about new ideas. One of their salient characteristics is venturesomeness. They play a gate-keeping role in the flow of an innovation into a system. Early adopters are a "more integrated part of the local social system than are innovators" (p. 283). They are usually not too far ahead of the average individual in innovativeness and they often serve as a role model for many other members in the system. The early majority adopt innovations just before the average number of a social system. Their innovation-decision process is relatively longer than that of innovators and the early majority. They usually "follow with deliberating willingness in adopting innovations but seldom lead" (Rogers, 2003, p. 284). The late majority are skeptical to new ideas. They adopt innovations just after the average number of the system, usually due to economic necessity or peer pressure. The social norms must definitely favor an innovation before the members of the late majority are convinced to adopt it. Laggards are the last group in the system to adopt an innovation. They tend to be suspicious of innovation or even resistant to innovation.

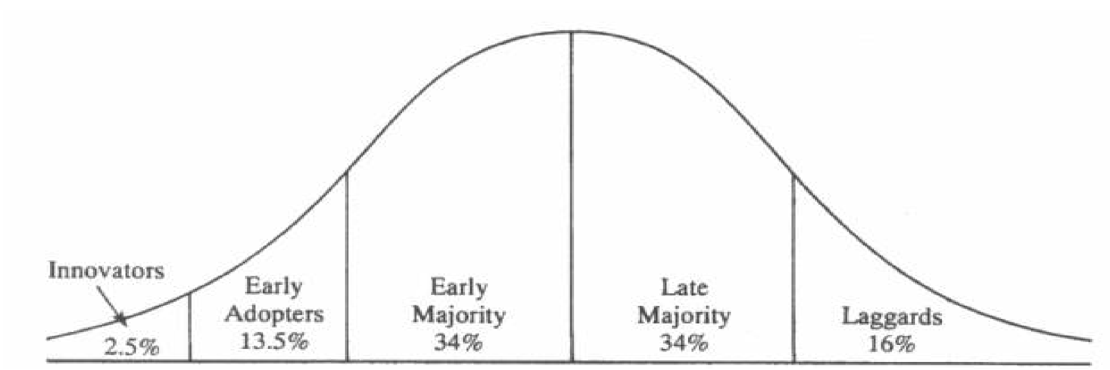

Figure 3. Adopter categorization on the basis of innovativeness (Adapted from: Rogers, 1995. p. 281).

Second, a person's perception of an innovation influences the adoption decision. Five perceived attributes of an innovation have been shown to have strong influence – trialability (i.e., the degree to which potential adopters can experiment with the new behavior), observability (i.e., the degree to which the results of an innovation are visible to others), relative advantage (i.e., the degree to which a new system is perceived as being better than the alternative it supersedes), complexity (i.e., the degree to which an innovation is perceived as difficult to understand and use), and compatibility (i.e., the similarity with previously adopted innovations) (Rogers, 2003).

Third, diffusion is a process that occurs over time and can be seen as having five distinct stages - knowledge, persuasion, decision, implementation, and confirmation (as shown in Figure 4). But, before an innovation is formally evaluated by an individual, four prior conditions must be met: (a) the person or unit of analysis needs to have previous experiences relevant to the innovation, (b) there is a perceived need or problem facing the individual to consider the innovation as an option, (c) the new ideas or techniques must have novelty or innovativeness, and (d) the norms of the social system should show some evidence favoring innovation. In the knowledge process, an individual is exposed to the existence of an innovation and gains an understanding of how it works. Three broad categories of personal characteristics-- socioeconomic characteristics, personality traits, and communication behaviors-- affect the extent to which the person possesses knowledge about the innovation. The next process, persuasion, occurs when an individual forms an attitude towards the innovation. The personal perception on the five attributes of an innovation plays a vital role in forming the favorable or unfavorable attitude towards innovation. In the next process, decision, the individual has decided to either adopt or reject the innovation and engaged in activities associated with the choice. In the implementation process, the individual puts the new idea or innovation into use, if deciding to adopt the innovation. In the final process, confirmation, an individual seeks reinforcement or revision of the decision being made. If the previous decision of adoption or rejection seems to be correct, the individual keeps the same choice; otherwise, the person reverses the previous decision.

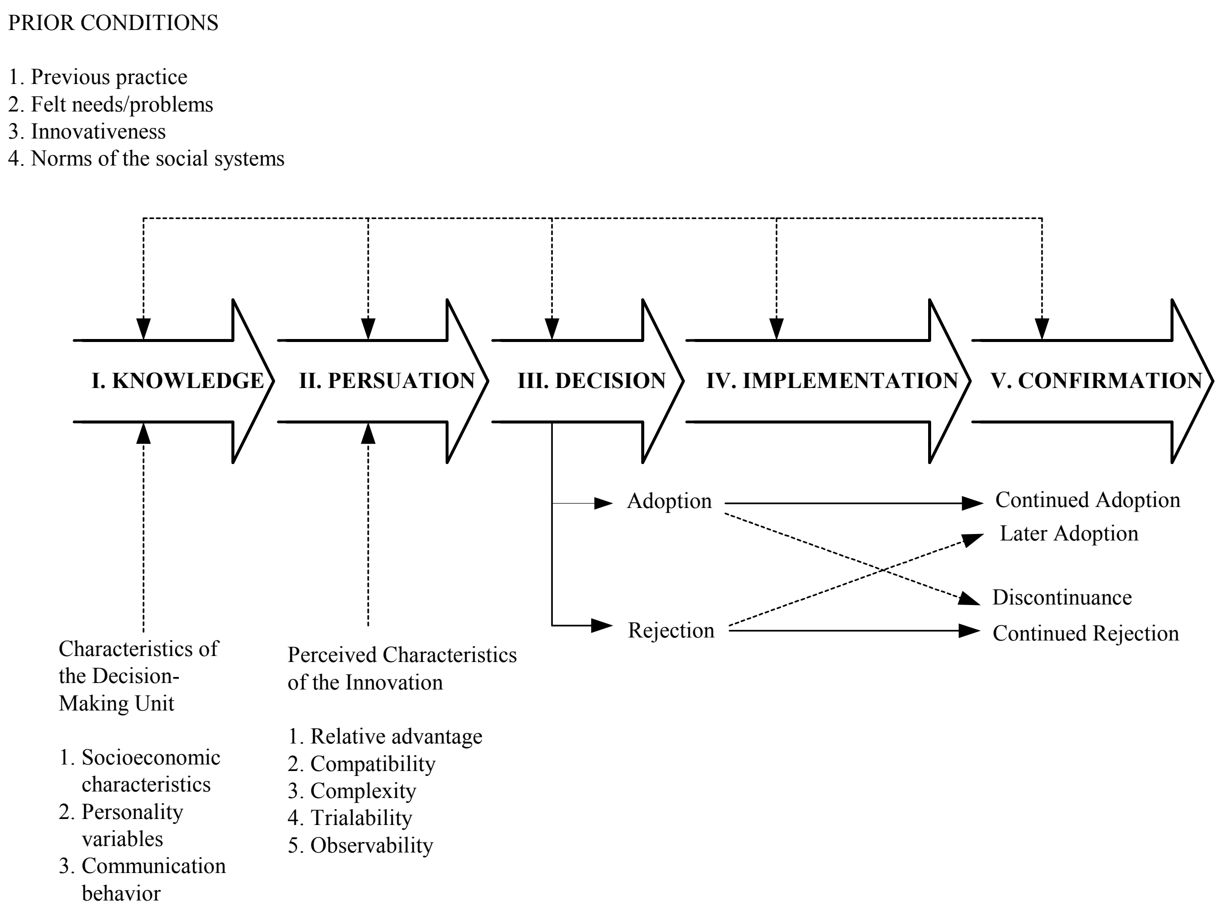

Figure 4. A model of five stages in the innovation-decision process (Adapted from: Rogers, 2003, p. 170).

Finally, the rate of adoption indicates the relative speed with which members of a social system adopt an innovation. Five broad categories of variables affect the adoption rate as shown in Figure 5: perceived attributes of an innovation, type of innovation-decision, communication channels, nature of the social system, and the extent of the changing agent's promotion effort.

Rogers stated about 49-87% of the variance in the rate of adoption can be explained by the five categories of variables. The type of innovation-decision affects the rate of adoption in the sense that the greater the number of individuals involved in the decision process, the slower the rate of adoption. Thus, the optional innovation-decision category, which requires only an individual's independent decision, was the fastest one, whereas the collective decision-process which needs consensus from most of the members of a system is slowest. Communication channels in the form of mass media make the rate of adoption faster than the means of interpersonal channels which often happen for later adopters. If a social system is highly structured, interconnected, and organized, the adoption rate of innovation is usually fast. In the last, the more promotion effort on innovation the change agent spends, the faster the rate of adoption, although the relationship between them is not linear.

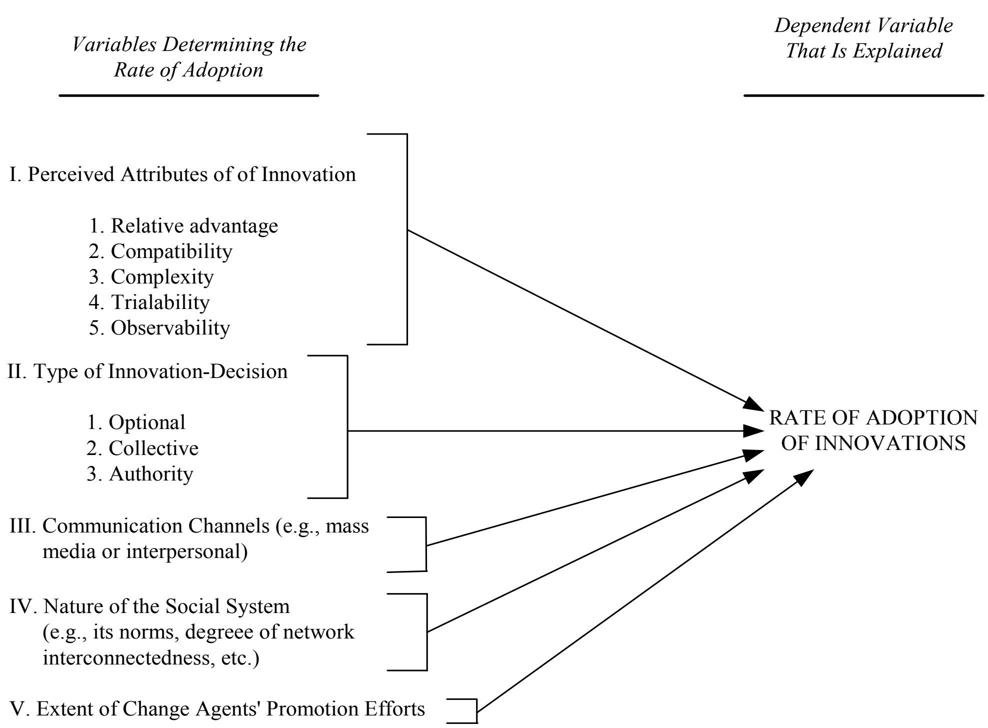

Figure 5. Variables determining the rate of adoption of innovations (Adapted from: Rogers, 2003, p. 222).

Many studies have used the diffusion theories to explain the phenomena of technology diffusion in higher education. For instance, several studies have used Roger's concepts of adopter categories and rate of adoption to investigate the differences between early and late adopters, the perceived barriers and incentives to adoption of web-based education (WBE) innovations, and the rate of adoption of WBE innovations (Ebersole & Vorndam, 2002; Ferrarini & Poindexter, 2001; Jacobsen, 1998); the findings generally supported Rogers' theory. Jacobsen (2000) used the five stages of the innovation-decision process as a conceptual framework to explain the individual stories about adopting technology for teaching and learning. Other authors (e.g., Bronack & Riedl, 1998; Jones, 1999) have used the perceived characteristics of innovations to examine why some innovations work and others do not. Yi et al. (2006) reported that relative advantage, complexity, observability, and image are the most important factors in predicting student teachers' intentions to make use of technology. Surry and Gustafson (1994) concluded that compatibility, complexity, and relative advantage are the important factors when introducing an innovation into instructional settings.

Studies on Barriers to Computing Technology Adoption

In addition to the theoretical exploration on the general diffusion process, a rich body of empirical research has specifically focused on barriers to ICT adoption. For instance, P. Rogers (1999) interviewed 28 college and university teachers in Minnesota and found the four top barriers were the lack of funds specified for technology-related needs, the lack of sharing best practices across systems, the need of technical support staff, and the need for release time and time for training faculty and staff. Chizmar and Williams (2001) reported the three major barriers to adoption of instructional technology for the majority of faculty at Illinois State University were the lack of institutional support, the lack of financial support, and most importantly, the lack of time to learn new technologies. Investigating a sample of 125 faculty members in the College of Sciences and Humanities at Ball State University, Butler and Sellbom (2002) found that the major factors affecting ICT adoption were technology reliability, learning to use new technologies, uncertainty about its worth, and the lack of institutional support. Ebersole and Vorndam (2002) concluded that the top leading barriers to adoption of educational technology were time, resources, and a lack of confidence after interviewing 24 lead faculty members at a Midwestern university. Muilenburg and Berge (2001) conducted a large-scale survey with a sample of 2,504 participants from different levels of education systems, governmental agencies, business organizations, and nonprofit organizations. The factorial analytic analysis revealed ten factors of barriers: (a) administrative structure, (b) organizational change, (c) technical expertise, (d) social interaction and quality, (e) faculty compensation and time, (f) threat of technology, (g) legal issues, (h) evaluation/effectiveness, (i) access, and (j) student support services.

After reviewing many studies on barriers to technology adoption at the international level for teachers across education levels, Becta (2004) drew the following conclusions: (a) a very significant determinant of teachers' levels of engagement in ICT is their level of confidence in using the technology--teachers who have little or no confidence in using computers in their work will try to avoid them altogether; (b) levels of access to ICT are significant in determining the levels of ICT use by teachers; (c) inappropriate training styles result in low levels of ICT use by teachers; (d) teachers are sometimes unable to make full use of technology because they lack the time needed to fully prepare and research materials for lessons; (e) technical faults with ICT equipment are likely to lead to lower levels of ICT use by teachers; (f) resistance to change is a factor which prevents the full integration of ICT in the classroom; (g) teachers who do not realize the advantages of using technology in their teaching are less likely to make use of ICT; (h) little evidence supports the view that age affects levels of teachers' ICT use; and (i) some evidence suggests that teachers' gender has an effect on the degree to which they use ICT, with male teachers making more use of ICT than female teachers, and with female teachers reporting greater levels of computer anxiety than male teachers (Becta, 2004).

Several authors classified barriers into two types: the external or first-order barriers such as limited resources, lack of time, lack of technical support, and technical problems, and the internal or second-order barriers, which relate to teachers' attitudes to ICT such as lack of confidence, resistance to change, negative attitudes, and no perception of benefits (Ertmer, 1999; Snoeyink & Ertmer, 2001). Another way of grouping the barriers is to consider whether they relate to the individual (i.e., teacher level barriers) such as lack of time, lack of access to quality computing resources, lack of effective training and technical problems, or to the institution (i.e., school level barriers) including lack of time, lack of confidence, resistance to change and negative attitudes, and no perception of benefits (Veen, 1993). The lack of time could fall under either category as teacher's lack of time may be due to the systems put in place by the school, making it therefore a school level barrier, but the lack of time might also be caused by the teacher's own organization and preferences, which would make it a teacher level barrier. Understanding the extent to which these barriers affect individuals and institutions may help in deciding how they are to be tackled (Becta, 2004).

It has been argued that there are close relationships between many of the identified barriers to ICT uses; any factors influencing one barrier are also likely to influence several other barriers. For example, teacher confidence is directly affected by levels of personal access to ICT, levels of available technical support and the amount and type of training available, all of which can be seen as barriers to ICT themselves (Ertmer, 1999).

Studies on Attributes of Computing Technology

Rogers (1962, 1971, 1983, 1995, 2003) identified five critical attributes of innovation affecting the rate of diffusion of an innovation: relative advantage, compatibility, complexity, trialability, and observability. He stated the first two attributes are particularly important in explaining the rate of adoption. He also stated that among the five types of variables influencing the rate of adoption in Figure 5, the perceived attributes of innovation have been the most extensively studied. After reviewing the research on this topic across disciplines over years, he concluded that perceived attributes of innovations could explain approximately half of the variance in rate of adoption.

Based on a meta-analysis of 105 publications on diffusion, Tornatzky and Klein (1982) identified the ten most frequently used attributes of innovation: compatibility, relative advantage, complexity, cost, communicability, divisibility, profitability, social approval, trialability, and observability. They further stated that compatibility, relative advantage, and complexity are the most important innovation characteristics related to innovation adoption. Moore and Benbasat (1991) developed a survey based on Tornatzky and Klein (1982)'s work. However, their factor analysis on a sample of 540 employees in seven companies suggested an eight-factor structure. In addition to the five attributes in Rogers, voluntariness, image, and demonstrability were identified.

Holloway (1975) conducted one of the earliest studies on attributes of innovation in education settings. He investigated the perception of secondary school personnel, parents, and students on Project Advance, a joint cooperative program between Syracuse University and various New York secondary schools. The results supported Rogers' categories of five attributes. In another related study (Holloway, 1977) with 100 high school principals, he found similar results. But the factor analysis showed that the attributes of relative advantage and compatibility lacked a clear differentiation/delineation and status-conferring emerged as the sixth attribute from relative advantage (Holloway, 1977).

Bennett and Bennett (2003) investigated the impact of perceived characteristics of instructional technology on faculty members' willingness to integrate ICT into their teaching practices. They reported the most important barriers to adopting technology use are the faculty members' reluctance in and disbelief in the use of technology, rather than the commonly recognized lack of technological facilities or financial funds. Similarly, Medlin (2001) found that personal motivation was the most important factor influencing faculty members' decisions to integrate technology into their instructional processes.

Park (2003) used personal characteristics (i.e., computer experience and self efficacy), perceived attributes of innovation (i.e., complexity and relative advantage), and perception of influence and support from the environment (i.e., subjective norm, support, and time) to predict the level of web-assisted instruction use, employing structural equation modeling. The results indicated computer experience, subjective norm, self-efficacy, relative advantage, and complexity were the important predictors with relative advantage and subjective norm having a direct effect on level of ICT use.

Research interested in the relationship between perception of attributes of innovation and technology adoption has investigated educational practitioners in other countries as well in recent years. For instance, Li (2004) examined 273 faculty members' perceptions about attributes and barriers affecting the diffusion of Web-based distance education at the China Agricultural University. The results showed: (a) the Chinese university instructors tended to agree with the existence of the five attributes of relative advantage, compatibility, complexity, trialability, and observability but there were no differences on the five perceived attributes by professional area, gender, age, level of education, and academic rank; (b) teaching experience had significant influence on compatibility; and (c) distance education experience had significant influence on compatibility and observability.

Al-Fulih (2003) used the eight attributes from Moore and Benbasat (1991) (i.e., relative advantage, image, compatibility, ease of use, result demonstrability, visibility, trialability, and voluntariness) to predict the Internet use for instructional purposes of 453 Saudi faculty members from three universities. Results showed that approximately 40% of variation on Internet adoption could be explained by these eight variables, but only relative advantage, image, compatibility, ease of use, and visibility were significant predictors in the presence of other predictors. In contrast, in a study on the use of the Internet as an instructional tool in Brazil, Martins, Steil, and Todesco (2004) reported the two most significant predictors were trialability and observability.

Usluel, Aşkar, and Baş (2008) used the technique of structural equation modeling to investigate the impacts of ICT facilities (i.e., in classroom, in lab, and in office) and ICT attributes (i.e., relative advantage, compatibility, ease of use, and observability) on ICT instructional and managerial uses in 834 faculty members from 22 universities in Turkey. The findings indicated that about 61% of variance on ICT uses could be explained by ICT facilities and ICT attributes. But ICT facilities ($\beta = .73$, $t = 11.46.$, $p < .05$) contributed much more in the prediction model than ICT attributes did, although the direct path between ICT attributes and ICT uses was statistically significant ($\beta = .19$, $t = 4.01.$, $p < .05$) as well.

Almobarraz (2007) employed a multiple regression model to predict the Internet adoption in 344 faculty members from Imam Mohammed Bin Saud University in Saudi Arabia by the eight perceived attributes in Moore and Benbasat's (1991) research. The results showed that these eight attributes could collectively explain 33.4% of the variance on Internet adoption.

E-Learning in Omani Higher Education

Country Profile

The Sultanate of Oman is located in the Southeast of the Arabian Peninsula. It borders the United Arab Emirates (UAE) on the northwest, Saudi Arabia on the west and Yemen on the southwest. The coast is formed by the Arabian Sea on the south and east and the Gulf of Oman on the northeast (See Appendix D). Oman is the third largest country in the Arabian Peninsula following the Kingdom of Saudi Arabia and the Republic of Yemen. The Sultanate is divided into nine governorates and regions. The Governorate of Muscat is the most densely populated region in the Sultanate with a population of more than half a million. It is the political, economic, and administrative center in Oman. The total population is about 2.8 million. Of those, about two million are Omanis and one fourth guest workers from Pakistan, Bangladesh, Egypt, Jordan, India and the Philippines. In Oman, about 50% of the population lives in Muscat and the Batinah coastal plain northwest of the capital. The entire land area is 309,500 square kilometers (Al-Shaibany, 2008; Omani Ministry of Information, 2007).

Prior to 1967, the Omani economy primarily depended on subsistence agriculture and fisheries. Since the first commercial of oil started in 1967, oil exports have become increasingly important to the Omani economy. Recently, the Omani economy has been a combination of oil, agriculture, and fisheries. Islam is the religion of the country. Arabic is the official language but English is used to some extent in communications, trading, and in some higher and professional educational contexts (Al-Abri, 1995).

Education in Oman

Before 1970, only three formal schools existed in Oman, with fewer than 1,000 students.

Since Sultan Qaboos came to power in 1970, the government has given high priority to education and considered education as a vital factor in the country's economic and social progress. In 1997, the ministry began development work on a Basic Education program to gradually replace the three-level General Education system. The aim of the reform is to create a unified system covering the first ten years of schooling. Basic Education is organized into two cycles: the first cycle covers grades 1 to 4 and the second cycle covers grades 5 to 10. These two cycles are followed by two years of secondary education. By the year 2007, there were 1,052 state schools with 553,000 students (Sultanate of Oman Ministry of Education, 2004, 2008).

Higher education is Oman is relatively new. In reviewing the history of higher education in Oman, Sridhar (2005) wrote:

> The advent of higher educational institutions in Oman began with the establishment of the Omani Bankers Institute (currently College of Banking and Financial Studies) in 1983 and the Intermediate Teachers' Colleges (currently Colleges of Education) in 1984. At the same time the Technical Industrial College (currently Higher Technical Colleges) was opened to provide specialist vocational qualifications. (p. 259).

Then, the Institute of Agriculture at Nazwa became a full college in 1985. Three teachers' colleges were functioning as of 1986. In the same year, Oman's first university, Sultan Qaboos University, was opened. The private sector of higher education starting in 1994 has scaled up rapidly with about 20 private colleges and universities. In the past decade, the government has reformed the higher education system to meet the needs of a growing population by providing incentives to existing private colleges to upgrade, by creating new degree-granting private colleges, and by restructuring the existing colleges. By the end of the academic year 2005-2006, there were a total of 52 public and private universities and colleges in Oman (as shown Table 1).

Meanwhile, the number of students enrolled in higher education has rapidly increased as well. For instance; the number of students in SQU had increased from 557 in 1986 to 3,278 in the academic year of 2004-2005, and to 13,410 in the academic year of 2007-2008 (see Table 2).

Table 1

Number of Higher Education Institutes in Oman in 2006

Government sector	Private sector
Sultan Qaboos University	Dhofar University
14 University colleges	Sohar University
17 Specialized institutes	Nizwa University
	17 higher education institutes
Total: 32	20

Table 2

Number of Students at SQU in the Academic Years of 2006-2007 and 2007-2008

Category	2006-2007	2007-2008
Undergraduate students	13,483	13,410
Male	6,961	6,958
Female	6,522	6,452
Postgraduate diploma students	362	455
Male	65	91
Female	297	364
Master students	793	855
Male	496	492
Female	297	363
Doctorate students	2	2
Male	1	1
Female	1	1
Total students	14,640	14,722
Male	7,523	7,522
Female	7,117	7,180

Source: SQU statistical Year Book 2007-2008.

E-Learning in Omani Higher Education

E-learning has a comparatively short history in Oman. SQU was the first higher education institution in Oman adopting the e-learning approach in 2001 and continues to be the leader for the e-learning movement. However, online learning has steadily grown at other universities and colleges in Oman in the past several years. For instance, when SQU first started the online learning platform WebCT in 2001 with eight online courses, it was totally technology-driven, operationalized without the foundation of a vision or even an action plan to implement e-learning at the university level. But, as mentioned earlier, by the academic year 2006-2007, the online courses at SQU had climbed to 387 with 268 WebCT and 119 Moodle courses with 20,409 available seats. Table 3 shows the number of WebCT courses and users at SQU in its first three semesters of implementation. Table 4 lists the numbers of online courses and users in Spring

Semester, 2005, and Table 5 tabulates the number of WebCT and Moodle courses and users in the academic year of 2006-2007. These statistics clearly demonstrate that online learning has gotten more popular at SQU.

Table 3

WebCT Courses and Number of Users at SQU between Fall 2001 and Fall 2002

College	Fall 2001		Spring 2002		Fall 2002	
	No. of courses	No. of users	No. of courses	No. of users	No. of courses	No. of users
Agriculture	0	0	0	0	4	87
Arts	0	0	0	0	0	0
Commerce	0	0	0	0	1	0
Education	4	161	7	640	15	441
Engineering	0	0	0	0	0	0
Medicine	1	5	1	85	0	0
Science	0	0	2	22	8	494
Language center	3	815	8	1,719	10	1,917
CET	0	0	2	65	2	62
Total	8	981	20	2,531	40	3,001

Source: Multimedia Department at the Center for Education Technology (CET) (2005)

Table 4

Number of Online Courses and Users at SQU in Spring, 2005

College	Number of courses	Number of online courses	Number of seats
Agriculture	25	6	144
Arts	52	19	1,053
Commerce	20	6	231
Education	44	14	1,117
Engineering	63	24	760
Language center	61	37	5,495
Medicine	30	15	1,571
Science	97	25	1,534
Total	392	146	11,905

Source: SQU Center for Education Technology (summer, 2005)

Table 5

Number of Online Courses and Users at SQU in the Academic Year of 2006-2007

	Courses			Seats		
College/center	WecCT	Moodle	Total	WecCT	Moodle	Total
Agriculture	8	7	15	341	214	555
Arts	70	18	88	2,316	410	2,726
Commerce	2	3	5	40	105	145
Education	32	21	53	1,311	338	1,649
Engineering	26	7	15	1,243	232	1,475
Language center	36	22	58	3,745	1,533	5,278
Medicine	32	17	49	3,587	543	4,130
Science	62	24	86	3,631	820	4,451
Total	268	119	387	16,214	4,195	20,409

Source: Center for Educational Technology at Sultan Qaboos University (2005)

Oman launched the eOman initiative in 2006 to prepare its businesses and people to participate fully in the digital society. eOman was founded on His Majesty Sultan Qaboos bin Said's progressive vision to transform the Sultanate into a knowledge-based society and to build a knowledge-based economy. eOman aims at creating an effective government-community-citizen infrastructure that provides better services to people. Leveraging ICT power for economic and social benefits is eOman's greatest goal. Integrating government departments to provide more efficient public services, increasing IT literacy, developing the economy through smart electronic services, creating local knowledge industries, and minimizing the digital divide are some initiatives undertaken by eOman (Omani Information Technology Authority, 2008).

Along with the e-government initiative, recently, the Ministry of Education in Sultanate of Oman (2008) implemented e-learning for the state schools in two contexts: a virtual classroom system and a self-learning system. The use of virtual classrooms is to provide lectures on the Internet in an interactive learning environment consisting of teachers and learners, and coach trainees. The self-learning system is based on the design of electronic content. It allows the learner or trainee the possibility of direct research on educational materials and training courses from the existing manual system from anyplace, at any time (Omani Ministry of Education, 2008). Although there is no nationwide e-education systems in place at present, many efforts to restructure the country's education system to be technology-based such as the "laptop for each teacher" project, have taken place. Currently, the Ministry of Education is strategically planning the nation's infrastructure of educational system.

Research on E-Learning in Omani Higher Education

Research on e-learning in Omani higher education has been in three broad categories: (a) institutional strategic implementation of the e-learning system in the nation or at a particular university; (b) faculty members and e-learning, including the use, attitudes, perception, concerns, and impact of e-learning on their instructional practices, and (c) the impact of e-learning on students. Even before the debut of e-learning as an integrated part of Omani higher education, researchers have advocated its implementation. For instance, Al Rawas (2001) contended that Omani higher education must be extended throughout the country using distance learning and e-learning solutions. Al Balushi (2001) stated that e-learning is the ‘now big thing’ not the ‘next big thing’, and pointed out the serious need for a strategic plan for e-learning in the Gulf region. Akinyemi and Al Rawas (2002) have identified some critical ingredients for e-learning installation and offered some recipes for e-learning implementation in Oman. In addressing Omani educators’ doubts about e-learning, Al Musawi and Akinyemi (2002) concluded that peoples’ concerns for comparability between the e-learning system and the traditional system must be attended to before e-learning can be diffused into Omani higher education on a large scale.

Most of the empirical studies so far have focused on faculty members at Sultan Qaboos University. Hamshari and Bu-Azzah (2000) conducted one of the earliest surveys on 182 SQU faculty members’ Internet use before the-learning was launched in 2001. They found about 37% of faculty members at SQU used the Internet; the majority of them were in scientific colleges. Their purposes for using the Internet in rank order were: communication through e-mail, teaching, research, and browsing and visiting sites looking for information. The major difficulties faced by those faculty members in using the Internet were the slowness of communication and the heavy use of the Internet.

Abdelraheem and Al Musawi (2003a, 2003b) conducted another survey on the instructional uses of the Internet in 193 SQU University faculty members and further examined the group differences on gender, college affiliation, teaching experience, and academic rank with ANOVAs. They reported that the two most frequent uses of Internet were in courses, and to download ready-made instructional materials. Whereas there were no differences on Internet use between females and males faculty members, they did find the group difference was in favor of science faculty members, those with 5 to 9 years teaching experiences, and assistant professors.

Abdelraheem (2004) examined the context beliefs of 250 Sultan Qaboos University faculty members about teaching with technology. It was found that SQU faculty members held positive beliefs but with varying degrees. The findings of group differences on teaching experience, college affiliation, and academic rank were in favor of those faculty members with longer teaching experience, at science camp, and in the senior positions (i.e., associate professors and professors).

Akinyemi, Osman, and Al Kindi (2009) in Al Musawi & Abdelraheem, 2004) investigated the viability of WebCT as a mode of instructional delivery at SQU in its early implementation stage. They found both faculty and students were favorably disposed to this new technology in spite of some problems. But they made recommendations on infrastructural improvements on hardware, software, and IT training in order for e-learning to gain popularity at SQU.

Al Musawi and Abdelraheem (2004) reviewed the WebCT implementation at SQU in its first few years. They found online courses had increased each year. Students were able to access the Internet for knowledge sources and faculty members used the Internet in their instructional processes. They concluded that web-based instruction was as effective as the traditional face-to-face approach on students' achievement. However, they argued more online courses needed to be offered and standards must be set before e-learning could be more widely used at SQU.

Al-Washahi (2007) investigated the perceived effectiveness and impact of educational technology faculty development activities in the College of Education (COE) at Sultan Qaboos University using the qualitative approach of interviews, focus groups, and document analysis. The COE faculty members described the college's culture as technology-oriented since faculty members rely on technology in their daily activities and form networks to learn technology. Nevertheless, the study revealed that no structured form of a program or a plan with a clear vision, goals, and strategies for educational technology faculty development existed in the COE. Also, a lack of systematic evaluation and follow-up to encourage and support faculty members in applying technology in instruction was found. The COE faculty primarily gained their confidence through their own experiences of integrating technology into the teaching practices.

Al-Suqri (2008) examined the information needs and information-seeking behaviors of social science scholars at Sultan Qaboos University using a mixed-method research method. Findings revealed that SQU social science faculty members make increasing use of electronic resources but retain a preference for print materials and informal sources of information. The three main types of barriers to information seeking faced by those scholars were: (a) limited availability of resources, especially full text resources; (b) poor Internet connection speeds or Internet availability; and (c) a lack of sufficient Arabic language sources. The study also reported that information needs and information-seeking practices vary with age, academic rank, and academic department or college.

Online learning has the potentials for greater access to knowledge and serves as an ideal alternative to deliver instruction. Nevertheless, online learning could have the drawbacks of loosely structured environments, the vast amount of information, intensive mental influx required from learners, and possibly unclear learning goals and tasks for learners if not designed well (Al-Khanjari, Kutti, & Ramadhan, 2005; Osman, 2005). Thus, the implementation of the e-learning platform and environment need a balance "between choice and control, and between instruction, construction, and inadvertent distraction to learning" (Osman, 2005, p. 353). Therefore, it is not surprising to find studies that have focused on students' perception of their e-learning environment and the attitude towards e-learning in general. For instance, Osman and Ahmed (2003) examined the potential and the impact of web-assisted instruction on SQU students' learning and attitudes. They found that students had positive attitudes towards web-assisted instruction and that web-assisted instruction was as effective as face-to-face instruction on student achievement.

Osman (2005) investigated students' reaction to implemented WebCT at Sultan Qaboos University in a sample of 31 undergraduates. Results showed that students are generally positive to the WebCT learning environment at the university and they are confident with major features of the new learning tool. But the participants indicated that the slow network performance and limited number of computers on campus are two major factors affecting their effective use of WebCT. It is interesting to note that the majority of the students liked the blended learning as practiced in the university rather than the pure online learning without weekly lectures.

Elango, Gudep, and Selvam (2008) examined the issues related to the six quality dimensions of e-learning in a sample of 112 UAE and Omani students. They found that students perceived their e-learning system as having both strengths (e.g., course contents, knowledge level of instructors) and weaknesses (e.g., graphics and animations). Findings also indicated that the e-learners had diverse opinions with regard to administrative issues, instruction materials, instructors' support, viper sessions (the software program which helps interactive learning through the Internet), grading, and assessment. The authors recommended that university administrators take a holistic approach to address the needs and problems faced by the e-learners to ensure a better future for e-learning education in the Mid-East.

In summary, Oman's utilization of educational and information technology in higher education has proceeded rapidly in the past decade (Al Musawi & Abdelraheem, 2004). The number of online courses available and the number of users involved have dramatically increased, most notably at SQU. Studies conducted in Oman have shown that Omani faculty and students are favorably disposed to e-learning (Akinyemi, 2003). Nevertheless, educational technology in the Omani higher education context is still characterized by the underutilization of advanced technology; and unsatisfactory staff skills to achieve an appropriate level (Al Khawaldi, 2000). Faculty members are, in many instances, short of the required preparation time to apply the new educational innovations (Abdelraheem & Al Musawi, 2003). In addition, faculty members vary in the level of ICT uses in their teaching practices. The factors underlying the differences of ICT uses in Omani faculty members are still unclear. Thus, a need for multivariate investigation on the topic is apparent.

Purposes of the Study

The above literature review clearly demonstrated that although some studies on ICT adoption byOmani faculty members have been carried out, multivariate investigation on factors influencing faculty members' ICT uses in the instructional processes is still limited. Thus, the present study was designed to extend the existing research by exploring the factors impacting faculty members' ICT uses in the Omani cultural context using the multivariate approach, in addition to providing descriptive information and examining the group differences among different types of adopters on ICT uses and skills, perception of barriers to adopting ICT, and perception of ICT attributes. More specifically, the purposes of this study were to:

1. Identify the current statuses of ICT uses and skills of Omani faculty members
2. Classify the faculty members based on Roger's categories of adopters
3. Describe faculty members' perception of barriers to adopting ICT in their instructional processes
4. Understand faculty members' perception of ICT attributes
5. Examine any differences on ICT uses and skills, perception of barriers, and perception of ICT attributes in different types of adopters
6. Determine if the level of ICT skills, self-classification of adopter category, perception of barriers, and perception of ICT attributes, along with the selected demographic and job-related variables could significantly predict the ICT uses by Omani faculty members

Assumptions

This study relied on the following major assumptions: (a) The survey translated to Arabic from English through the forward-and-backward translation process maintained conceptual validity; (b) the survey had acceptable construct validity; (c) faculty members were able to understand and answer the questions on the survey; and (d) each participant answered the survey independently.

CHAPTER III

METHODLOGY

Sample and Population

The participants in this study were three hundred Omani faculty members from Sultan Qaboos University (SQU) (after excluding two with incomplete responses). They represented all nine colleges: Agricultural and Marine Sciences, Arts and Social Sciences, Commerce and Economics, Education, Engineering, Law (added in 2005), Medicine, Nursing (added in 2008), and Science. The total number of staff by December 31, 2007 at SQU was 2,559; 879 were academic staff. The total number of faculty members broken down by academic rank in each college at SQU is shown in Table 6. Of them, 430 were Omani. These faculty members served as the population of the present study.

Table 6

Total Number of Faculty Members at SQU and Their Rank Distribution per College

College	Professor	Associate Prof.	Assistant Prof.	Instructor
Art and social sciences	7	18	96	52
Education	5	12	69	41
Science	11	51	76	38
Medicine and health sciences	13	20	32	30
Engineering	3	26	48	22
Commerce and economics	3	5	35	39
Agriculture and marine sciences	4	19	26	13
Law	1	2	17	16
Nursing	1	1	5	22
Total	48	154	404	283
Ratio	5.4%	17.3%	45.4%	31.8%

Source: SQU Statistical Year Book 2007-2008.

Table 7 presents the demographic information of the participants. The majority of the participants were male. All of the faculty members were under 60 years-old, and the 30-49 year-old groups comprised almost two-thirds of the participants. The percentages for the four groups by academic rank generally resembled the ratios in the faculty pool at SQU as shown in Table 6, except for the relatively lower percentages for the two senior faculty groups. Over half of the participants rated themselves as fluent in the English language. Only 20% of them perceived their level of English language proficiency as average and below. Over 95% of the faculty members had a home computer, and over 75% of the participants owned a Laptop computer. The ownership of the newest technology – a mobile phone computer-- was also relatively high. Over one -third of the participants had such a device.

Table 7

Demographic Information of the Participants

Variables	Frequency	Percentage
Gender		
male	181	60.3
female	119	39.7
Age group		
20-29	89	29.7
30-39	134	44.7
40-49	61	20.3
50-59	16	5.3
60 and above	0	0
Academic rank		
lecturer/instructor	113	37.7
assistant professor	149	49.7
associate professor	29	9.7
professor	9	3.0

(*table continues*)

Table 7 (*continued*).

Variables	Frequency	Percentage
English proficiency		
none	6	2.0
poor	14	4.7
average	37	12.3
good	88	29.3
very good	155	51.7
Computer at home		
yes	286	95.3
no	14	4.7
Own a laptop		
yes	233	77.7
no	67	22.3
Own a mobile phone computer		
yes	107	35.7
no	193	64.3

Table 8 presents the descriptive statistics for the job-related variables. As shown, these faculty members, on average, taught approximate two traditional classes but less than one blended class although there was a large variation in the number of blended classes being taught. The information on variables was basically self-explanatory, requiring no further discussion. But, it should be noted that SQU currently has a much larger portion of undergraduates than of graduate students (see Table 2). This explains why the average number of graduate students currently supervising is very low.

Table 8

Job-related Variables of the Participants

Variables	Min	Max	*M*	*SD*
Number of traditional classes teaching currently	0	6	1.94	1.44
Number of blended courses teaching currently	0	12	.79	1.24
Credit hours currently teaching	0	20	8.87	5.34
Teaching experiences in higher education in years	0	25	7.60	4.93
Experiences of using computers in years	3	26	11.06	3.83
Daily use of computer in hours	0	14	4.73	2.18
Number of students currently teaching	0	359	84.17	56.27
Graduate students currently supervising	0	12	.54	1.33

The Measurement Instrument and Variables

The survey consists of five parts (see Appendix A). In Part 1, the faculty members were asked to rate themselves on the current level of ICT uses and skill on 18 items. These items, with some modifications, were based on other researchers' instruments devised for a similar task (Isleem, 2003; Sahin & Thompson, 2006). Classroom management was renamed as Web-based classroom management program for clarity. Eight items were added or re-organized: Website design software (e.g., FrontPage, Dreamweaver), Web 2.0 tools (e.g., blog, wiki), internet communication services (e.g., newsgroup, listserv, e-chatting), audio/video conferencing, FTP (File Transfer Protocol), interactive communication tools (e.g., Skype, SMS), search engines (e.g., Google, Yahoo), and electronic video (e.g. YouTube). Two items were dropped: tutorials (i.e., providing instruction that uses exercises and practice) and Macintosh operating system, as the former may not be obviously linked to ICT by the respondents and the latter was not applicable to Omani universities. These items were expected to cover the broad range of possible applications of ICT in today's educational environment at SQU.

Each item had five Likert-scale rating points: 0 = *never*, 1 = *rarely*, 2 = *sometimes*, 3 = *often*, and 4 = *very often*. The item-level means indicated the current level of computer uses by Omani faculty members on each application area. The scale-level mean, obtained by averaging the ratings across the 18 items, was used as the quantitative index of ICT adoption. It served as the dependent variable in the ANOVAs and the criterion variable in the multiple regression analysis.

Similarly, the self-perceived level of ICT skills were rated on the same 18 items as on computer uses with five anchor points: 0 = *no experience*, 1 = *beginner*, 2 = *intermediate*, 3 = *advanced* and 4 = *expert*. The item-level mean on computer skills described the current level of ICT skills for the Omani faculty members. The scale-level mean served as the dependent variable for the ANOVA on group differences by adopter category. However, for the multiple regression analysis, it was used as one of the predictor variables.

Part 2 was designed to classify faculty members into Rogers' five categories of adopters. It contains only one item with six possible choices (see Appendix A). The first four options correspond to innovator, early adopter, early majority, and late majority in Rogers (2003). The last two options fall into the category of laggards. Although it is desirable to use multiple items to categorize faculty into Rogers' five types of adopters, such a survey was not found. Thus, this study, like others (e.g., Less, 2003; Sahin & Thompson, 2006), used one comprehensive statement on the time sequence of ICT adoption to differentiate faculty relative to their colleagues. This categorical variable was used as the grouping variable for the ANOVAs and as a predictor in the regression model for predicting ICT adoption.

Part 3 was designed to focus on the perception of barriers to ICT adoption. However, a desirable survey covering a broad range of barriers with a sound theoretical foundation was not located. Some surveys seemed to be too simple (e.g., Isleem, 2003; Sahin & Thompson, 2006), others appeared to be complicated with too many factors due to the loose cutoff criterion used in the process of exploratory factor analysis (e.g., Muilenburg & Berge, 2001). Thus, a 44-item questionnaire on the faculty's perception of barriers to ICT adoption was constructed for the purpose of this study (see Appendix A). Each item had five rating points: 1 = *sstrongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *agree*, 5 = *strongly agree*. These 44 items were drawn from multiple sources of empirical studies and theoretical works on barriers to ICT adoption. For instance, several authors (e.g., Ertmer, 1999; Snoeyink & Ertmer, 2001) classified barriers into two types: the external or first-order barriers (e.g., limited resources, lack of time, lack of technical support, and technical problems) and the internal or second-order barriers, which relate to teachers' attitudes about ICT such as a lack of confidence, resistance to change, negative attitudes, and no perception of benefits. Surry, Ensminger, and Haab (2005) proposed the RIPPLES model to address barriers to the integration of instructional technology into higher education for college deans: *resources, infrastructure, people, policies, learning, evaluation,* and *support*. They claimed their model was based on Rogers' (1995) theories, Hall and Hord's (1987) concerns-based adoption model, Ely's (1999) eight conditions that facilitate implementation, Stockdill and Morehouse's (1992) critical factors in adoption checklist, Burkman's (1987) user-oriented instructional development model, and Farquhar and Surry's (1994) concept of adoption analysis.

Empirical studies have shown that the following could be barriers to ICT adoption: (a) lack of teacher confidence (Bosley & Moon, 2003; Bradley & Russell, 1997; Fabry & Higgs, 1997; Larner & Timberlake, 1995), (b) resistance to change and negative attitude (Cuban, Kirkpatrick, & Peck, 2001; Ertmer, 1999; Mumtaz, 2000; Snoeyink & Ertmer, 2001; Veen, 1993), (c) no perception of benefits (Cox, Preston, & Cox, 1999; Mumtaz, 2000; Snoeyink & Ertmer, 2001; Yuen & Ma, 2002), (d) lack of time (Cuban, 1999; Cuban et al., 2001; Ebersole & Vorndam, 2002; Fabry & Higgs, 1997; Jacobsen, 1998; Snoeyink & Ertmer, 2001), (e) lack of training (Kirkwood, Murphy & Greenwood, 1998; Kirkwood, Van Der Kuyl, Parton, & Grant, 2000; Veen, 1993; Wild, 1996), (f) lack of access to computing resources (Bosley & Moon, 2003; Fabry & Higgs, 1997; Guha, 2000; Mumtaz, 2000; Pelgrum, 2001), and (g) lack of institutional support (Butler & Sellbom, 2002; Cuban, 1999; Snoeyink & Ertmer, 2001). These theoretical frameworks and empirical evidence served as sources of item constructions in the present study. The final structure of this Perception of Barriers to Adopting ICT Scale for Omani Faculty Members was subject to exploratory factor analysis. The mean factor score and total scale mean were computed. For investigation on the group differences among different type of adopters, both the factor means and the total scale mean were used as the dependent variables. However, for the prediction of ICT adoption, only the total scale mean was used as a predictor.

Part 4 focused on faculty members' perceptions of ICT attributes. These items were drawn from Moore and Benbasat (1991). Moore and Benbasat developed the survey targeting Rogers's attributes of innovation. The final survey, with 38 items after three stages of testing, covered eight factors: voluntariness, relative advantage, compatibility, image, easy of use, demonstrability, visibility, and trialability. The comparison between Rogers' model and Moore and Benbasat's construct is presented in Table 9. The reviewing committee recommended to remove two items as not being valid in the Omani culture (i.e., My using computing technology requires a lot of mental work and computing technology was available to me to adequately test run various applications). Thus, the final survey contained 36 items. However, as this eight-factor structure was originated for an American population, it may not be appropriate in the Omani culture. To validate this survey and possibly to find different constructs, the other 14 items excluded in the testing process by Moore and Benbasat were included in Part 4 as well. But, there were two minor modifications to Moore and Benbasat's survey. All of the wording of PWS (personal work station) was substituted by computing technology. The order of the items was randomized rather than in the sequence of factors as in Moore and Benbasat (see Appendix A). Similar to the strategies used to handle the scores on the Perception of Barriers to Adopting ICT, the factor means and the total scale mean were used as the dependent variables in examining the group differences by adopter category. And, the scale mean was used as one of the predictor variables in the prediction model.

Table 9

Comparison of Rogers' Attributes and Moore and Benbasat's Constructs

Rogers' Model	Moore and Benbasat's Construct
Relative advantage	Relative advantage Image (In Rogers, image is part of relative advantage)
Compatibility	Compatibility
Complexity	Ease of use
Trialability	Trialability
Observability	Visibility Demonstrability Voluntariness

Note: adapted from Al-Furaih (2002).

Part 5 was designed to collect the demographic and job-related information from the faculty members. The demographic variables collected were gender, age, academic rank, English language proficiency, and ownership of a home computer, of a Laptop computer, and of a mobile phone computer. As previously mentioned, the job-related variables selected for the study were the number of the traditional classes currently teaching, the number of blended classes currently teaching, the total credit hours currently teaching, the total teaching experience in higher education, total years of experience with computers, daily hours spent using computers, number of students currently teaching, and number of graduate students currently supervising (see Appendix A). These variables have been investigated in other studies on ICT adoption for faculty members (e.g., Al Musawi & Abdelraheem, 2004; Cardwell-Hampton, 2009; Lee, 1998; Medlin, 2001; Rousseau & Rogers, 1998). These two blocks of variables were also used as predictors in the regression analysis of ICT adoption.

In summary, the survey used for the present study consisted of five sections. The first section included 18 items related to the perceived level of ICT uses and expertise. The second section had 1 item on self-perception of adopter category. The third section included 44 items on perception of barriers to adopting ICT in teaching tasks. The fourth section included 50 items on perception of ICT attributes from Moore and Benbasat (1991). The last section had 7 items on demographic information and 8 items on job-related information.

Validity, Reliability, and the Pilot Study

Validity has two distinct types of applications. One is test validity in the field of psychometrics. In this context, validity refers to the degree to which a study accurately assesses the concept the researcher attempts to measure. Test validity often involves construct validity, content validity, and criterion validity. Construct validity is usually evidenced in convergent and discriminant validity (Gall, Gall, & Borg, 2007). In the present study, convergent and discriminant validity on the Perception of Barriers to ICT Adoption Scale in Section 3 and on the Perception of ICT Attributes Scale in Section 4 were evaluated through inter-factor correlation. Ideally, the factors on the scales positively correlated to one another at a moderate degree (i.e., between .30 and .50), demonstrating evidence of both convergent and discriminant validity. Content validity typically involves a panel of experts to "examine test items and judge the extent to which these items sample a specified performance domain" (Crocker & Algina, 1986, p. 238). For this study, a panel of eight experts (see Appendix E), four of them familiar with the Omani culture, examined the content of the survey. Their comments on content validity were used to modify the items/contents of the survey instrument. Then the survey was pilot tested on ten faculty members from SQU who were not included in the final sample. Criterion validity involves the correlation between the test and a criterion variable taken as representative of the construct. It is often evidenced with concurrent validity and predictive validity. As this study used only one survey, criterion validity was unable to be assessed.

The second type of application of validity involves research design. Validity in this context refers to the degree to which a study supports the intended conclusion drawn from the results. It can be assessed through internal and external validity (Maxwell & Delany, 2004). Whereas internal validity is more relevant to the experimental studies in the Campbellian tradition, the concept of external validity, which refers to the ability of the results of a study to be generalized to the target population, is pertinent to this corrrelational study. Given that this research used a non-random sample from just one university in Oman, the external validity of this study was assumed to be limited.

Reliability refers to the consistency of the responses provided by the participants. Although there are several types of reliability, the most widely used one is internal consistency reliability, often reported in Cronbach alpha. Thus, the internal consistency reliability coefficients in Cronbach alpha were examined for the Scale of ICT uses and skills in Section 1, the Perception of Barriers to ICT Adoptions Scale in Section 3, and the Perception of ICT Attributes Scale in Section 4. In judging the goodness of an internal consistency reliability coefficient, Nunnally (1978) suggested using .70 as the minimum threshold for acceptable, .80 for satisfactory, and .90 for adequate. DeVellis (1991) further stated that alpha coefficients between .60 and .70 were acceptable although undesirable for exploratory studies. These criteria served as the guidelines in interpreting the internal consistency reliability coefficients in the study. In addition, the alpha coefficient is significantly affected by the number of items. A scale or sub-scale with fewer numbers of items tends to have lower alpha coefficients (Crocker & Algina, 1986). This factor was considered as well in interpreting the findings on alpha coefficients.

Data Collection Procedures

The presidents at SQU were initially contacted for the feasibility of having their faculty members participate in the study. After obtaining the official permission letters from the presidents and the Institutional Review Board's (IRB) approval from the University of North Texas (see Appendix C), the translated questionnaires were pilot-tested with several faculty members at SQU to make sure the instructions and the statements in the survey were clear to them. These people were not included in the study. Before distributing the survey to the faculty members, the president's office sent a short introduction letter to the faculty to encourage their participation. Then, the introduction letter from the investigator, the consent forms, and the survey were distributed to all of the faculty members. The participants were informed of the purpose of the study, the voluntary participation, the free will to discontinue at any time without penalty, and given about one hour to complete the survey.

Data Analysis Strategies

Strategies to Manage Nonnormality and Outliers

Normal distribution of data is often a critical assumption in inferential statistics (Hair et al., 2006). Thus, it is necessary to check the normality of data distribution. The standardized scores of skewness and kurtosis were used to determine the normality of the continuous variables (Hair et al., 2006). If their absolute values are out of the range of 3.29 (i.e., at the .001 level), necessary measures such as data transformation are used to maintain normality.

Outliers of observation often greatly distort the true findings (Hair et al., 2006). Thus, in the present study, both univariate and multivariate outliers were examined, and removed if necessary. Univariate outliers were detected based on the standardized scores. If the absolute value of a standard score was beyond three, the observation was considered as an outlier. In the regression analysis, multivariate outliers were detected based on the approach of Mahalanobis distance.

Design of the Study and Statistical Analysis Strategies

The four major components of statistical analysis in the present study are: (a) examination of the group differences between the early adopters and late adopters on ICT uses and skills, perception of barriers, and perception of attributes of computing technology; (b) exploratory factor analysis on barriers to adopting computing technology (i.e., Part 3 of the survey); (c) confirmatory and possibly exploratory factor analysis on perception of attributes of computing technology (i.e., Part 4 of the survey); and (d) regression analysis to predict ICT uses with skills of computing technology, perception of barriers to adopting computing technology, perception of attributes of computing technology, and the demographic and job-related variables.

For the examination of group differences, ANOVAs and a *t*-test were used. In determining the statistical significance, the conventional 2-tailed .05 level was used throughout this study. In judging the magnitude of a practical significance, the default η^2 from the SPSS software package, which indicates the percentage of variance of the dependent variable accounted for by the grouping variables, was used.

Table 10 lists the global fit indices and the cutoff values used for determining the fit between the specified model and sample data. These indices and criteria were based primarily on the recommendations by Jöreskog and Sörbom (2002), Kline (1998), Hair et al. (2006), and other empirical SEM studies on parenting. For instance, as the χ^2 statistic is often sensitive to the sample size, χ^2 / df is recommended to be used. Kline (1998) suggested that a ratio of less than 1.5 usually is considered adequate, less than 2 as satisfactory, and less than 3 as acceptable. The GFI indicates the proportion of the sample covariances explained by the model-implied covariances, analogous the R^2 in multiple regression. The AGFI is the downward correction of the GFI for model complexity, similar to the adjusted R^2 in multiple regression (Kline, 1998). The NFI indicates the proportion of the improvement of the overall fit of the tested model to a null model (Bentler, 1990). CFI is similar to NFI, but less affected by sample size (Kline, 1998). The SRMR is a standardized summary of the average covariance residuals. The RMSEA is based on the non-centrality parameter with a value of less than .07 considered as satisfactory and as poor if larger than .10, for a sample size larger than 250 (Hair et al, 2006).

Table 10

Model Fit Criteria and the Cutoff Values

Model fit criteria	Cutoff values Acceptable level
Chi-square/degree of freedom	$\chi^2/df < 3$
Goodness-of-fit (GFI)	>.95
Adjusted GFI (AGFI)	>.95
Normed fit index (NFI)	>.95
Comparative fit index (CFI)	>.95
Standardized root mean squared residual (SRMR)	User defined, 0 meaning perfect fit.
Root-mean-square error of approximation (RMSEA)	<.07

In order to proceed with exploratory factor analysis, Hair et al. (2006) recommended that at least two assumptions need to be met: (a) Bartlett's test of sphericity for the correlation matrix of the items must be at least significant at least at the .05 level, and (b) the value of measure of sampling adequacy (MSA) must be greater than .50 for both the overall scale and each individual variable. In assessing factor loading, Hair et al. (2006) stated ±.50 as the minimum criterion for practical significance. These guidelines were followed in the present study. In addition, the corrected item-total correlation is an assessment of convergent construct validity at the item level. Different cutoff points have been used in the literature to retain the items such as .30 (e.g., Noble, Eby, Lockwood, & Allen, 2004), .40 (e.g., Gay, d'Acremont, Schmidt, & Van der Linden, 2008), or .50 (e.g., Robinson, Shaver, & Wrightsman, 1991). For the present study, the cutoff point of .40 was used.

For multiple regression analysis, the dependent variable was the mean score on ICT uses across the 18 items. The predictors were: (a) the mean score of computing technology skills, (b) the scale mean score of perception of barriers to adopting computing technology, (c) the scale mean score of perception of attributes of computing technology, (d) demographic variables including gender, age, academic rank, English proficiency, computers at home, ownership of a laptop, ownership of a mobile phone computer, and (e) job-related variables including traditional classes teaching, blended classes teaching, credit hours teaching, total teaching experience in higher education, total experience with computers, daily hours spent on computers, number of students teaching, and number of graduate students supervising.

For categorical predictors, the technique of criterion coding (Schumacker & James, 1993), that is, the dependent variable mean of each group in the categorical predictor used to replace the original nominal value, was used. This coding technique allows “the use of a single vector to represent all categories of the nominal independent variable (instead of multiple dummy coded variables) and the simultaneous use of such vectors with other criterion coded variables in the same regression analysis” (Henson & Hwang, 2002, p. 717).

There are four major assumptions in multiple regression analysis: (a) linearity of the phenomenon, (b) constant variance of the error terms, (c) independence of error terms, and (d) normality of the error term distribution (Hair et al, 2006). These assumptions were addressed as well. If violations occur, necessary remedy measures are implemented.

CHAPTER IV

RESULTS

Descriptive Statistics

Level of ICT Uses and Skills

Table 11 shows the means and standard deviations of ICT uses and skills in the sample. For the Omani faculty members at SQU, the top three categories of ICT uses were browsing the contents of the worldwide web, using Internet search engines, and word processing. They used these ICT functions more than “often.” The next three highly used areas were presentations, internet communication services (e.g., emails, e-chatting, newsgroup, or listserv), and spreadsheets. They had average rating scores greater than 3.0, implying that the faculty members used them more than “sometimes.” The five least utilized ICT application areas were simulation and games, video/audio conferences, web design software (e.g., FrontPage, Dreamweaver), interactive communication (e.g., Skype or SMS), and Web 2.0 tools (e.g., blogs or wikis). All of them had means less than 2, that is, below the “rarely” used level.

The means of ICT skills in Table 11 revealed a similar pattern as those for ICT uses of these faculty members. The participants rated themselves at the advanced level on the three most used areas: internet search engine, internet content, and word processing. They also perceived their technical competencies on the three categories in the second highly used block (i.e., presentation, internet communication services, and spreadsheet) at above the intermediate level. Perhaps not surprisingly, the five least used areas had lowest scores, below the intermediate level.

The Pearson correlation coefficient between ICT uses and skill was .81 (p<.001). The internal consistency reliability coefficients in Cronbach alpha were .80 for ICT uses and .83 for ICT skills, respectively. Both were satisfactory.

Table 11

*Levels of ICT Uses and Skills (*N *= 300)*

Items	Level of Uses *M*	Level of Uses *SD*	Level of Skills *M*	Level of Skills *SD*
1. Word Processing	4.15[a]	.94	3.99[b]	.91
2. Spreadsheets	3.34	1.16	3.31	1.00
3. Database Management	2.13	1.10	2.53	1.11
4. Graphics	2.53	1.16	2.91	1.09
5. Presentation	3.87	1.04	3.96	.90
6. CD-ROM, DVD, Web-based Interactive Content	2.89	1.20	3.17	1.07
7. Website Design Software	1.77	1.02	2.16	1.13
8. Internet Communication Services	3.82	1.38	3.77	1.10
9. Internet Content	4.30	1.03	4.02	1.04
10. Data Analysis Software	2.44	1.31	2.60	1.22
11. Simulations and Games	1.63	.93	2.01	1.08
12. Video/Audio Conferencing	1.68	1.00	1.93	1.00
13. FTP	2.40	1.26	2.53	1.26
14. Web-based Class Management Tools	2.10	1.28	2.41	1.22
15. Interactive Communication	1.81	1.07	2.21	1.23
16. Web 2.0 Tools	1.90	1.16	2.18	1.27
17. Search Engines	4.23	1.04	4.16	.91
18. Electronic Video	2.85	1.24	3.16	1.22

Note: *a*. 1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *often*, and 5 = *very often*.
b. 1 = *no experience*, 2 = *beginner*, 3 =*intermediate*, 4 =*advanced*, and 5 = *expert*.

Table 12 further lists the descriptive statistics on ICT uses and skills by the selected demographic variables. The means in the table were derived not only for the descriptive purpose and for testing on group differences, but also for criterion coding in the multiple regression analysis.

With respect to gender, both the male and female groups used ICT close to the level of “sometimes” and rated their ICT skills close to the “intermediate” level. Male faculty members seemed to have higher means on ICT uses and skills than their female counterpart. However, the independent sample t-test indicated that there were no differences between the two groups: $t(283) = 1.50$, $p > .05$ for ICT uses, and $t(298) = .37$, $p > .05$ for ICT skills. It should be noted that the degree of freedom was adjusted to 284 for ICT uses due to the violation of assumption of equal variance.

On the age factor, due to the small cohort for the 50−59 years old group, this group was combined with the 40−49 years old group. The recoded three groups had similar means on ICT uses and skills, close to the “sometimes” level on ICT uses and around the “intermediate” level on ICT skills. The 30−39 years old group had the largest means on both ICT uses and skills. However, there were no differences among the three groups on ICT uses and skills: $F(2, 297) = 2.83$, $p > .05$ for ICT uses, and $F(2, 297) = 2.83$, $p > .05$ for ICT skills.

For academic rank, due to the small group size, the professors were combined with the associate professors into a senior faculty member group. The instructor group had means lower than the assistant professor group, which had lower means than the senior faculty member group on both ICT uses and skills. The ANOVA test indicated there was a difference among the three groups only on ICT uses: $F(2, 297) = 3.52$, $p < .05$, but not on ICT skills: $F(2, 297) = 2.71$, $p > .05$. Further examination of the post-hoc test using the Scheffe method on ICT uses found no differences between the pairwise groups. However, the difference between the senior faculty group with the highest mean and the instructor group with the lowest mean was marginally significant at the .05 level.

Regarding English language proficiency, only 6 faculty members reported no knowledge of English at all, and 14 rated themselves as poor. These faculty members were combined with the "average" group. The newly formed group had a cohort of 57, closer the group sizes of 88 and 155 for the "good" and "very good" groups than before the combination. The recoded three groups had similar means: around 2.75 on ICT uses and 2.95 on ICT skills. The ANOVAs also showed no differences among the three groups: $F(2, 297) = .48$, $p > .05$ for ICT uses, and $F(2, 297) = .03$, $p > .05$ for ICT skills. Thus, English language proficiency was not a factor affecting faculty members' ICT uses and skills.

Fourteen faculty members indicated that they did not have a computer at home. This group was not different from that with a computer at home on ICT uses and skills: $t(298) = -1.41$, $p > .05$ for uses, and $t(298) = -.76$, $p > .05$ for skills. Similarly, the independent sample *t*-test showed no differences on ICT uses and skills between faculty owning a laptop and those without a laptop: $t(298) = -.80$, $p > .05$ for ICT uses, and $t(298) = -1.21$, $p > .05$. However, the ownership of a mobile phone computer made a difference on ICT uses and skills: $t(298) = -3.16$, $p < .01$ for ICT uses, and $t(298) = -3.26$, $p < .001$. Faculty members with a mobile phone computer tended to use ICT mores and to have higher ICT skills than those without the device.

Table 12

*Levels of ICT uses and Skills by Demographic Variables (*N *= 300)*

Demographic Variables	Uses		Skills	
	M	*SD*	*M*	*SD*
Gender				
1 = male (*n* = 181)	2.81	.58	2.96	.59
2 = female (*n* =119)	2.71	.48	2.93	.54
Age				
1 = 20−29 year old (*n* = 89)	2.66	.57	2.86	.56
2 = 30−39 year old (*n* = 134)	2.84	.52	3.03	.57
3 = 40−49 year old (*n* = 61)	2.78	.53	2.92	.60
4 = 50−59 year old (*n* = 16)	2.75	.53	2.81	.37
Age (recoded)				
1 = 20−29 year old (*n* = 89)	2.66	.57	2.86	.56
2 = 30−39 year old (*n* = 134)	2.84	.52	3.03	.57
3 = 40−59 year old (*n* = 77)	2.77	.53	2.90	.56
Academic rank				
1 = lecturer/instructor (n = 113)	2.67	.57	2.90	.55
2 = assistant professor (*n* = 149)	2.80	.52	2.93	.58
3 = associate professor (*n* = 29)	2.91	.47	3.17	.53
4 = professor (n = 9)	2.92	.58	3.05	.52
Academic rank (recoded)				
1 = lecturer/teacher (*n* = 113)	2.67	.57	2.90	.55
2 = assistant professor (*n* = 149)	2.80	.52	2.93	.58
3 = associate professor / professor (*n* = 38)	2.92	.49	3.14	.52
English proficiency				
1 = none (*n* = 6)	2.87	.14	3.06	.27
2 = poor (*n* = 14)	2.77	.35	3.12	.49
3 = average (*n* = 37)	2.66	.55	2.84	.54
4 = good (*n* = 88)	2.80	.46	2.95	.48
5 = vary good (*n* = 155)	2.77	.60	2.95	.63

(*table continues*)

Table 12 (*continued*).

Demographic Variables	Uses		Skills	
	M	*SD*	*M*	*SD*
English proficiency (recoded)				
1 = none /poor/average (*n* = 57)	2.71	.48	2.93	.52
2 = good (*n* = 88)	2.80	.46	2.95	.48
3 = fluent (*n* = 155)	2.77	.60	2.95	.63
Computer at home				
0 = no (*n* = 14)	2.57	.35	2.83	.46
1 = yes (*n* = 286)	2.78	.55	2.95	.57
Laptop				
0 = no (*n* = 67)	2.72	.45	2.87	.49
1 = yes (*n* = 233)	2.78	.56	2.99	.58
Mobile phone computer				
0 = no (*n* = 193)	2.70	.52	2.87	.58
1 = yes (*n* = 107)	2.90	.56	3.09	.52

Different Type of Adopters

Table 13 lists the numbers of faculty members in each of the five adopter categories in Rogers's model based on their self evaluation. About one-fifth of the respondents identified themselves as innovators. The early adopters and early majority groups contained about 65% of the participants. The last group had only two members. Thus it was combined with the late majority group for the purpose of group difference analysis. The data distribution of the numbers of participants in each group was approximately close to a normal distribution as claimed by Rogers (2003) (see Appendix E).

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Table 13

*Number of Participants in Different Types of Adopters (*N *= 300)*

Types	Frequency	Percentage
Innovator	55	18.33
Early adopters	106	35.33
Early majority	96	32.00
Late majority	41	13.67
Laggard	2	.66

Perception of Barriers

Exploratory factor analysis was used to extract factors on the 44-item survey on perception of barriers. In the first step, the positively stated items (i.e., Items 5, 6, 7, 8, 9, 14, 15, 18, 19, 20, 22, 23, 24, 28, 29, 30, 31, 33, 34, 35, and 39) were reversely coded. The initial principal component analysis showed the overall KMO Measurement of Sampling of Adequacy (MSA) was .79 and Bartlett's test of sphericity was $\chi^2(903) = 6245.48$, $p < .001$. Both were acceptable. The item-level MSA indicated only item 10 had a value of .46, smaller than the minimum threshold .50. However, many items had corrected item-total correlations far smaller than the cutoff value of .40. Thus, in the second step, the corrected item-total correlation was used as the primary evidence to eliminate the items, one at a time, staring with the one having the lowest correlation. The items deleted during this process were 11, 34, 31, 35, 10, 30, 33, 15, 27, 40, 42, 3, 1, 32, 6, 4, 13, 12, 2, 38, 39, 36, and 25, in sequence. The remaining 21 items all had item-total correlations greater than .40.

In the third step, the 300 observations on the 21 items were submitted to principal component analysis with Promax, an oblique rotation strategy. The purpose of this step was to find the correlations between the factors and to decide whether a high order factor analysis was required. The results showed the correlations among the factors were between .20 and .42, not strong enough for a higher order analysis; thus, an orthogonal rotation was appropriate.

In the fourth step, the 300 observations were submitted to principal component analysis with Varimax, an orthogonal rotation strategy. The K1-method (i.e., eigenvalue greater than 1) suggested a five-factor structure. But Item 21 had weak loadings of less than .50 on all of the factors. It was eliminated and the rest of the items were again submitted to principal component analysis with Varimax. Item 26 had weak loadings. After it was excluded, Item 41 had weak loadings in the next exploratory factor analysis. After Item 41 was eliminated, the EFA with the K-1 method suggested a four-factor structure. Under the four-factor structure, Items 17, 14, 28, and 7 had weak loadings and they were removed from EFA in that sequence. For the remaining 14 items, the K-1 method suggested a three-factor structure. Items 20 and 5 showed weak loadings in the three-factor EFA and were eliminated in order. Then Item 23 showed cross-loading on the three factors. It was excluded as well. The remaining 11 items clearly loaded on three factors, as shown in Table 14. In addition, the overall MSA, Barlett's test of sphericity, and the item-level MSAs were all satisfactory (see Table 14).

These three factors collectively could explain approximately 62% of the variances in the 11 items. Factor 1 had four items. These items were mostly related to the value of ICT in the teaching-learning process. Hence, Factor 1 was named as lack of values. It accounted for 23% of the total variance. Factor 2 contained five items. The contents of the items were on various aspects of support. Thus, this factor was named as lack of support. It alone could explain about

22% of the variance. The last factor contained only 2 items targeting skills and confidence. Hence, it was named as lack of skill and confidence. It accounted for 17% of the total variance.

Table 14

*Factor Pattern for 11 Items on the Perception of Barriers Scale (*N *= 300)*

Items	*MSA*	*M*	*SD*	Factors			
				F1	F2	F3	h^2
18. I evaluate the use of computing technology in relation to students' learning goals.*	.75	2.16	.94	.82	.04	.24	.45
19. I am happy with the fiscal investment into computing technology in my organization.*	.82	1.94	.91	.78	.25	.11	.60
22. I evaluate the use of computing technology in relation to my teaching goals.*	.78	2.30	1.10	.81	.12	.22	.56
43. I am not interest in using computing technology in the teaching and learning processes.	.77	1.98	1.07	.63	.30	-.07	.42
16. I do not see too much advantage of computing technology over the traditional approach in the instructional process.	.78	2.25	1.00	.24	.61	-.13	.47
24. I am happy with the hardware equipments in my organization.*	.83	2.11	1.03	.12	.73	.24	.74
29. Learning to operate computing technology is easy for me.*	.86	2.40	1.12	.15	.73	.10	.69
37. The training on computing technology in my organization just does not fit my style.	.89	2.19	1.02	.19	.59	.19	.71
44. My organization does not care too much on faculty member's utilization of computing technology.	.84	2.20	1.10	.06	.65	.20	.49
8. I have the necessary skills to utilize computing technology.*	.66	2.17	.99	.11	.16	.92	.88
9. I am confident on adopting computing technologies.*	.73	2.11	.98	.25	.23	.82	.79
Trace				2.53	2.46	1.80	
% Variance				23%	22%	16%	
Total % variance: 61.7%							
Mean h^2							62%

Note: a. 5 point Likert scale with 1 = *strongly disagree* and 5 = *strongly agree*.

b. Factor 1 = Lack of values. Factor 2 = Lack of support. Factor 3 = Lack of skills and confidence. Structure coefficients greater than .50 are underlined. Percent variance is post-rotated. As there are 11 items, "% Variance" is trace divided by 11 multiplies 100%

c. Overall MSA: .78; Bartlett's Test of Sphericity: $\chi^2(55) = 1153.19$, $p < .001$.

* indicates the item was reversely coded.

The means on the three subscales and the entire barrier scale all fell below 2.5, as shown in Table 15. These numbers indicated that the faculty members overall tended to disagree on the barriers to adopting ICT in the instructional process. Relatively speaking, lack of support had the highest rating and lack of values had the lowest rating.

The internal consistency reliability measures of Cronbach alpha for the three factors and the entire scale were between .73 and .84. They are deemed either acceptable or satisfactory. The inter-factor correlation coefficients were between .37 and .44, all significant at the .001 level. These significant moderate correlations demonstrated both convergent and discriminate validity of the 11-item scale.

Table 15

Cronbach Alpha and the Inter-factor Correlation Matrix for the Barrier Scale

	M	*SD*	F1	F2	F3
F1 (4 items, α = .80)	2.10	.80	—		
F2 (5 items, α = .73)	2.23	.73	.44*	—	
F3 (2 items, α = .84)	2.14	.91	.37*	.39*	—
Scale (11 items, α = .83)	2.16	.62			

Note: * All coefficients are statistically significant at the .001 level.
F1 = Lack of values.F2 = Lack of support. F3 = Lack of skills and confidence.

Perception of ICT Attributes

To determine if the eight-factor structure from Moore and Benbasat (1991) would be valid in the Omani culture, confirmatory factor analysis was first performed on the 37-item version of the survey, and then on the extended 50-item survey. Unfortunately, in both cases, the solution was found non-admissible after 50 iterations (see Appendix G for the syntax used for CFA and Appendix H for the variance-covariance matrices). Thus, the eight-factor structure was not confirmed in the current sample either for the short 37-item survey or the extended 50-item survey.

The next step was to extract the constructs using the similar procedures of EFA on the barriers scale. The overall KMO MSA initially was .80. Bartlett's test of sphericity was: $\chi^2(1125) = 8728.41$, $p < .001$. Both were in the range of acceptable. The item-level MSA indicated only item 3 had a value of .44, smaller than the cutoff point .50. Nevertheless, many items had much lower corrected item-total correlation coefficients than the cutoff value of .40. Thus, the 50 items were inspected on the corrected item-total correlations with the lowest one excluded first. In this order, Items 2, 3, 4, 21, 47, 34, 20, 22, 39, 49, 23, 46, 48, 33, 37, 40, 41, 50, 44, 38, 42, 36, 19, 27, 24, 25, 26, 8, 43, and 28 had item-total correlations less than .40, and they were excluded one at a time.

The remaining 20 items loaded on five factors with the K1 method. However, the last factor had an eigenvalue of 1.025. As the criterion of igenvalue =1 is generally liberal and unreliable (Thompson, 2004), a parallel analysis was performed 10 times to get a stable average igenvalue for each factor. Then igenvalues between the K1 Varimax method and the parallel analysis method were compared. It turned out that four factors on the K1 Varimax method had larger igenvalues than those from the random parallel analysis. However, Items 45, 7, 18, 32, and 45 had loadings of less than .50 on the four factors. They were excluded in that order. Item 12 had cross loading (i.e., .50, .46, .24, respectively), and then Item 17 had cross loading (i.e., .68, .46, .02, and .23); they were also excluded. However, after these steps, the fourth factor had an eigenvalue of 1.099. The parallel analysis suggested a 3-factor structure. Thus, the 14 items were submitted to principal component analysis with Varimax in three factors. Item 35 appeared to be weakly loaded and it was excluded. In the next run of EFA, Item 1 had weak loadings and it was eliminated. Finally, the remaining 12 items solidly loaded on the three factors, as shown in Table 16. In addition, the overall MSA, Bartlett's test of sphericity, and item-level MSA were all in the range of acceptable as shown in Table 16.

Factor 1 had six items. The contents of these items were either on the ICT's values relating to jobs or on compatibility. Thus, Factor 1 was named as compatibility between ICT and job duties or personal style. The three items in Factor 2 were on ease of use of ICT. The two items in the last factor were about the relative advantages of ICT on job efficiency. Collectively these three factors could explain 68% of the variances in these 12 items. The individual factors could account for 35%, 18%, and 16% of variables on the 12-item scale, respectively.

Table 16

*Factor Pattern for 12 Items on the Perception of ICT Attributes Scale (*N *= 300)*

Items	*MSA*	*M*	*SD*	Factors			
				F1	F2	F3	h^2
9. Using computing technology improves my job performance.	.86	4.16	.79	<u>.81</u>	.09	.19	.71
10. Using computing technology enhances my effectiveness on the job.	.84	4.19	.74	<u>.83</u>	.12	.22	.76
11. Overall, I find using computing technology to be advantageous in my job.	.91	4.28	.78	<u>.85</u>	.23	.06	.78
13. Using computing technology increases my productivity.	.89	4.18	.76	<u>.62</u>	.24	.29	.52
14. Using computing technology is compatible with all aspects of my work.	.86	4.06	.90	<u>.62</u>	.30	.18	.51
15. Using computing technology is completely compatible with my current situation.	.93	4.11	.86	<u>.75</u>	.24	.06	.62
16. I think that using computing technology fits well with the way I like to work.	.89	4.07	.94	<u>.72</u>	.17	.08	.55
29. Learning to operate computing technology is easy for me.	.81	4.11	.78	.16	<u>.83</u>	.03	.71
30. I would have no difficulty telling others about the results of using computing technology.	.87	4.06	.75	.24	<u>.76</u>	.21	.69
31. I believe I could communicate to others the consequences of using computing technology.	.90	3.98	.95	.25	<u>.74</u>	.10	.62
5. Using computing technology enables me to accomplish tasks more quickly.	.74	4.24	.77	.19	.11	<u>.90</u>	.86
6. Using computing technology makes it easier to do my job.	.74	4.27	.78	.20	.15	<u>.90</u>	.87
Trace				4.15	2.16	1.89	
% Variance				35%	18%	16%	
Total % variance: 68.3%							
Mean h^2							68%

Note: a. 5 point Likert scale with 1 = *strongly disagree* and 5 = *strongly agree*.
b. F1 = Compatibility between ICT and job duties or personal style, F2 = Ease of use, F3 = Relative advantage on job efficiency. Structure coefficients greater than .50 are underlined. Percent variance is post-rotated. As there are 12 items, "% Variance" is trace divided by 12 multiplies 100%.
c. The overall KMO MSA was .86. Bartlett's Test of Sphericity: $\chi^2(66) = 1986.44$, $p < .001$.

Table 17 shows that the internal consistency reliability coefficients were .89 for the entire scale and .89, .75 and .86 respectively for the three individual subscales. They were all satisfactory. The inter-factor correlations were significant at the .001 level, and their magnitudes were between .32 and .51. These moderate correlations demonstrated both convergent and discriminant validity of the 12-item scale on perception of ICT attributes. Thus, it can be concluded that the three-factor structures in these 12 items were both reliable and valid in the present sample.

Table 17 also lists the means and standard deviation on the three factors and the entire scale. All of the three factors and the entire scale had mean scores slightly over 4.0. These numbers indicated that the faculty members as a whole agreed the values of ICT in the three domains. Factor 3 on the ICT advantages relatively had higher rating than on the other two factors.

Table 17

Cronbach Alpha and the Inter-factor Correlation Matrix for the ICT Attributes Scale

	M	*SD*	F1	F2	F3
F1 (7 items, α = .89)	4.15	.65	—		
F2 (3items, α = .75)	4.05	.68	.51*	—	
F3 (2 items, α = .86)	4.26	.72	.41*	.33*	—
Scale (12 items, α = .89)	4.14	.55			

Note: All coefficients are statistically significant at the .001 level.
F1 = Compatibility between ICT and job duties and personal style, F2 = Ease of use, F3 = Relative advantage on job efficiency.

Statistical Analysis

Adopter Categories and the Level of ICT Uses and Skills

Table 18 first lists the means and standard deviations on ICT uses and ICT skills for the faculty members by adopter category. The last group was composed of those self-selected as late majority and laggard. As expected, the four groups had means of ICT uses and skills in descending order. The innovator group had the highest means and the last group had the lowest means. Overall, the Omani faculty members used ICT around the level of "sometimes" and perceived their ICT skills around the intermediate level. The innovator groups had means above the "sometimes" level on ICT uses, whereas the other three groups were below the level of "sometimes." On ICT skills, the innovator and early adopter groups rated themselves above the immediate level, while the other two groups perceived themselves below the intermediate level.

Table 18

*Descriptive Statistics of ICT Uses and Skills by Adopter Category (*N = 300*)*

Category	Uses		Skills	
	M	*SD*	*M*	*SD*
Innovator (*n* = 55)	3.04	.58	3.27	.58
Early adopter (*n* = 106)	2.85	.57	3.06	.56
Early majority (*n* = 96)	2.69	.41	2.79	.41
Late majority/laggard (*n* = 43)	2.40	.43	2.59	.60
Total (*N* = 300)	2.77	.54	2.95	.57

Next, the group differences on ICT uses and skills among the four groups were examined in a one-way ANOVA. But it was first necessary to check the three assumptions for an ANOVA: independent and random samples from the defined populations, normal distribution of the dependent variable, and homogeneity of variance (Hinkle, Wiersma, & Jurs, 2003). Although the present study used a convenient sample, the effect of the violation to the first assumption on the Type I error rate is minimal (Glass, Peckham, & Sanders, 1972). For the second assumption, as shown in Table 19, all of the 10 dependent variables except for ICT skills, including the ones on perception of barriers and ICT attributes, were not normally distributed. Nevertheless, ANOVA is generally robust to the violation of this assumption especially with a large sample size (Hinkle, Wiersma, & Jurs, 2003; Maxwell & Delaney, 2004); thus, data transformation was not performed. Furthermore, no outliers were identified.

The test results on the assumption of homogeneity of variance are also shown in Table 19. Five out of 10 ANOVAs did not meet this assumption. Glass, Peckham, & Sanders, (1972) stated there may be a serious possibility of changing the Type I error rate if the equal variance assumption is violated when sample sizes in the cells are unequal. More specifically, they argued that the F test tends to be too conservative when the larger cell sample has the larger variance and tends to be liberal if the larger cell sample has the smaller variance (Glass, Peckham, & Sanders, 1972). Based on these guidelines and the information on standard deviations in the cells in Table 18, for the ANOVAs on ICT uses and skills, the alpha level was kept at the .05 level.

Table 19

*Descriptive Statistics of ICT uses and Skills by Adopter Category (*N *= 300)*

Variables	Skewness	Kurtosis	$Z_{skewness}$	$Z_{kurtosis}$	Levene Statistic	*df1*	*df2*	*p*
Uses	.44	.44	3.14	1.54	4.38	3	296	.005
Skills	.27	.50	1.89	1.76	4.28	3	296	.006
Barriers – Factor 1	1.31	1.80	9.24	6.35	1.42	3	296	.237
Barriers – Factor 2	.77	.75	5.43	2.64	1.83	3	296	.141
Barriers – Factor 3	1.14	1.41	8.09	4.98	5.23	3	296	.002
Barriers – Mean	1.16	2.00	8.18	7.08	4.44	3	296	.005
Attributes – Factor 1	-1.04	1.64	-7.34	5.81	1.47	3	296	.222
Attributes – Factor 2	-.76	1.31	-5.35	4.61	5.06	3	296	.002
Attributes – Factor 3	-1.24	2.37	-8.74	8.38	.41	3	296	.747
Attributes – Factor 3	-1.10	2.64	-7.79	9.34	1.94	3	296	.123

Table 20 shows the results of the ANOVAs on ICT uses and skills. As expected, there were significant differences among the four groups: $F(3, 296) = 14.16$, $p < .001$ for ICT uses, and $F(3, 296) = 17.62$, $p < .001$ for ICT skills. Furthermore, the practical significance, estimated by η^2, was medium in both tests (Cohen, 1988). The group membership by adopter category could account for 13% and 15% of the total variance on ICT uses and skills, respectively.

Table 20

ANOVA Tables for the Group Difference on ICT Uses and Skills

Factors	*SS*	*df*	*MS*	*F*	*p*	η^2
ICT uses						
Between groups	1.95	3.00	3.65	14.16	<.001	.13
Within groups	76.30	296.00	.26			
Total	87.25	299.00				
ICT skills						
Between groups	14.56	3.00	4.85	17.62	<.001	.15
Within groups	81.55	296.00	.28			
Total	96.12	299.00				

The pairwise post-hoc tests on ICT uses, using the most conservative Scheffe method with respect to Type I error (Hair et al, 2006), also found some significant group differences. The innovator group was higher than the last two groups but not different from the early adopter group. The early adopter group and the early majority group were higher than the last group but they were not different from each other. On ICT skills, the innovator and early adopter groups were significantly higher than the other two groups, but there were no differences between the innovator and the early adopter groups or between the early majority and the late majority/laggard groups.

When the innovator and the early adopter groups were collapsed into one group (n = 161), and the others were combined into another group (n = 139), the group differences on ICT uses and skills were also statistically significant at the .001 level: $F(1, 298) = 26.52, p < .001$ for ICT uses, and $F(1, 298) = 41.82, p < .001$ for ICT skills. The effect sizes in η^2 were 8.2% for ICT uses and 12.3% for ICT skills.

Although the four groups were not statistically significant from one another on ICT uses and skills in each pairwise comparison, the above findings generally supported Hypotheses 1 and 2. The early adopters used ICT more than the later adopters, and they had higher ICT skills than the later adopters. In addition, the adopter category accounted for noticeable portions of the total variances on ICT uses and skills.

Adopter Categories and Perceptions of Barriers

The subscale and scale means on the perception of barriers to adopting ICT by the category group are presented in Table 21. Although the means on the three factors and the scale were different in the four groups, they were all around 2.0, in the range of 1.5 and 2.5. Relatively, the innovator group had the lowest scores on the perception of barriers and the early majority group had the highest means. In addition, the early majority and late majority/laggard groups generally had higher levels of perception of barriers than the innovator and early adopter groups except for on Factor 2 - lack of support.

Table 21

Descriptive Statistics on Perception of Barriers by Adopter Category

Category	F1		F2		F3		Scale	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Innovator (*n* = 55)	1.84	.75	2.05	.76	1.85	.77	1.94	.59
Early adopter (*n* = 106)	2.06	.84	2.28	.79	2.13	.90	2.17	.68
Early majority (*n* = 96)	2.29	.82	2.21	.71	2.33	1.08	2.26	.64
Late majority / laggard (*n* = 43)	2.08	.54	2.39	.52	2.09	.61	2.22	.34

Note: F1 = Lack of values, F2 = Lack of support, F3 = Lack of skills and confidence.

The group differences on the perception of barriers by adopter category were examined by one-way ANOVA as well. The results are shown in Table 22. The four groups were different on two factors and the entire scale: $F(3, 296) = 4.03$, $p < .01$ for lack of values, $F(3, 296) = 3.33$, $p < .05$ for lack of skills and confidence, and $F(3, 296) = 3.48$, $p < .01$ for the scale. But the practical significances, estimated by η^2, were all small, with a value of 4%, 3%, and 3%, respectively. The four groups were not different on the perception of lack of support: $F(3, 296) = 2.03$, $p > .05$. The Scheffe post-hoc test only found that the innovator group had significant lower perception of barriers on lack of values, lack of skills and confidence, and on the entire scale than did the early majority group. No other pairwise group differences were found.

Given the fact of that there were no differences between the innovator and the early adopter groups or between the early majority and the late majority/laggard groups, innovators and early adopters were combined into one group and the rest became the second group. The independent sample *t*-test showed similar results to those found in the overall ANOVAs. The first group was significantly lower the second group: $t(298) = -2.64$, $p < .01$ for lack of values; $t(298) = -2.11$, $p < .05$ for lack of skills and confidence, and $t(298) = -2.19$, $p < .05$ for the entire scale. The above findings generally supported Hypothesis 3 with small practical significances: Early adopters perceive significantly lower barriers to adopting ICT than late adopters do.

Table 22

ANOVA Tables for the Group Difference on Perception of Barriers

Factors	*SS*	*df*	*MS*	*F*	*p*	η^2
Factor 1						
Between groups	7.42	3	2.47	4.03	<.01	.04
Within groups	181.76	296	.61			
Total	189.18	299				
Factor 2						
Between groups	3.21	3	1.07	2.03	.11	.02
Within groups	156.08	296	.53			
Total	159.29	299				
Factor 3						
Between groups	8.17	3	2.72	3.33	.02	.03
Within groups	241.95	296	.82			
Total	25.12	299				
Scale						
Between groups	3.92	3	1.31	3.48	.02	.03
Within groups	111.10	296	.38			
Total	115.02	299				

Note: F1 = Lack of values, F2 = Lack of support, F3 = Lack of skills and confidence.

Adopter Categories and Perceptions of Attributes of Computing Technology

The means on the three subscales and the entire scale of perception of ICT attributes by category group are displayed in Table 23. The innovator group had the largest means and the late majority/laggard group had the smallest means. In addition, these means were in descending order for the four groups. Nevertheless, all of the four groups had means around 4.0.

Table 23

Descriptive Statistics on Perception of ICT Attributes by Adopter Category

Category	F1		F2		F3		Scale	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Innovator ($n = 55$)	4.33	.60	4.18	.40	4.53	.59	4.32	.42
Early adopter ($n = 106$)	4.22	.58	4.10	.69	4.26	.80	4.19	.54
Early majority ($n = 96$)	4.17	.62	4.02	.74	4.15	.69	4.13	.53
Late majority/laggard ($n = 43$)	3.73	.75	3.81	.75	4.14	.68	3.82	.62

Note: F1 = Compatibility between ICT and job duties and personal style, F2 = Ease of use, F3 = Relative advantage on job efficiency.

With respect to the group differences, one-way ANOVAs found significant results, as shown in Table 24. The groups were different on all of the three factors and the entire scale: $F(3, 296) = 8.41$, $p < .001$ on compatibility; $F(3, 296) = 2.67$, $p < .05$ on ease of use; $F(3, 296) = 4.74$, $p < .01$ on relative advantage; and $F(3, 296) = 7.82$, $p < .001$ on the scale. However, the practical significances in η^2 were all small with a value of 8%, 3%, 4% and 7%, respectively.

The Scheffe post-hoc test found that: (a) On factor 1 and the entire scale, the first three groups were significantly higher than the late majority/laggard group, but no differences showed among the first three groups; (b) on factor 2 – ease of use, no pairwise group differences emerged; and (c) on factor 3 – relative advantage, the innovator group was significantly higher than the early majority group at the .02 level but only marginally higher than the late majority/laggard group at the .07 level due to the relative large standard error. When the four groups were collapsed into two groups, with innovators and early adopters as the first group, and the rest as the second group, the independent sample *t*-tests showed significant group differences on all of the three factors and the entire scale: $t(298) = 3.04$, $p < .01$ on compatibility, $t(298) = 2.17$, $p < .01$ on ease of use, $t(298) = 2.46$, $p < .01$ on relative advantage, and $t(298) = 3.32$, $p < .001$ on the scale. The above findings indicated that the early adopters perceived ICT attributes higher than the late adopters. Thus, Hypothesis 4 was considered as supported.

Table 24

ANOVA Tables for the Group Difference on Perception of Attributes

Factors	*SS*	*df*	*MS*	*F*	*p*	η^2
F1						
Between groups	9.78	3	3.26	8.41	<.001	.08
Within groups	114.75	296	.39			
Total	124.53	299				
F2						
Between groups	3.62	3	1.21	2.67	<.05	.03
Within groups	133.59	296	.45			
Total	137.20	299				
F3						
Between groups	5.69	3	1.90	3.74	<.01	.04
Within groups	15.05	296	.51			
Total	155.74	299				
Scale						
Between groups	6.58	3	2.19	7.82	<.001	.07
Within groups	83.04	296	.28			
Total	89.62	299				

Note: F1 = Compatibility between ICT and job duties and personal style, F2 = Ease of use, F3 = Relative advantage on job efficiency.

Predictions on Use of Computing Technology

The last research question was to predict Omani faculty members' ICT uses and to determine the salient factors affecting the ICT uses by employing multiple regression analysis. Multiple regression, as a versatile multivariate statistic technique, investigates the relationship between one dependent and multiple independent variables. In the present study, the dependent variable was the level of ICT uses. The predictor variables were in four groups: (a) level of ICT skills, (b) self-rated adopter category, perception of barriers to adopting ICT to the instructional process, and perception of ICT attributes, (c) demographic variables including gender, age, academic rank, English language proficiency, owning a home computer, having a laptop computer, and owning a mobile phone computer, and (d) eight job-related variables including numbers of traditional and blended classes currently teaching, credit hours currently teaching, total teaching experience in higher education, total experience with computers, daily hours spent on computers, number of students currently teaching, and number of graduate students currently supervising. It should be noted for the categorical demographic variables, criterion-coded variables were used. Multiple regression analyses were done in two different ways. First, all of the predictors simultaneously entered the equation. The purpose of such an analysis was to determine whether the selected variables as a whole can predict the level of ICT uses. Then the hierarchical regression strategy with the four blocks of variables was used to find out the relative contribution of the variables in each block.

Hair et al. (2006) stated that there are four primary assumptions for a multiple regression: (a) linearity of relationship between the predictors and the criterion variable, (b) constant variance of the errors (i.e., homoscedasticity), (c) independence of error terms (i.e., each predicted value is independent of other predicted values), and (d) normality of the error terms. They further suggested that the first three assumptions can be examined through the studentized residual diagram, whereas the last one can be detected through the normal probability plot. In addition, Hair et al. (2006) argued that multicollinearity among the independent variables could lead to the suppression effect. Multicollinearity was detected by using the variance inflation factor (VIF), the inverse of the tolerance value, which is the amount of the variability not explained by other independent variables. For the present study, a more restrictive VIF value of 1.96, corresponding to a tolerance of .51 or a multiple correlation coefficient of .70, was used as the threshold.

In reporting the statistics at the model level, in addition to the conventional *F* value and the multiple R^2, the adjusted R^2 was also emphasized as it is more robust due to its adjustment to the model specification, sampling, and random errors. Cohen (1988) provided a rule of thumb on the multiple R^2 to determine the magnitude or effect size in multiple regression for psychological and educational studies: .01 as the minimum threshold for a small effect, .09 for a medium effect, and .25 for a large effect. This guideline was followed in interpreting the results. For the contribution of each individual predictor, the standardized regression coefficient (i.e., β) was used due to its comparability across the predictor variables in different units of measure. In addition, Courville and Thompson (2001) pointed out that predictors in a multiple regression are often correlated to some extent. They further proposed to use both the standardized β weight and the structural coefficient (i.e., the correlation between the predictor and the predicted value of the dependent variable) for judging the relative importance of each predictor variable.

The VIF values for each predictor are shown in Table 25; none of them exceeded 1.96. Thus, no serious multicollinearity among these independent variables was found. Appendix H presented the studentized residual diagram and the normal probability plot. The studentized residual diagram was close to a null plot except for fewer observations in the range beyond ±2 SD. The normal probability plot showed a pattern of nonpeaked univariate distribution. The residual line, closely following the diagonal, seemed to indicate the residuals as close to a normal distribution. This was supported by the histogram of residual (see Appendix H), as well. Consistent patterns of nonlinearity and the dependence of error terms were not found. Thus, the assumptions were considered to be met and remedial actions were not needed. In addition, no multivariate outliers were detected based on the Mahalanobis distance statistics.

In the first simultaneous regression, overall, the nineteen predictors together significantly predicted the ICT uses at the .001 level: $F(19, 280) = 37.14$, $p < .001$. The R^2 and adjusted R^2 were noticeably large with a value of .72 and .70, respectively. The level of ICT skills was the most significant predictor with the largest β and structural coefficient values. Faculty members with higher ICT skills tended to use ICT more in their jobs. With the presence of the other 18 predictors, this variable alone could explain 90.25% of the variance on ICT uses. The other two important predictors were perception of ICT attributes and number of traditional classes currently teaching. They also had significant β weights and meaningful structural coefficient values. With the presence of other predictors, these two variables could account for 20% and 11% of the variances on the predicted variable, respectively. Faculty members perceiving higher values of ICT attributes used ICT at a higher level. The negative β value for the number of traditional classes teaching denoted that faculty members tended to use ICT less when they taught more traditional classes. The other remaining predictors either had an insignificant β value at the .05 level or had a small structural coefficient, less than the minimum threshold .30 for a moderate correlation. Thus, they were not considered as salient predictors. It should be noted that adopter category was only statistically significant at the marginal .06 level with the presence of the other 18 predictor variables, although it was a significant group variable in the ANOVA of ICT uses.

Table 25

Results of the Simultaneous Regression on ICT Uses

Predictors	*VIF*	ICT uses			
		β	*t*	*p*	r
Skills	1.55	.72	18.23	.00	.95
Perception of barriers	1.43	.07	1.84	.07	-.21
Perception of attributes	1.55	.11	2.83	.01	.45
Adopter category	1.45	.07	1.91	.06	.42
Gender	1.20	.03	.89	.37	.10
Age	1.41	-.08	-2.17	.03	.16
Academic rank	1.41	.02	.41	.68	.18
English proficiency	1.30	-.02	-.42	.67	.07
PC at home	1.17	.01	.23	.82	.10
Laptop	1.14	-.03	-.81	.42	.05
Mobile phone PC	1.17	.04	1.17	.24	.21
Traditional classes teaching	1.76	-.15	-3.62	.00	-.33
Blended classes teaching	1.17	.07	2.05	.04	.29
Credit hours teaching	1.58	-.06	-1.52	.13	-.13
Teaching experiences	1.72	.03	.71	.48	.14
Experiences of years with PC	1.93	.11	2.43	.02	.22
Daily hours with computers	1.22	-.05	-1.38	.17	.18
Number of students teaching	1.55	.04	1.08	.28	-.12
Number of graduate students supervising	1.33	.00	.09	.93	-.03
Model Summary		$F(19, 280) = 37.14, p < .001, R^2 = .72, R^2_{adj} = .70$			

Table 26 shows the results of the hierarchical regression for the four blocks of variables. The first model, with the sole predictor of ICT skills, was remarkably significant: $F(1, 298) = 547.19, p < .001$. This predictor alone could predict 65% of the variances on ICT uses.

In the second model with three self-rated variables added, the regression was also significant at the .001 level: $F(4, 295) = 142.85, p < .001$. The whole model could account for 66% of the variance of the level of ICT uses. Nevertheless, much of the prediction was from the variable of ICT skills in the first model. The three variables in the second block together only contributed an additional 1% to the prediction. The four-predictor model indicated that among the three variables in the second block, perception of the ICT attributes was an important predictor.

The third model, with seven demographic variables included, was significant at the .001 level as well: $F(11, 288) = 53.26$, $p < .001$.But the seven demographic variables together contributed only an additional 1% to the prediction on the level of ICT uses. None of the seven demographic variables were important in this 11-predictor regression model. The two salient factors in this model with 11 predictors were still the level of ICT skills and perception of ICT attributes, as in the previous model.

The final model, with the eight job-related variables added to the earlier model, was also significant at the .001 level: $F(19, 280) = 34.17$, $p < .001$. The newly included eight variables contributed an additional 5% to the prediction of ICT uses. Of them, number of traditional classes teaching, experiences of computers, and number of blended classes teaching had β values significant at the .05 level. Faculty members teaching fewer traditional classes, teaching more blended classes, and having more experiences with computers were likely to use ICT more in their teaching practices.

The findings from the hierarchical regression models clearly demonstrated that: (a) the level of ICT skills was the most salient predictor, (b) among the other three blocks of variables, the job-related one contributed relatively more to the prediction than the other two blocks of variables, and (c) demographic variables seemed to be least important in predicting the level of ICT uses. Nevertheless, in all of the four regression models, the level of ICT levels was predicted to a large magnitude. Thus, Hypothesis 5 was supported.

Table 26

Results of the Hierarchical Regression with Four Blocks of Variables on ICT Uses

Predictors	ICT uses				
	β	t	p	Model statistics	ΔR^2
Block 1 – Skills				$F(1, 298) = 547.19, p < .001, R^2 = .65, R^2_{adj} = .65$	
Skills	.80	23.39	.00		
Block 2 - Perceptions				$F(4, 295) = 142.85, p < .001, R^2 = .66, R^2_{adj} = .66$	.01
Skills	.76	19.69	.00		
Adopter category	.04	1.19	.24		
Barriers	.07	1.84	.07		
Attributes	.11	2.74	.01		
Block 3 –Demographic variables				$F(11, 288) = 53.26, p < .001, R^2 = .67, R^2_{adj} = .66$	.01
Skills	.76	19.44	.00		
Category	.03	.67	.50		
Barriers	.08	1.98	.05		
Attributes	.11	2.61	.01		
Gender	.05	1.41	.16		
Age	-.01	-.36	.72		
Rank	.06	1.50	.14		
English proficiency	.05	1.30	.20		
PC at Home	.04	1.17	.24		
Owning a Laptop	-.03	-.75	.46		
Owning mobile phone PC	.04	1.07	.29		

(*table continues*)

Table 26 (*continued*).

Predictors	ICT uses				
	β	t	p	Model statistics	ΔR^2
Block 4 – Job-related variables				F(19, 280) = 37.14, p < .001, R^2 = .72, R^2_{adj} = .70	.05
Skills	.72	18.23	.00		
Category	.07	1.91	.06		
Barriers	.07	1.84	.07		
Attributes	.11	2.83	.01		
Gender	.03	.89	.37		
Age	-.08	-2.17	.03		
Rank	.02	.41	.68		
English proficiency	-.02	-.42	.67		
PC at Home	.01	.23	.82		
Owning a Laptop	-.03	-.81	.42		
Owning mobile phone PC	.04	1.17	.24		
Traditional classes teaching	-.15	-3.62	.00		
Blended classes teaching	.07	2.05	.04		
Credit hours teaching	-.06	-1.52	.13		
Teaching experiences	.03	.71	.48		
Experiences of years with PC	.11	2.43	.02		
Daily hours with computers	-.05	-1.38	.17		
Number of students teaching	.04	1.08	.28		
No. of graduates supervising	.00	.09	.93		

CHAPTER V

DISCUSSION

Summary and Discussion

With the widespread use of computing technology in Oman in the past decade, informational and computing technology (ICT) has become an integrated component for Omani faculty members in their teaching practices (Al-Musawi, 2007). However, empirical data on the level of ICT uses and skills and the factors influencing the ICT uses for Omani professors are still limited. The primary purposes of the present study were to describe the current levels of ICT uses and skills and to explore the salient factors affecting the ICT uses for Omani faculty members. In formulating the study, Rogers' (2003) model of DoI served as the theoretical foundation. Rogers stated that members of a given population vary greatly in their willingness to adopt a particular innovation and that they can be divided into five categories: innovators, early adopters, early majority, late majority, and laggards. Furthermore, the numbers of these five types of adopters closely form a normal distribution on the basis of the relative time taken to adopt the innovation. Many personal, social, and technological characteristics affect the adoption rate. This study only focused on some of the individual variables, perceived attributes of technology, and perceived barriers to adopting ICT. The five hypotheses guided the present study were: (a) earlier adopters use ICT more than the later adopters; (b) earlier adopters are more technically skillful than the later adopters; (c) earlier adopters perceive fewer barriers than the later adopters; (d) earlier adopters are more positive towards to the ICT attributes than the later adopters; and (e) the level of ICT uses can be significantly predicted by the users' ICT skills, perception of barriers to ICT adoption, perception of ICT attributes, and some demographic and job-related variables. Three hundred Omani faculty members from SQU participated in the study.

Findings from this study first indicated that the Omani faculty members at SQU as a whole used ICT at the level of slightly more than "sometimes" but less than "often". The top three areas of ICT uses were browsing the contents of websites, using Internet search engines, and word processing. On the other hand, the faculty members rarely used simulation and games, video/audio conferences, web design software, interactive communication, or Web 2.0 tools. These findings were consistent with previous research that reported word processing, emails, and web content browsing as the most popular uses and multimedia and communication tools as the least frequent ICT uses in faculty members in other countries (see for example, Jacobsen, 1998; Lamboy & Bucker, 2003; Lee, 1998; Odabasi, 2000).

Contradictory to some studies that reported faculty members in the developing countries lack many technological competencies (Alghazo, 2006; Sahin & Thompson, 2006), this study found that the overall level of ICT skills for SQU faculty members was close to the "intermediate". Not surprisingly, the ICT skills repertoire for the SQU faculty members followed a similar pattern to their ICT uses. The participants also had the most advanced skills on the three most often used ICT application areas and had the least skills for the five least often used technological functions. Isleem (2003) identified the same pattern in his sample of 1,170 technology education teachers in Ohio public schools in the United States. In addition, the correlation between the levels of ICT uses and ICT skills in this study was .81, similar to the canonical correlation coefficient .84 between the level of computer use and expertise found in Isleem's research.

The adopter category, a statistical criterion for placing people into time-referenced categories based on how quickly they adopt change, has long been recognized in exploring faculty members' ICT adoption (Porter, 2005; Rogers, 2003). In line with Rogers' model, this study found the numbers of the faculty members in the five adopter categories were close to a normal distribution. Approximately 86% of the faculty members classified themselves in the innovator, early adopter, and early majority categories. Investigating faculty members' adoption of Web-enhanced instructional technology (WEIT) in 11 Institutes of Technology in the central region of Taiwan, Lee (2002) also reported most faculty members self-identified in the upper three categories (Innovator, Early Adopter, and Early Majority). However, in the present study, due to the relatively small overall sample size, the laggard group was too small to be an independent group for the purpose of examination on group differences. Thus, it was combined with the late majority group.

The group differences on ICT uses and skills in one-way ANOVAs showed significant differences among the four groups at the .001 level. In addition, the practical significances were medium. Adopter category could account for 13% and 12% of the variances on ICT uses and skills, respectively. Although the post-hoc tests did not necessarily reveal significant differences in all of the pairwise groups, the early adopter groups always had significantly higher ICT uses and skills than the late adopter groups. Hypotheses 1 and 2 were considered to be supported. Thus, the self-reported adopter category seemed to be a valuable variable in differentiating Omani faculty members on their ICT uses and skills.

These findings were consistent with many other studies. For example, Lu (2006), using a qualitative approach, investigated the factors influencing the diffusion of wireless Internet technology among faculty members at a large American Midwestern state university, and reported early adopters and non-adopters (the mainstream) were different in knowledge of and skill with technology, teaching practices, teaching philosophy, technology needs, communication channels, and characteristics. Jacobsen (1998), using a mixed-method approach, found some differences between early adopters and mainstream faculty for self-rated computer expertise and total adoption of technology for teaching and learning in 76 faculty members from across the disciplines at two large North American universities.

Research question 3 was to examine the group differences between early and late adopters on perception of barriers to adopting ICT for instructional processes. For this purpose, a self-constructed 44-item survey based on relevant theories and empirical findings was developed. Exploratory factor analysis reduced it to an 11-item survey in three factors: lack of values, lack of support, and lack of skills and confidence. These three factors could explain up to 62% of the variances on the scale. Overall, Omani faculty members did not perceive much of a barrier to adopting ICT in their teaching practices. The findings from the exploratory factor analysis in this study were different from many other studies in terms of the number of barriers and the particular significant barriers. For instance, Haber and Mills (2008) reported time and compensation were the greatest barriers in Florida's full-time community college faculty members. Odabasi (2000) stated the most important barrier to be the lack of easily accessible resources for Turkish faculty members. Gardner (2008) identified the greatest barriers to computer-based technology integration as the financial costs associated with computer hardware and software and the availability of computers for use for Oregon secondary agricultural education teachers.

Nevertheless, in the present study, the four groups were statistically different on lack of values, lack of confidence and skills, and the entire scale. The post-hoc test found early adopters perceived significantly lower barriers of ICT than the late adopters. Hypothesis 3 was supported.

Rogers (2003) stated that five perceived attributes of an innovation have strong influences on the adopting process: trialability, observability, relative advantage, complexity, and compatibility. Moore and Benbasat (1991) reported that Rogers' attributes can be further expanded. Image was found as an independent attribute apart from Rogers' relative advantage. Observability was further broken into three separate attributes: voluntariness, demonstrability, and visibility. However, confirmatory factor analysis (CFA) did not support Moore and Benbasat's eight-factor structure of ICT attributes. The CFAs, using either the 38-item short form or the 50-item long form in Moore and Benbasat (1991), yielded the convergent and admissible solutions problem (i.e. Heywood case). Thus, exploratory factor analysis (EFA) on the 50-item long form was performed to find the new structure of the 50-item scale in the Omani culture. Remarkably, the EFA reduced the original survey from 50 items to 12 items. Results of the EFA indicated three factors on the 12-item survey: compatibility between ICT and job duties or personal style, ease of use, and relative advantage on job efficiency. Theses three factors collectively could account for 68% of the variance of the perception scale. Furthermore, the three-factor structure survey demonstrated both reliability and construct validity.

Examination of the three factors seemed to indicate that Omani faculty members only concentrate on these ICT attributes related to their jobs, their personal ability, and their style. Other constructs such as trialability, image, voluntariness, demonstrability, and visibility, valid in the Western culture, did not hold in the Omani culture. However, the finding was consistent with Tornatzky and Klein's (1982) and Surry and Gustafson's (1994) conclusions that compatibility, relative advantage, and complexity are the most important innovation attributes related to innovation adoption. Kumar and Rose (2008) also reported that perceived usefulness, perceived ease of use, job relevance, and computer compatibility showed significant positive relationship with actual computer use for secondary school Mathematics, Science and English language teachers in Malaysia.

The descriptive means on the three factors and the scale were in descending order from the innovator group to the least innovative late majority/laggard group. However, the four group means on the three factors and on the entire scale were all close to 4.0 or above 4.0. This finding indicated that Omani faculty members in all of the four groups agreed on the ICT values. Further examination by one-way ANOVAs showed significant group differences on all of the three factors and the entire scale, with small practical significances. The subsequent post-hoc tests and the independent sample *t*-test found that the innovator and early adopter groups had generally higher means on the perceived ICT attributes than the early majority and late majority/laggard groups. Hence, Hypothesis 4 was supported as well.

The last research question was to predict, using a variety of selected variables, the Omani faculty members' ICT uses. These variables were in four blocks: (a) ICT skills; (b) self-rated adopter type, perception of barriers, and perception of ICT attributes; (c) demographic variables including gender, age, academic rank, English language proficiency, computers at home, owning a laptop, and owning a mobile phone computer; and (d) selected job-related variables including number of traditional classes currently taught, number of blended classes currently taught, credit hours teaching, total teaching experience in higher education in years, total years with computers, daily hours spent on a computer, number of students teaching, and number of graduate students supervising. The regression analysis was performed in two ways. The first approach included all of the 19 predictors simultaneously into the prediction model to reveal the overall prediction effect and to find out the relative importance of the competing predictors. The second method used the hierarchical regression model to explore the relative contribution for each of the four block variables.

The results from the simultaneous regression showed that the 19 predictors together significantly predicted ICT uses at the .001 level with a large predictive power. The predictors collectively could account for 72% of the variance on ICT uses. In addition, the minor difference between the adjusted R^2 and the multiple R^2 (i.e., .70 and .72) indicated a lack of overfitting of the model statistics. Among the 19 predictors, the most important one was the level of ICT skills. It could explain over 90% of the variance on ICT uses in the presence of the other 18 predictors. The other two salient predictors were perception of ICT attributes and number of traditional classes being taught. Faculty members with higher ICT skills, perceiving higher values of ICT attributes, or teaching fewer traditional classes tended to use ICT more in their instructional processes. The other predictors were either with insignificant regression coefficients or small structural coefficients or both. Thus, they were deemed as unimportant predictors.

The hierarchical regression started with the level of ICT skills. This single variable could explain 65% of the variance on ICT uses, indicating this single predictor model had a remarkable prediction power. With the variables of adopter category, perception of barriers, and perception of ICT attributes in the second block added, the prediction model with the four variables was still significant. But the second block variables contributed only an additional 1% to the prediction. Perception of ICT attributes appeared to be the next salient predictor after the level of ICT skills. The seven demographic variables in the third block collectively only contributed another 1% to the overall prediction. In addition, none of the demographic variables appeared to be important predictors. Finally, the eight job-related background variables in Block 4 contributed another 5% to the prediction, bringing the prediction power to .72, the same as in the simultaneous regression model in the first approach. Number of traditional classes taught and total years of experience with computer use appeared to be important predictors in this block. Faculty members teaching fewer traditional classes or having more experience with computers tended to use ICT more. In short, these findings indicated that the level of ICT uses for Omani faculty members could be significantly predicted by the level of ICT skills, adopter category, perceptions of barriers and ICT attributes, and the selected demographic and job-related variables. Among the 19 predictors, three were found to be salient. The most critical one was the level of ICT skills. The other two important predictors were perception of ICT attributes and number of traditional classes teaching. Experience with computer in years was also statistically significant. But the small structural coefficient was small. This variable could only account for 4.8% of the total variances on the level of ICT uses, much less than those for the other three salient predictors. This variable could be considered as marginally significant. Overall, results from the multiple regression analysis supported Hypothesis 5.

The finding of ICT skills as the most significant predictor was consistent with many other studies (Almusalam, 2001; Blankenship, 1998; Isleem, 2003; Jacobsen, 1998; Lee, 2002; Park, 2005; Sahin & Thompson, 2006). The finding of perception of ICT attributes as the second best predictor of ICT uses was also consistent with those in Almusalam (2001), Albejadi (2000), Blankenship (1998), Isleem (2003), Jacobsen (1998), and Park (2005). The insignificant impact of demographic variables on ICT uses has also been reported in Dusick and Yildirim (2000) and Isleem (2003). It should be noted that perception of barriers and adopter category were significantly related to ICT uses when they were considered individually. However, their significance disappeared when they were examined jointly with other predictor variables. This finding was congruent with Cardwell-Hampton (2009) but different from those reported some demographic variables as significant predictors (e.g., Yidana, 2008; Sahin & Thompson, 2006).

In summary, all of the five hypotheses in the present study were supported. The Omani faculty members at SQU varied on their levels of ICT uses and skills, their perception of barriers to adopting ICT in the instructional processes, and their perception of ICT attributes. The self-rated adopter category could statistically explain these differences with small or medium practical significance. The prediction models on ICT uses had remarkable predictive powers. More specifically, the major findings of this study were: (a) the Omani faculty members at SQU overall used ICT at the “sometimes” level and had ICT skills at the “intermediate” level; (b) the most frequently used and skillful ICT functional features were website browsing, Internet search engine use, and word processing, whereas the least utilized and skillful ICT areas were simulation and games, video/audio conferences, and web design software; (c) the numbers of faculty members in the five adopter categories were close to a normal distribution; (d) significant group differences of ICT uses and skills, perception of barriers, and perception of ICT attributes on the adopter category--the Early adopters used ICT more, had a higher level of ICT skills, perceived fewer barriers in the adopting process, and recognized higher values of ICT attributes than the later adopters; and (e) the ICT uses could be significantly predicted by the selected 19 predictor variables, to a large magnitude. The level of ICT skills was the most salient predictor. Perception of ICT attributes and number of traditional classes teaching also appeared to be important. The other variables demonstrated weak relationships with ICT uses.

Contributions and Limitations

The present study can be seen to contribute to the existing body of knowledge in several ways. Firstly, it described the current status of ICT uses and skills for Omani faculty members at SQU. Secondly, it examined the distribution pattern of the five adopter categories; the finding supported Rogers’ categorization (2003). Thirdly, it explored the group differences of ICT uses and skills, perception of barriers, and perception of ICT attributes for these faculty members on adopter category. The results confirmed Rogers'(2003) claim of adopter category as an important factor for differentiating people in adapting to innovation. Fourthly, this study found that ICT uses for Omani faculty members can be predicted with a large prediction power, and that the level of ICT skills was the most critical factor affecting these faculty members' ICT adoption. Fifthly, it developed the Perception of Barriers to Adopting to Information and Computing Technology Scale, based on the Western literature. The exploratory factor analysis remarkably reduced the survey items from 44 to 11; the remaining 11items solidly loaded on three factors with acceptable reliability and construct validity. Lastly, this study validated the psychometric properties of the Perception of Adopting an Information Technology Innovation Scale by Moore and Benbasat (1991). Confirmatory factor analysis did not support the validity of this American culture-laden measurement instrument in the Omani culture. The subsequent exploratory factor analysis eliminated 38 out of the total 50 items. The remaining 12 items soundly loaded on three factors with satisfactory reliability and validity. The Omani faculty members appeared to focus on the ICT attributes related to their personal ability and styles, and their job duties. These findings from the confirmatory and exploratory factor analysis not only provided empirical evidences on the cross-cultural validity of the two instruments but also offered some foundation for future development of indigenous measurement instruments on these variables applicable to the Omani culture.

Despite both theoretical and practical contributions made by this research, the findings of this study, nevertheless, should be considered in light of the following study limitations. First, as this study used a convenience sample, the generalizability of this study was limited and the findings should thus be interpreted with caution. Second, as there were no ethnographically valid surveys for the Omani or Arabic cultural context suitable for the purpose of the present study, the survey used in the present study mainly originated from constructs identified in the Western culture. They have not been validated in the Omani culture before. Thus, the cultural validity of these surveys remains an issue although its content validity has been confirmed by a panel of experts. Third, this study was driven by Rogers' theory on DoI (2003). Explanations of the findings under other theoretical models may still be possible. Fourth, as a faculty member's ICT adoption may be affected by a variety of personal, institutional, technological, or cultural factors in reality, the present study focused only on a few selected factors related to Rogers' theory and some demographic and job-related variables. Other important factors influencing faculty members' ICT adoption may still exist and have not been investigated by this study. Fifth, although Rogers' theory served as the theoretical foundation in this study, Rogers' model was not a prediction model. Thus, the present study was exploratory in nature. Sixth, this study was a correlational investigation, rather than a well-controlled experimental study. Hence, causal conclusions about ICT uses and influencing factors cannot be made from the results of this study. Last but not the least, this quantitative study suffers from all of the weaknesses of a quantitative inquiry. Qualitative or mixed method approaches may reveal more detailed and dynamic views of ICT adoption and the associated influencing factors for Omani faculty members.

Implications and Recommendations

Theoretical Implications

The findings from the present study had several theoretical implications. First, this study was mainly designed based on Rogers' DoI theory (2003). Particularly, it focused on the parts of adopter categories, perceived attributes of the innovation, and factors influencing the adoption process and rate. In many aspects, the findings from the study generally supported Rogers' theory. For instance, faculty members in different adopter categories approximated to a normal distribution. Early adopters (i.e., innovators and early adopters) were superior to the late adopters (i.e., early majority, later majority, and laggards) in their ICT uses and skills, and in their perception of barriers to ICT adoption and perception of ICT attributes. And the factor of perceived attributes of ICT was significant in affecting ICT uses.

Although Roger's theory was supported at the macro level in the present study, the findings did not exactly confirm Rogers' theory at the micro level. For example, the group differences of ICT uses on the adopter category did not always show significant pairwise results in the post-hoc test. This finding may suggest that Rogers' categorization on the five types of adopters is too detailed for the context of the Omani faculty members. A category of two or three types may be more appropriate for the reality. Perception of ICT attributes was found to be a significant predictor as claimed by Rogers (2003). Nevertheless, in this study, it was much less important than the level of ICT skills. However, the latter predictor was not stressed in Rogers' theory. Indeed, it seems that the only artifact in Rogers' theory possibly relating to the level of ICT skills is that of 'previous practices' as one of the prior conditions in the five-step adoption-decision process. Rogers stated that the knowledge stage of the innovation-decision process occurs when the potential adopter not only first learns of the innovation's existence, but also understands how it functions (2003). The ICT competency may need to be further emphasized in the adoption process. In addition, this study found the demographic variables were less important than the job-related variables in predicting ICT uses. While Rogers repeatedly emphasized the role of the demographic variables in his model, he rarely discussed the importance of the job-related variables (2003). The latter may need to be stressed based on the findings from the study.

Second, although perception of ICT attributes was found as a significant factor affecting the faculty members' ICT adoption, neither Moore and Benbasat's (1991) eight-factor structure nor Rogers' (2003) five-factor structure showed validity in the Omani culture. Results of the exploratory factor analysis seemed to suggest that the Omani faculty members only focused on the ICT attributes related to their technical skills, personal styles, and job responsibilities, which included relative advantage, compatibility, and complexity. The other ICT attributes such as image, trialability, and observability were not found to be valid constructs.

A rich body of the Western literature has shown that the perception of barriers is another important factor influencing university faculty members' ICT adoption, which was not addressed by Rogers (2003). Unfortunately, however, a satisfactory questionnaire on measuring faculty members' perception of barriers to adopting ICT was not found. Many existing questionnaires on the perception of barriers appeared to be simple in scope and lacking theoretical foundations. Thus, drawn from various theoretical and empirical sources, this study attempted to develop a comprehensive 44-item questionnaire for measuring the perception of barriers to adopting ICT. Similar to the findings on perception of ICT attributes, the exploratory factor analysis showed that many factors valuable in the Western culture were not applicable to the Omani culture. The Omani faculty members seemed to feel barriers only as a lack of values, a lack of support, and a lack of confidence and skills. Furthermore, a higher order structure on the perception of barriers was not supported in the study. These findings from the exploratory factor analysis on perception of ICT attributes and perception of barriers indicated that the Western constructs do not have adequate cross-cultural validity in Oman. The Omani faculty members may not perceive that the barriers to adopting ICT and ICT attributes are as complicated as their Western counterparts do. It is also possible that they care about other constructs which have not been explored in the study.

Hence, it is highly recommended to further explore the indigenous constructs and develop culturally reflective surveys in the future.

Recommendations for the SQU

The findings from the study also had several implications for practices. First, the overall level of ICT uses was slightly above "sometimes" but much below "often" .This finding indicated the Omani faculty members do not routinely use ICT in their instructional processes at SQU. Thus, there is much room to promote ICT uses at the university.

Second, the study found that the top five most frequently used and skilled application areas of ICT for Omani faculty members were those of website browsing, Internet search engine use, word processing, presentations in PowerPoint, and email communications in the instructional processes. Whereas these ICT features are valuable and necessary, the SQU administrators and the Center for Educational Technology may need to help the faculty members to utilize other ICT functions as well.

One of the most important findings of the present study was the salient factors influencing ICT uses for Omani faculty members. Among the 19 variables investigated, only a few significantly impacted ICT uses. The level of ICT skills was the most influential. Hence, the university needs to help its faculty members improve ICT skills. The number of traditional classes currently being taught by the faculty member was found to have a negative impact on ICT uses; which has several implications. SQU first needs to continue to increase the number of blended classes being offered. Then, the academic planning committee or the program advisor in each department needs to balance the number of traditional and blended classes for each faculty member.

Findings from this study indicated that the early adopters are different from the later adopters, as reported in other studies (Jaconsen, 1998). Thus, campus-wide integration plans cannot be developed on the assumption that mainstream faculty will naturally use computers as readily and easily as the early adopters. Thus, SQU needs to develop different effective strategies to enhance its faculty members' ICT uses for different types of adopters.

Implications for Future Research

This study was designed to explore the factors influencing ICT uses by Omani faculty members based on Rogers' theory of DoI (2003). However, many parts of Rogers' theory were not included in the investigation due to the limited resources and the time constraints for faculty members completing the survey. Future studies with sufficient funding, time, and human resources should examine Rogers' theory thoroughly, on a large scale, by including the personal, institutional, and societal variables omitted in the present study.

This study used one-item questionnaire for classification of adopter category. This study limitation needs to be improved in future research when a reliable and valid multiple-item questionnaire is available. The information of adopter category for each faculty member may also be obtained through other qualitative means such as interview or life history of ICT adoption.

Both the self-constructed questionnaire on perception of barriers to adopting ICT and the survey on perception of ICT attributes by Moore and Benbasat (1991) from the Western literature showed cross-cultural validity challenges. Future studies need to explore the indigenously meaningful constructs on these issues.

The sample in the study was not random and the participants were Omani only. Future research should select a representative sample from the SQU faculty pool, use the entire faculty population, and extend to other universities and colleges in Oman to verify the findings. In addition, this exploratory study used as many as 19 predictor variables, which makes the ratio of observation to variables just marginally acceptable as recommended for a multiple regression analysis (Hair et al., 2006). Future research is recommended to either use a larger sample size or exclude the unimportant variables found in the present study for further investigation. Finally, this study was a survey-based quantitative investigation. Future research needs to use a qualitative approach or a mixed method to validate and extend the results found in this study.

Finally, this study is a corrrelational investigation. Any causal conclusions from the findings cannot be made on the relationships between the level of ICT uses and the selected independent variables. It is highly recommended to conduct additional controlled experimental studies in the future to find the causal relationships and to explore the intervention program effects on promoting faculty members' ICT adoptions for Omani faculty members.

Conclusions

Informational and computing technology in Omani higher education institutions has grown rapidly in the past decade, but is still in its childhood. It will continue to grow to its adolescence and to shape the way faculty members work and deliver teaching to students. Although today's faculty members are much more ICT proficient than those in the past due to the permeation of ICT into the society and the university, their ICT skills have primarily grown from the personal interests. However, the ICT skills are not being automatically transformed into the instructional processes. Furthermore, individual differences on ICT uses and skills for the university faculty members were identified in the study. Hence, it is important to investigate the critical factors affecting the faculty member's ICT uses. Through the findings, research-based suggestions can be provided to the university administrators, the ICT support department, and the faculty themselves on how to deliberately increase effective ICT uses in the Omani higher education system.

APPENDIX A

STUDY INSTRUMENT IN ENGLISH

STUDY INSTRUMENT in English

Survey of Computing Technology Use for Instructional Purposes

Section 1: For each of the categories below, please use the columns on the left to indicate your current level of use for instructional purposes (lesson preparation, lesson delivery, evaluation, communication, and administrative record keeping), and the columns on the right to rate your level expertise. Please consider the following explanations when rating your current level of computer use and your level of expertise:

Level of Use:

Rarely = Roughly once a semester. ***Sometimes*** = About once a month.
Often = About once a week. ***Very Often*** = Several times per week

Level of Expertise:

Beginner = Knowing basic functions. ***Intermediate*** = Confident with basic functions.
Advanced = Knowing most of the functions. ***Expert*** = Being about to teach the topic

	Level of Current Use					Level of Expertise				
	Very Often	Often	Sometimes	Rarely	Never	Expert	Advanced	Intermediate	Beginner	No Experience
1. Word Processing (i.e. creating, storing, retrieving, and printing electronic text)										
2. Spreadsheets (i.e., manipulating/ organizing numbers)										
3. Database Management (i.e., creating, designing, updating, and querying data)										
4. Graphics (i.e., storing / manipulating pictures, diagrams, graphs, or symbols)										
5. Presentation (e.g., PowerPoint)										
6. CD-ROM, DVD, and/or Web-based Interactive content (e.g., maps, dictionaries)										
7. Website Design Software (e.g., FrontPage, Dreamweaver)										
8. Internet communication services (e.g., Newsgroups, listserv, e-chat, E-mail)										

	Level of Current Use					Level of Expertise				
	Very Often	Often	Sometimes	Rarely	Never	Expert	Advanced	Intermediate	Beginner	No Experience
9. Internet Content (e.g., browsing/ searching the World Wide Web)										
10. Data Analysis Software (e.g., SPSS)										
11. Simulations and Games (i.e., reproducing the characteristics of a system or process)										
12. Video/Audio Conferencing										
13. FTP (File Transfer Protocol).										
14. Web-based class management tools (e.g., Blackboard or Moodle)										
15. Interactive communication (e.g. Skype, SMS)										
16. Web 2.0 tools (e.g., blogs, wikis)										
17.Search engine (e.g. Google, Yahoo)										
18. Electronic Video (e.g. YouTube)										

Section 2: Please mark with an "X" the response below that best describes your computer use for instructional purposes. (**Please choose only one response**)	Best of Me
I was using computer technology for instructional purposes before most faculty members in my college knew what it was or before the college purchased equipment.	
I was one of the first faculty members in my college to use computer technology for instructional purposes when the college first purchased equipment.	
I was not one of the first faculty members in my college to begin using computer technology, but used it ahead of most of my colleagues.	
I used computer technology for instructional purposes later than most of my colleagues.	
I was among the latest faculty at my institution using computer technology for instructional purposes.	

Section 3: Please indicate to what extent you agree or disagree with each of the following statements.

1 = Strongly Disagree   2 = Disagree   3 = Neutral   4 = Agree   5 = Strongly Agree

	1	2	3	4	5
1. I do not see too much need to utilize computing technology in the instructional process.					
2. The technical resources in my organization are unreliable.					
3. I do not have department funds to pay software costs.					
4. I have NOT been recognized for integrating computing technology into the instructional process in any means.					
5. The policies to adopt new computing technology in my organization are satisfactory.					
6. I am going to use more computing technologies in the next semester.					
7. I am happy with the procedures in my organization to adopt new computing technologies.					
8. I have the necessary skills to utilize computing technology.					
9. I am confident on adopting computing technologies.					
10. I have spent my personal money on computing technologies for my job.					
11. I feel already over-burdened without adding computing technology into my instructional process.					
12. Utilizing computing technologies in front of people makes me nervous.					
13. I am satisfied with the way I am doing now and not planning to adopt computing technology more in the future.					
14. I can access to quality computing resources in my work.					
15. Computing technology is valuable to the instructional process.					
16. The technical support on computing technology in my organization is not satisfactory.					
17. I do not see too much advantage of computing technology over the traditional approach in the instructional process.					
18. I evaluate the use of computing technology in relation to students' learning goals.					
19. I am happy with the fiscal investment into computing technology in my organization.					
20. We have an organization culture in using computing technology.					
21. I am not happy with the software programs in my organization.					
22. I evaluate the use of computing technology in relation to my teaching goals.					

1 = Strongly Disagree   2 = Disagree   3 = Neutral   4 = Agree   5 = Strongly Agree

	1	2	3	4	5
23. I am happy with the pedagogical support on integrating computing technology into the instructional process in my organization.					
24. I am happy with the hardware equipments in my organization.					
25. Scarcity of other non-computer-related facilities (e.g., printers and presentation equipment) makes me hard to adopt computing technologies.					
26. It is just too much trouble to use computing technology.					
27. The frequent changes in technology make it hard for me to keep abreast with computing technologies.					
28. My boss views computing technology as a strategic means to enhance educational goals.					
29. The networking facility at my organization is satisfactory.					
30. I am evaluated on the utilization of computing technology in relation to student learning goals by my supervisor.					
31. I have received tangible incentives for using computing technologies from my organization (e.g., leave time, contribution towards tenure, financial rewards).					
32. We are lack of sharing, discussion or mutual support on computing technology between colleagues.					
33. I am satisfied with the training on computing technology in my organization.					
34. The administrators evaluate faculty members on utilization of computing technology on an ongoing basis.					
35. I have pressures from my organization to use computing technologies.					
36. I am not satisfied with the administrative leadership on computing technology in my organization.					
37. The training on computing technology in my organization just does not fit my style.					
38. My organization does not provide convenient time for training.					
39. We have administrative support for adopting technology into the teaching and learning processes.					
40. I do not have time to learn new computing technologies.					
41. Technology does not fit well for the courses I teach.					
42. Classroom management is more difficult when using computing technology in teaching.					
43. I am not interest in using computing technology in the teaching and learning processes.					
44. My organization does not care too much on faculty member's utilization of computing technology.					

Section 4: Please respond to each statement by marking the option that most closely matches your level of agreement.

1 = Strongly Disagree   2 = Disagree   3 = Neutral   4 = Agree   5 = Strongly Agree

	1	2	3	4	5
1. My department expects me to use computing technology.**					
2. My use of computing technology is voluntary as opposed by the job requirement from the department.					
3. *My supervisor does not require me to use computing technology.					
4. *Although it might be helpful, using computing technology is certainly not compulsory in my job.					
5. *Using computing technology enables me to accomplish tasks more quickly.					
6. *Using computing technology makes it easier to do my job.					
7. *Using computing technology improves the quality of work I do.					
8. The disadvantages of my using computing technology far outweigh the advantages.** (See Note a.)					
9. Using computing technology improves my job performance.					
10. *Using computing technology enhances my effectiveness on the job.					
11. Overall, I find using computing technology to be advantageous in my job.					
12. *Using computing technology gives me greater control over my work.					
13. Using computing technology increases my productivity.					
14. *Using computing technology is compatible with all aspects of my work.					
15. Using computing technology is completely compatible with my current situation.					
16. *I think that using computing technology fits well with the way I like to work.					
17. *Using computing technology fits into my work style.					
18. Using computing technology improves my image within the organization.					
19. Because of my use of computing technology, others in my organization see me as a more valuable employee. (See Note a.)					
20. *People in my organization who use computing technology have more prestige than those who do not.					
21. *People in my organization who use computing technology have a high profile.					
22. *Having computing technology is a status symbol in my organization.					

1 = Strongly Disagree   2 = Disagree   3 = Neutral   4 = Agree   5 = Strongly Agree

	1	2	3	4	5
23. I believe that computing technology is cumbersome to use.**					
24. It is easy for me to remember how to perform tasks using computing technology. (See Note a.)					
25. Using computing technology is often frustrating.**					
26. *My interaction with computing technology is clear and understandable. (See Note a.)					
27. *I believe that it is easy to get computing technology to do what I want it to do.					
28. *Overall, I believe that computing technology is easy to use.					
29. *Learning to operate computing technology is easy for me.					
30. *I would have no difficulty telling others about the results of using computing technology.					
31. *I believe I could communicate to others the consequences of using computing technology.					
32. *The results of using computing technology are apparent to me.					
33. *I would have difficulty explaining why using computing technology may or may not be beneficial.**					
34. I have seen what others do using their computing technology.					
35. *In my organization, one sees computing technology on many desks.					
36. I have seen computing technology in use outside my firm. (See Note a.)					
37. *Computing technology is not very visible in my organization.**					
38. It is easy for me to observe others using computing technology in my firm.					
39. I have had plenty of opportunity to see computing technology being used. (See Note b.)					
40. I have not seen many others using computing technology in my department. **(See Note b.)					
41. I've had a great deal of opportunity to try various computing technology applications.					
42. I know where I can go to satisfactorily try out various uses of computing technology.					
43. *Before deciding whether to use any computing technology applications, I was able to properly try them out.					
44. *I was permitted to use computing technology on a trial basis long enough to see what it could do.					
45. I am able to experiment with the computing technology as necessary. (See Note b.)					

1 = Strongly Disagree   2 = Disagree   3 = Neutral   4 = Agree   5 = Strongly Agree

	1	2	3	4	5
46. I can have computing technology applications for long enough periods to try them out. (See Note b.)					
47. I did not have to expend very much effort to try out the computing technology. **(See Note c.)					
48. I don't really have adequate opportunities to try out different things on the computing technology. **(See Note c.)					
49. A proper on-the-job tryout of the various uses of the computing technology is not possible. **(See Note c.)					
50. There are enough people in my organization to help me try the various uses of the computing technology. (See Note c.)					

Notes 1: a. The indicated items were all deleted as the result of the first factor analysis and hence were not in the final scales.
b. The indicated items, which were deleted after the initial test, are suggested as candidates for inclusion in any expanded scale.
c. The indicated items, which were not in the final instrument, had item-scale correlations less than .40 in the initial test and are suggested as secondary candidates for lengthening the scale.
d. *— indicates items suggested for inclusion in any "short" scales.
e. **— indicates items were reversely coded.

Notes 2: The above notes were not shown in the actual survey to the participants. They were originally from Moore and Benbasat (1991) and were presented here for descriptive purposes)

Section 5: Please provide the demographics information below**.**

1. What is your gender? □ Male □ Female
2. What is your age group?

   □ 20-29 □ 30-39 □ 40-49 □ 50-59 □ 60 or more
3. What is your academic rank?

   □ Lecture/Instructor □ Assistant Professor □Associate Professor □Professor
4. What is your English language proficiency?

   □ None □ Poor □ Average □ Good □ Very Good
5. Do you have a computer at home? □ Yes □ No
6. Do you have a Laptop Computer? □ Yes □ No
7. Do you have a Mobile Phone Computer? □ Yes □ No

For the following items, please provide a number.

---

8. How many traditional classes do you teach in the current semester? _____ classes
9. How many online or blended classes do you teach in the current semester? _____ classes
10. How many credit hours do you currently teach? _____ hours
11. Including the current year, how long have you taught in higher education? _____ years
12. Including the current year, how long have you used computers in general? _____ years
13. How many hours have you spent on computers daily in the current year? _____ hours
14. What is the approximate number of students that you teach this semester? _____ students
15. How many graduate students do you currently supervise if any? _____ students

---

END OF THE SURVEY - Thank you very much for your participation!

APPENDIX B

STUDY INSTRUMENT IN ARABIC

استبانة حول استخدام تكنولوجيا المعلومات والإتصالات في العملية التعليمية التعلمية

القسم الأول: من خلال الفقرات الآتية، الرجاء استخدام الأعمدة التي في اليسار ، التي تشير إلى المستوى الحالي لإستخدامك لتكنولوجيا المعلومات والإتصالات في العملية التعليمية مثل (إعداد المحاضرة ، تصميمها ، وتخطيطها ، وتقديمها وعرضها ، وتقييمها) ، والأعمدة التي على اليمين تشير إلى عملية الخبرة الخاصة بك في استخدام تكنولوجيا المعلومات والإتصالات في عملك الأكاديمي .

رقم	العبارة	مستوى الخبرة أو المعرفة					مستوى الاستخدام				
		معرفة عالية جدا	معرفة متقدمة	معرفة متوسطة	معرفة مبتدئة	ليس لدي معرفة	في كثير من الأحيا ن	غالبا ما أستخدمة	أحيانا ماأستخدمة	نادرا	لم أستخدمة أبدا
1	معالجة الكلمات (أي ابتكار و تصميم ، لتخزين واسترجاع ، وطباعة النص الإلكتروني (e.g. Word Processing)										
2	جداول البيانات (أي إدارة / تنظيم الجداول الأعداد) Spreadsheets (e.g. Microsoft Excel)										
3	إدارة قواعد البيانات (أي ابتكار وتصميم وتحديث البيانات) (e.g. Database Management)										
4	رسومات (أي تخزين واسترجاع و إدارة الصور و الرسومات البيانية). (e.g. Photoshop)										
5	برامج العروض (e.g. PowerPoint)										
6	أقراص مدمجة (ملتميديا) أو على الشبكة العالمية مثل الخرائط وقواميس إلكترونية (CD-ROM, DVD , Multimedia)										
7	تصميم مواقع الإنترنت با ستخدام لغات برمجة أو برامج جاهزة لتصميم مواقع الإنترنت. (e.g. FrontPage, Dreamweaver)										
8	خدمات قوائم أخبارالإنترنت (e.g. Newsgroups listserv, e-chat, E-mail)										
9	الإنترنت Internet Content (مثل التصفح و البحث في الشبكة العالمية للإنترنت)										
10	تحليل البيانات والبرمجيات (e.g. SPSS,)										
11	المحاكاة والألعاب الافتراضيه (كمحاكات الخصائص المميزة لنظام أو عملية) Simulations and Games (e.g. Second Life)										

رقم	العبارة	مستوى الخبرة أو المعرفة					مستوى الاستخدام				
		معرفة عالية جدا	معرفة متقدمة	معرفة متوسطة	معرفة مبتدئة	ليس لدي معرفة	في كثير من الأحيان	غالبا ما أستخدمة	أحيانا مااستخدمة	نادرا	لم أستخد مه أبدا
12	مؤتمرات الفيديو وعقد المؤتمرات عن بعد (e.g. Video/Audio Conferencing)										
13	نقل الملفات إلكترونيا FTP (File Transfer Protocol)										
14	التدريس الصفي المعتمدعلى شبكة الإنترنت وإدارتها (e.g. Blackboard, Moodle)										
15	أدوات الاتصال التفاعلي (e.g. Skype, Windows Live Messenger)										
16	أدوات الويب Web 2.0 (e.g. Blogs, Wikis)										
17	محركات البحث الإكتروني (e.g. Google, Yahoo)										
18	أدوات الفيديو الإكتروني (e.g. YouTube)										

رقم	**القسم الثاني : يرجى وضع علامة (X) والتي تصف استخدامك لتكنولوجيا المعلومات والإتصالات في التعليم والتدريس . (يجب أن تختار استجابة واحده من الاختيارات المتعدده) .**	**أفضل أن أصف نفسي**
1	أنا أستخدم تكنولوجيا الحاسوب لأغراض التعليم والتدريس قبل معظم أعضاء هيئة التدريس في كليتي ومن قبل أن توفر الكلية لي حاسوب.	
2	أنا كنت واحدا من أوائل أعضاء هيئة التدريس في كليتي الذين يستخدمون تكنولوجيا الحاسوب لأغراض تعليمية عندما وفرت الكلية لي حاسوب.	
3	أنا لم أكن واحد من أوائل أعضاء هيئة التدريس في كليتي يستخدم تكنولوجيا الحاسوب ، ولكنها تستخدم كثيرا من قبل زملائي.	
4	أنا استخدم تكنولوجيا الحاسوب لأغراض تعليمية في وقت متأخر عن معظم زملائي	
5	أنا كنت آخر من استخدم تكنولوجيا الحاسوب لأغراض تعليميه بين أعضاء هيئة التدريس في مؤسستي الأكاديميه .	
6	أنا لم استخدم تكنولوجيا الحاسوب لأغراض تعليمية.	

القسم الثالث: يرجى الإشارة إلى أي مدى أنت توافق أو تختلف مع كل من الفقرات التالية :

أعارض بشدة = 1　　غير موافق = 2　　محايد = 3　　موافق = 4　　أوافق بشدة = 5

رقم	العبارة	1	2	3	4	5
1	لا أرى الكثير من الحاجة إلى استخدام تكنولوجيا الحاسوب في العملية التعليمية.					
2	المصادر التقنية في منظمتي غير متوافره.					
3	ليس لدي الدعم الكافي من الكلية لدفع تكاليف البرمجيات التعليمية.					
4	ليس لدي أي معرفة لأدخال تكنولوجيا الحاسوب وستخدامتها في العملية التعليمية.					
5	السياسات الجديدة من قبل مؤسستي الأكاديمية في مجال إدخال و استخدام تكنولوجيا الحاسوب مرضية.					
6	انا سوف أستخدم المزيد من تكنولوجيا الحاسوب في الفصل الدراسي المقبل.					
7	أنا اشعر بالسعادة في منظمتي الأكاديمية بإجراءات إدخال تكنولوجيات الحاسوب وتطبيقها في العملية التعليمية.					
8	لدي المهارات الضرورية لتطبيق تكنولوجيا الحاسوب في العملية الأكاديمية.					
9	أنا واثق من نفسي عندما أطبق وأستخدم تكنولوجيات الحاسوب.					
10	دفعت الكثير من المال لتدريب نفسي على كيفية استخدام تكنولوجيات الحاسوب وتطبيقتها.					
11	أشعر بالفعل بالأعباء الكثيرة دون إضافة تكنولوجيا الحاسوب للعملية التعليمية في مؤسستي أومنظمتي الأكاديمية .					
12	أشعر بالعصبية عندما أستخدم تكنولوجيات الحاسوب أمام الناس.					
13	أنا راض عن طريقة عملي الآن وليس لدي التخطيط لاستخدام تكنولوجيات الحاسوب في المستقبل.					
14	أستطيع الحصول على خدمات حاسوبية جيدة في عملي.					
15	تكنولوجياالحاسوب ذات قيمة للعملية التعليمية التعلمية.					
16	الدعم التقني والفني في استخدام وتطبيق تكنولوجيا الحاسوب في منظمتي ليست مرضية.					

رقم	العبارة	1	2	3	4	5
17	لا أرى الكثير من الفروق بين طريقة استخدام تكنولوجيا الحاسوب و استخدام طريقة المنهج التقليدي في عملية التعليم والتدريس.					
18	أنا أقيم استخدام تكنولوجيا الحاسوب في تحقيق أهداف الطلاب التعليمية.					
19	أنا مع الاستثمار العلمي في تكنولوجيا الحاسوب في منظمتي الأكاديمية .					
20	لدي ثقافة تكنولوجية في منظمتي الأكاديمية في استخدام تكنولوجيا الحاسوب.					
21	أنا لست سعيدا ببرامج الحاسب الآلي في منظمتي الأكاديمية .					
22	أنا أقيم فاعلية استخدام تكنولوجيا الحاسوب في التدريس .					
23	أنا سعيد بطريقة إدخال التكنولوجيا الحديثة في مجال الحاسوب في العملية التعليمية في منظمتي الأكاديمية.					
24	الأجهزة والمعدات الحاسوبية وتطبيقاتها متوفره في منظمتي.					
25	هناك ندرة في الملحقات التابعة للحاسوب (مثل الطابعات ، و الأجهزة العارضة) يجعلني من الصعب أن أطبق واستخدم تكنولوجيا الحاسوب.					
26	هناك الكثير من المتاعب والمصاعب لاستخدام تكنولوجيا الحاسوب.					
27	التغييرات المتكررة في التكنولوجيا تجعلني من الصعب مواكبة تكنولوجيا الحاسوب.					
28	المسؤول عني في العمل يرى أن استخدام تكنولوجيا الحاسوب استراتيجية جيدة لتعزيز و تحقيق الأهداف التعليمية.					
29	الربط الشبكي والإكتروني وتسهيلاته في منظمتي مرض .					
30	أنا أقيم من قبل رئيس قسمي أو وحدتي الأكاديميه في العمل في استخدامي لتكنولوجيا الحاسوب في تعليم الطلاب داخل الغرفة الصفية.					
31	تلقيت حوافز ملموسة لاستخدام تكنولوجيا الحاسوب من منظمتي الأكاديمية (مثل إعطاءِ الوقت ، دعم المشاريع المحوسبة ، مكافآت مالية).					
32	أواجه صعوبة في التواصل مع الزملاء في تقاسم الخبرات أو مناقشتها المتبادلة في مجال تكنولوجيا الحاسوب.					
33	أنا أحصل على تدريب جيد في مجال تكنولوجيا الحاسوب في منظمتي الأكاديمية.					
34	الرؤساء في العمل يقيمون أعضاء هيئة التدريس في استخدام الحاسوب والتكنولوجيا بشكل مستمر.					
35	تلقيت ضغوط من منظمتي على استخدام تكنولوجيا الحاسوب.					
36	أنا غير راض عن القيادة الإدارية في مجال تكنولوجيا الحاسوب في منظمتي الأكاديمية.					

رقم	العبارة	1	2	3	4	5
37	التدريب على استخدام تكنولوجيا الحاسوب لا يتناسب وأسلوب عملي .					
38	منظمتي لا توفرالوقت المناسب للتدريب ولتطبيق تكنولوجيا الحاسوب واستخداماتها في العمليه التعليميه.					
39	لدينا الدعم الإداري والمالي في استخدام تكنولوجياالحاسوب في عملية التعليم والتدريس.					
40	ليس لدي الوقت لتعلم والتدرب على تكنولوجيات الحاسوب الجديدة.					
41	تكنولوجيا الحاسوب لا تتناسب مع المقرر الدراسي الذي أدرسة.					
42	إدارة الصفوف التعليمية هي أكثر صعوبة عند استخدام تكنولوجيا الحاسوب في التدريس.					
43	أنا لا أرغب في استخدام تكنولوجيا الحاسوب في عملية التعليمية التعلمية.					
44	منظمتي أو مؤسستي الأكاديمية غير مهتمة كثيرا في استخدامات أعضاء هيئة التدريس لتكنولوجيا الحاسوب في عملية التعليمية التعلمية.					

القسم الرابع : الرجاء دوَن استجابتك في المربع المناسب على كل فقرة من الفقرات التاليه :

أعارض بشدة = 1 غير موافق = 2 محايد = 3 أوافق = 4 أوافق بشدة = 5

رقم	العبارة	1	2	3	4	5
1	يتوقع القسم في كليتي أنني أستخدم تكنولوجيا الحاسوب في العملية التعليمية.					
2	استخدامي لتكنولوجيا الحاسوب طواعية في العملية التعليمية وليس من شروط عملي.					
3	رئيسي في القسم أو الوحده الأكاديمية لا يطلب مني استخدام تكنولوجيا الحاسوب في العملية التعليميه.					
4	على الرغم من أن استخدام تكنولوجيا الحاسوب مفيد ولكن استخدامها ليس إجباريا في وظيفتي					
5	استخدامي لتكنولوجيا الحاسوب يتيح لي إنجاز مهامي بسرعة أكبر.					
6	استخدامي لتكنولوجيا الحاسوب تجعل من السهل القيام بعملي الأكاديمي.					
7	استخدامي لتكنولوجيا الحاسوب تحسّن وتطوّر من نوعية عملي الأكاديمي.					

رقم	العبارة	1	2	3	4	5
8	مساوئ استخدام تكنولوجيا الحاسوب تفوق مزاياه.					
9	استخدامي لتكنولوجياالحاسوب تحسن وتطور من أداء وظيفتي الأكاديمية .					
10	استخدامي لتكنولوجياالحاسوب تعزز من فعالية وظيفتي الأكاديمية .					
11	أجد استخدام تكنولوجيا الحاسوب مفيدا في وظيفتي الأكاديمية.					
12	استخدامي لتكنولوجياالحاسوب يتيح لي قدرا أكبر من التحكم في عملي الأكاديمي .					
13	استخدامي لتكنولوجياالحاسوب يزيد من إنتاجية عملي الأكاديمي .					
14	استخدامي لتكنولوجياالحاسوب متوافق مع جميع جوانب عملي الأكاديمي .					
15	استخدامي لتكنولوجياالحاسوب متوافق مع وضعي الحالي.					
16	اعتقد أن استخدام تكنولوجيا الحاسوب متوافق بشكل جيد مع طريقتي في عملي الأكاديمي التي أحب العمل بها.					
17	استخدامي لتكنولوجيا الحاسوب يتناسب وأسلوب عملي الأكاديمي .					
18	استخدامي لتكنولوجيا الحاسوب يحسّن صورتي في داخل المنظمة الأكاديميه التي أعمل بها.					
19	بسبب استخدامي لتكنولوجيا الحاسوب ، زملائي في منظمتي الأكاديميه ينظرون لي باهتمام أكثر .					
20	زملائي في منظمتي الأكاديمية والذين يستخدمون تكنولوجيا الحاسوب يحصلون على هيبة أكثر من أولئك الذين لا يستخدمونها.					
21	زملائي في منظمتي الأكاديميه الذين يستخدمون تكنولوجيا الحاسوب يحصلون على مكانة بارزة.					
22	امتلاكي لتكنولوجيا الحاسوب يعطيني فرصة للحصول على مكانة في منظمتي الأكاديمية .					
23	أعتقد أن تكنولوجيا الحاسوب مرهقة لاستخدام في إدارة العملية التعليمية .					
24	من السهل بالنسبة لي أن استخدم تكنولوجيا الحاسوب في العملية التعليمية.					
25	استخدامي لتكنولوجيا الحاسوب غالبا ما يكون محبطا ومخيفا.					
26	تفاعلي مع تكنولوجياالحاسوب واستخدامتها واضحة ومفهومة .					
27	أعتقد أنه من السهل الحصول على تكنولوجيا الحاسوب لتنفيذ كل ما أريد أن أفعله في عملي الأكاديمي .					
28	أعتقد أن تكنولوجيا الحاسوب سهلة الاستخدام .					
29	من السهل لي أن أتعلم تكنولوجيا الحاسوب وتطبيقاتها.					
30	ليس لدي أي صعوبة في إخبار زملائي عن تجاربي في استخدام تكنولوجيا الحاسوب.					
31	أعتقد أنني أستطيع التواصل مع زملائي في مجال استخدام تكنولوجيا الحاسوب.					

5	4	3	2	1	العبارة	رقم
					نتائج الدراسات والبحوث في استخدام تكنولوجيا الحاسوب في العملية التعليمية واضحة بالنسبة لي.	32
					لدي صعوبة في شرح إمكانية وفائدة استخدام تكنولوجيا الحاسوب أوعدم فائدتها في العملية التعليمية.	33
					بإمكاني أن أرى ما يفعلة الآخرون من تطبيقات في العمل الأكاديمي باستخدام تكنولوجيا الحاسوب.	34
					في منظمتي أو مؤسستي الأكاديمية ، ترى الكثير من تكنولوجيا الحاسوب على المكاتب الادارية.	35
					أنا رأيت من قبل استخدام تكنولوجيا الحاسوب خارج منظمتي أو موسستي في العملية التدريسية.	36
					تكنولوجيا الحاسوب ليست واضحة الإستخدام في منظمتي الأكاديمية.	37
					من السهل لي الاطلاع على تجارب الآخرين عندما يستخدمون تكنولوجيا الحاسوب في منظمتي أو مؤسستي الأكاديمية.	38
					أتيح لي الكثير من الفرص لرؤية استخدام تكنولوجيا الحاسوب في العمليه التعليمية.	39
					أنا لم أرى أحدا في قسمي يستخدم تكنولوجيا الحاسوب في العملية التعليمية.	40
					أتيح لي الكثير من الفرص لتطبيق مختلف تطبيقات تكنولوجيا الحاسوب في عملي الأكاديمي.	41
					لدي المعرفة الجيدة بطرق الحصول على تكنولوجيا الحاسوب وتجريب تطبيقاتها المختلفة.	42
					قبل أن أقرر استخدام تطبيقات تكنولوجيا الحاسوب في العملية التعليمية أجربها أولا.	43
					يسمح لي باستخدام تكنولوجيا الحاسوب وتجريبها لفترة كافية في عملي الأكاديمي .	44
					أنا قادر على تجربة تكنولوجيا الحاسوب اللازمة لعملي الأكاديمي.	45
					يمكن أن اخذ تطبيقات تكنولوجيا الحاسوب معي إلى خارج مؤسستي الأكاديمية لمحاولة تجريبها قبل استخدامها.	46
					ليس لدي الجهد الكافي لتجربة تكنولوجيا الحاسوب في الخارج .	47
					ليس لدي الفرصة الكافية لتجربة أشياء مختلفة في تكنولوجيا الحاسوب وتطبيقاتها.	48
					من غير الممكن تجريب تطبيقات تكنولوجيا الحاسوب المختلفة وأناعلى رأس عملي الأكاديمي.	49
					هناك ما يكفي من العاملين والفنيين في مؤسستي أو منظمتي الأكاديمية لمساعدتي في تجريب تكنولوجيا الحاسوب واستخدامتها .	50

القسم الخامس : المعلومات عامة

1- الجنس : ذكر أنثى

2- العمر : 20-29 سنة 30-39 سنة 40-49 سنة 50-59 سنة 66 سنة أو أكثر.

3- الرتبة الأكاديمية : أستاذ أستاذ مشارك أستاذ مساعد مدرس

4- هل لديك حاسوب في البيت ؟ نعم لا

6- هل لديك حاسوب في العمل ؟ نعم لا

7- هل لديك هاتف محمول تستخدم فيه تطبيقات تكنولوجيا الحاسوب؟

Hand-on Mobile Phone Computer نعم لا

8- هل لديك خدمة إنتر نت في عملك ؟ نعم لا

9- كم عدد المقررات التي تدرسها بطريقة التعلم عن بعد أو بطريقة المزج بين التعلم عن بعد والطريقه الاعتيادية في هذا الفصل ؟ Online blended courses or online courses ________________ مقرر / مقررات.

10- كم ساعة معتمدة تدرس في هذا الفصل ؟ ________________ ساعة / ساعات .

11- كم سنة وأنت تدرس في التعليم العالي ؟ ________________ سنة / سنوات.

12- كم سنه وأنت تدرس في هذه الجامعة ؟ ________________ سنة / سنوات .

13- كم عدد الساعات التي تقضيها في اليوم الواحد وأنت تستخدم الحاسوب ؟ ________________ ساعة / ساعات.

14- كم عدد الطلبة الكلي الذين تدرسهم في هذا الفصل ؟ ________________ طالب .

15- كم عدد طلاب الدراسات العليا الذين تشرف عليهم حاليا ؟ ________________ طالب .

شاكرا ومثمنا مشا ركتكم الفاعلة في الإجابة على فقرات الاستبانة .

APPENDIX C

IRB APPROVAL

UNT
UNIVERSITY OF
NORTH TEXAS
Discover the power of ideas.

OFFICE OF THE VICE PRESIDENT FOR RESEARCH AND ECONOMIC DEVELOPMENT
Office of Research Services

March 3, 2009

Said Al Senaidi
Department of Learning Technologies
University of North Texas

RE: Human Subjects Application No. 09037

Dear Mr. Al Senaidi:

In accordance with 45 CFR Part 46 Section 46.101, your study titled "An Investigation on Factors Affecting Omani Faculty Member's Adoption of Information and Communication Technology" has been determined to qualify for an exemption from further review by the UNT Institutional Review Board (IRB).

Enclosed is the consent document with stamped IRB approval. Please copy and **use this form only** for your study subjects.

No changes may be made to your study's procedures or forms without prior written approval from the UNT IRB. Please contact Shelia Bourns, Research Compliance Administrator, ext. 3940, if you wish to make any such changes.

Sincerely,

P. Kaminski, PhD

Patricia L. Kaminski, Ph.D.
Associate Professor
Chair, Institutional Review Board

PK:sb

cc: Dr. Jim Poirot

1155 Union Circle #305250 | Denton, Texas 76203-5017 | TEL 940.565.3940 | FAX 940.565.4277
TTY 940.369.8652 | www.unt.edu

APPENDIX D

MAP OF OMAN


OMAN
IRAN
Khasab
Musandam
Peninsula
The
Gulf
QATAR
Madha (Oman)
Batinah
Coast
Sohar
Muscat
Tropic of Cancer
Barka
UNITED
ARAB
EMIRATES
Rustaq
Nakhal
Gulf of Oman
Sur
Nizwa
Umm al-Samim
Al-Ghaba
Wahiba Sands
SAUDI
ARABIA
Salt Flat
Masirah Island
Undemarcated
Borders
Hajmah
Arabian Sea
Danka
Kuria
Muria
Islands
Salalah
YEMEN
Mughsail
0 200 km
0 120 miles

APPENDIX E

THE PANEL OF EXPERTS REVIEWING THE SURVEY

Members of the Validation Committee of the Survey

Dr. James L. Poirot
Learning Technologies Department
University of North Texas

Dr. Cathleen Norris
Learning Technologies Department
University of North Texas

Dr. Gerald A. Knezek
Learning Technologies Department
University of North Texas

Dr. Brian O'Conner
School of Library and Information Sciences
University of North Texas

Dr. Mohammad Omary
Department of Chemistry
University of North Texas

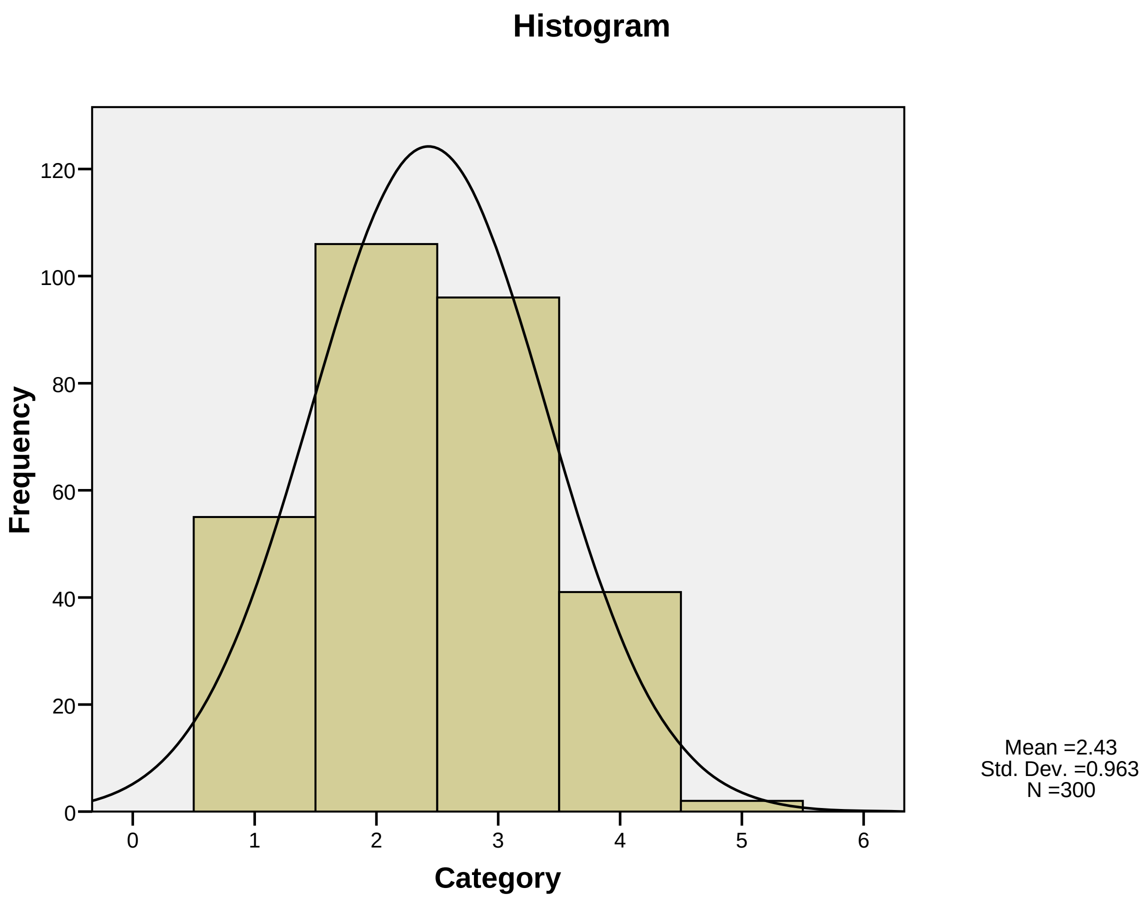
Dr. Taher bin Abdulrahman Ba-Omar
College of Science
Sultan Qaboos University

Dr. Ali S. Al-Musawi
Instructional and Learning Technologies Department
College of Education
Sultan Qaboos University

Dr. Najib M. Manea
Department of Education
University of New Mexico

APPENDIX F

THE HISTOGRAM OF THE FOUR ADOPTER CATEGORIES


Histogram
Frequency
120
100
80
60
40
20
0
0
1
2
3
4
5
6
Category
Mean =2.43
Std. Dev. =0.963
N =300

APPENDIX G

THE SYNTAX FOR CFA IN LISREL

37 Items on Perception of Technology Attributes - A Confirmatory Factor Analysis

```
Observed Variables
S4_Q1RC S4_Q2 S4_Q3 S4_Q4 S4_Q5 S4_Q6 S4_Q7 S4_Q9 S4_Q10 S4_Q11 S4_Q12 S4_Q13 S4_Q14 S4_Q15
S4_Q16 S4_Q17 S4_Q18 S4_Q20 S4_Q21 S4_Q22 S4_Q23RC S4_Q25RC S4_Q27 S4_Q28 S4_Q29 S4_Q30
S4_Q31 S4_Q32 S4_Q33RC S4_Q34 S4_Q35 S4_Q37RC S4_Q38 S4_Q41 S4_Q42 S4_Q43 S4_Q44
Covariance Matrix From File ATT37.COV
Sample Size 300
Latent Variables: Voluntary Advantage Compatible Image Easiness Demonstration Visible Trial
Relationships:
        S4_Q1RC S4_Q2 S4_Q3 S4_Q4 = Voluntary
        S4_Q5 S4_Q6 S4_Q7 S4_Q9 S4_Q10 S4_Q11 S4_Q12 S4_Q13 = Advantage
        S4_Q14 S4_Q15 S4_Q16 S4_Q17 = Compatible
        S4_Q18 S4_Q20 S4_Q21 S4_Q22 = Image
        S4_Q23RC S4_Q25RC S4_Q27 S4_Q28 S4_Q29 = Easiness
        S4_Q30 S4_Q31 S4_Q32 S4_Q33RC = Demonstration
        S4_Q34 S4_Q35 S4_Q37RC S4_Q38 = Visible
        S4_Q41 S4_Q42 S4_Q43 S4_Q44 = Trial
Number of Decimals = 3
Wide Print
Print Residuals
Path Diagram
End of Problem
```

50 Items on Perception of Technology Attributes - A Confirmatory Factor Analysis

```
Observed Variables
S4_Q1RC S4_Q2 S4_Q3 S4_Q4 S4_Q5 S4_Q6 S4_Q7 S4_Q8RC S4_Q9 S4_Q10 S4_Q11 S4_Q12 S4_Q13
S4_Q14 S4_Q15 S4_Q16 S4_Q17 S4_Q18 S4_Q19 S4_Q20 S4_Q21 S4_Q22 S4_Q23RC S4_Q24 S4_Q25RC
S4_Q26 S4_Q27 S4_Q28 S4_Q29 S4_Q30 S4_Q31 S4_Q32 S4_Q33RC S4_Q34 S4_Q35 S4_Q36 S4_Q37RC
S4_Q38 S4_Q39 S4_Q40RC S4_Q41 S4_Q42 S4_Q43 S4_Q44 S4_Q45 S4_Q46 S4_Q47RC S4_Q48RC
S4_Q49RC S4_Q50
Covariance Matrix From File ATT50.COV
Sample Size 300
Latent Variables: Voluntary Advantage Compatible Image Easiness Demonstration Visible Trial
Relationships:
        S4_Q1RC S4_Q2 S4_Q3 S4_Q4 = Voluntary
        S4_Q5 S4_Q6 S4_Q7 S4_Q8RC S4_Q9 S4_Q10 S4_Q11 S4_Q12 S4_Q13 = Advantage
        S4_Q14 S4_Q15 S4_Q16 S4_Q17 = Compatible
        S4_Q18 S4_Q19 S4_Q20 S4_Q21 S4_Q22 = Image
        S4_Q23RC S4_Q24 S4_Q25RC S4_Q26 S4_Q27 S4_Q28 S4_Q29 = Easiness
        S4_Q30 S4_Q31 S4_Q32 S4_Q33RC = Demonstration
        S4_Q34 S4_Q35 S4_Q36 S4_Q37RC S4_Q38 S4_Q39 S4_Q40RC = Visible
        S4_Q41 S4_Q42 S4_Q43 S4_Q44 S4_Q45 S4_Q46 S4_Q47RC S4_Q48RC S4_Q49RC S4_Q50 = Trial
Number of Decimals = 3
Wide Print
Print Residuals
Path Diagram
End of Problem
```

APPENDIX H

VARIANCE AND COVARIANCE MATRICES FOR CFA

Covariance Matrix for 37 Items

	S4_Q1RC	S4_Q2	S4_Q3	S4_Q4	S4_Q5	S4_Q6
	--------	--------	--------	--------	--------	--------
S4_Q1RC	0.532					
S4_Q2	-0.035	1.901				
S4_Q3	0.117	0.603	0.687			
S4_Q4	0.011	0.689	0.551	1.232		
S4_Q5	-0.286	0.050	-0.078	0.111	1.294	
S4_Q6	-0.696	0.310	-0.186	0.230	1.956	4.124
S4_Q7	-0.538	1.138	0.044	-0.042	1.461	2.479
S4_Q9	-0.363	0.093	-0.027	0.060	0.423	0.872
S4_Q10	-0.522	0.571	0.067	0.123	0.780	1.597
S4_Q11	-1.311	1.520	0.220	0.528	1.517	2.958
S4_Q12	-0.570	0.689	0.222	0.387	0.626	1.344
S4_Q13	-0.524	0.516	0.072	0.206	0.784	1.378
S4_Q14	-0.833	0.312	0.001	-0.150	1.017	1.963
S4_Q15	-0.355	0.295	-0.056	-0.039	0.514	0.853
S4_Q16	-0.542	0.603	0.065	0.102	0.807	1.419
S4_Q17	-0.551	0.616	0.056	0.100	0.748	1.357
S4_Q18	-0.333	0.578	0.142	0.152	0.785	1.552
S4_Q20	-0.052	0.396	0.133	0.025	0.261	0.290
S4_Q21	-0.096	-0.036	-0.082	-0.082	0.252	0.237
S4_Q22	-0.038	-0.001	-0.075	-0.322	0.188	0.141
S4_Q23RC	0.043	-0.069	0.040	-0.044	0.381	0.609
S4_Q25RC	-0.132	0.290	0.051	0.119	0.395	0.511
S4_Q27	-0.356	0.124	0.124	-0.211	0.543	0.745
S4_Q28	-0.316	0.100	0.051	-0.070	0.603	0.983
S4_Q29	-0.219	0.255	0.013	0.011	0.378	0.887
S4_Q30	-0.419	0.445	-0.163	0.180	0.831	1.714
S4_Q31	-0.155	0.045	-0.021	0.172	0.449	0.932
S4_Q32	-0.277	0.578	-0.025	0.036	0.467	0.976
S4_Q33RC	-0.162	0.237	-0.042	0.000	0.067	0.290
S4_Q34	-0.063	0.590	-0.121	0.256	0.378	0.702
S4_Q35	-0.267	0.042	-0.089	-0.030	0.258	0.530
S4_Q37RC	-0.209	0.119	-0.185	-0.192	0.250	0.626
S4_Q38	-0.090	0.140	-0.012	-0.022	0.360	0.641
S4_Q41	-0.235	-0.284	-0.142	-0.450	0.293	0.529
S4_Q42	-0.314	-0.034	-0.239	-0.455	0.400	0.674
S4_Q43	-0.261	0.668	-0.060	0.079	0.294	0.742
S4_Q44	-0.301	-0.037	0.002	-0.099	0.294	0.355

Covariance Matrix

	S4_Q7	S4_Q9	S4_Q10	S4_Q11	S4_Q12	S4_Q13
S4_Q7	9.595					
S4_Q9	1.264	0.876				
S4_Q10	2.600	1.392	2.637			
S4_Q11	6.339	3.166	5.823	16.358		
S4_Q12	2.842	1.034	1.865	5.329	3.486	
S4_Q13	2.537	0.777	1.434	4.170	2.375	2.435
S4_Q14	3.131	1.078	2.037	5.423	2.374	2.562
S4_Q15	1.798	0.703	1.291	3.573	1.480	1.246
S4_Q16	2.946	1.110	2.142	5.269	1.960	1.743
S4_Q17	3.373	1.314	2.433	6.473	2.533	2.232
S4_Q18	2.927	0.734	1.545	3.505	1.438	1.527
S4_Q20	1.041	0.425	0.840	1.730	0.524	0.678
S4_Q21	0.195	0.094	0.047	0.318	0.252	0.324
S4_Q22	0.923	0.192	0.243	1.068	0.281	0.232
S4_Q23RC	0.924	-0.034	0.193	-0.131	0.280	0.247
S4_Q25RC	1.727	0.313	0.770	1.779	0.372	0.491
S4_Q27	1.716	0.522	0.850	2.084	0.842	0.766
S4_Q28	1.205	0.414	0.717	1.858	0.917	0.915
S4_Q29	1.698	0.448	0.991	2.800	1.071	0.752
S4_Q30	2.328	0.821	1.500	4.202	1.442	1.278
S4_Q31	1.483	0.451	0.811	2.200	0.898	0.820
S4_Q32	1.815	0.317	0.784	2.037	1.022	1.000
S4_Q33RC	1.003	0.270	0.721	1.238	0.540	0.430
S4_Q34	0.757	0.048	0.267	0.356	0.684	0.526
S4_Q35	0.612	0.299	0.433	1.350	0.798	0.857
S4_Q37RC	1.318	0.221	0.409	0.942	0.464	0.314
S4_Q38	0.948	0.271	0.463	0.745	0.545	0.460
S4_Q41	0.446	0.161	0.305	0.836	0.272	0.171
S4_Q42	0.794	0.368	0.662	1.745	0.895	0.703
S4_Q43	1.473	0.253	0.772	1.789	0.914	0.681
S4_Q44	0.188	0.196	0.250	0.766	0.581	0.497

Covariance Matrix

	S4_Q14	S4_Q15	S4_Q16	S4_Q17	S4_Q18	S4_Q20

S4_Q14	5.156					
S4_Q15	1.780	1.567				
S4_Q16	3.251	1.739	4.326			
S4_Q17	3.526	1.910	4.007	5.156		
S4_Q18	1.782	1.101	1.999	2.436	3.062	
S4_Q20	0.908	0.451	0.819	1.115	1.527	2.689
S4_Q21	0.399	0.151	-0.027	0.208	0.575	1.217
S4_Q22	0.573	0.379	0.339	0.653	0.720	1.375
S4_Q23RC	0.510	0.173	-0.181	0.032	0.139	-0.228
S4_Q25RC	0.510	0.565	0.396	0.593	0.557	-0.109
S4_Q27	1.639	0.569	1.668	1.736	0.810	0.477
S4_Q28	1.189	0.595	0.715	1.126	0.746	0.511
S4_Q29	1.498	0.789	1.221	1.629	0.933	0.689
S4_Q30	1.829	1.052	1.646	2.146	1.087	0.367
S4_Q31	1.120	0.821	0.973	1.266	0.714	0.448
S4_Q32	0.987	0.755	1.008	1.283	1.114	0.405
S4_Q33RC	0.329	0.111	0.411	0.627	0.091	-0.213
S4_Q34	0.383	0.207	0.403	0.622	0.541	0.367
S4_Q35	1.134	0.510	0.742	0.989	0.700	0.440
S4_Q37RC	0.317	0.389	0.194	0.298	0.170	-0.430
S4_Q38	0.354	0.240	0.511	0.687	0.707	0.101
S4_Q41	0.796	0.362	0.713	0.551	0.211	-0.185
S4_Q42	1.164	0.497	0.861	0.887	0.442	-0.086
S4_Q43	1.010	0.644	1.007	1.225	0.795	0.489
S4_Q44	1.139	0.384	1.030	0.791	0.437	0.072

Covariance Matrix

	S4_Q21	S4_Q22	S4_Q23RC	S4_Q25RC	S4_Q27	S4_Q28
S4_Q21	1.390					
S4_Q22	1.013	3.043				
S4_Q23RC	-0.258	0.288	1.654			
S4_Q25RC	-0.367	0.536	1.038	2.397		
S4_Q27	0.137	0.154	-0.070	0.304	3.429	
S4_Q28	0.356	0.240	0.393	0.652	1.826	2.553
S4_Q29	0.268	0.380	0.404	0.683	1.223	1.676
S4_Q30	0.410	0.461	0.158	0.821	1.237	1.404
S4_Q31	0.336	0.550	0.489	0.716	0.393	0.570
S4_Q32	0.074	0.704	0.638	1.130	0.521	0.771
S4_Q33RC	-0.496	0.036	0.706	1.431	0.338	0.751

S4_Q34	0.183	0.560	0.242	0.520	-0.047	0.233
S4_Q35	0.241	0.340	0.001	0.207	0.686	0.690
S4_Q37RC	-0.506	0.335	0.759	1.247	0.087	0.232
S4_Q38	-0.176	-0.003	0.075	0.503	0.663	0.488
S4_Q41	-0.198	0.009	0.288	0.480	0.841	0.694
S4_Q42	-0.003	-0.322	0.210	0.347	1.233	1.376
S4_Q43	0.203	0.206	0.134	0.513	0.410	0.734
S4_Q44	0.073	0.005	-0.050	-0.080	0.876	0.543

Covariance Matrix

	S4_Q29	S4_Q30	S4_Q31	S4_Q32	S4_Q33RC	S4_Q34
S4_Q29	2.660					
S4_Q30	2.233	4.244				
S4_Q31	1.265	1.663	1.802			
S4_Q32	0.755	1.167	0.777	2.109		
S4_Q33RC	0.786	0.560	0.277	0.950	2.797	
S4_Q34	0.823	0.564	0.700	0.119	0.537	3.711
S4_Q35	0.556	0.520	0.525	0.484	0.103	-0.038
S4_Q37RC	0.220	-0.119	0.384	0.822	1.404	0.404
S4_Q38	0.480	0.823	0.692	0.442	0.475	1.104
S4_Q41	0.475	0.162	0.116	-0.030	0.316	0.571
S4_Q42	0.982	0.808	0.220	0.488	0.460	-0.214
S4_Q43	1.133	0.846	0.540	0.543	0.484	0.732
S4_Q44	0.373	0.360	0.156	0.162	-0.198	0.015

Covariance Matrix

	S4_Q35	S4_Q37RC	S4_Q38	S4_Q41	S4_Q42	S4_Q43
S4_Q35	1.401					
S4_Q37RC	0.436	2.580				
S4_Q38	0.305	0.421	1.942			
S4_Q41	0.119	0.717	0.679	2.253		
S4_Q42	0.775	0.483	0.525	1.598	3.249	
S4_Q43	0.714	0.474	0.268	0.687	1.508	2.660
S4_Q44	0.527	-0.145	0.413	0.902	1.161	0.824

Covariance Matrix

	S4_Q44
S4_Q44	1.642

Covariance Matrix for 50 Items

	S4_Q1RC	S4_Q2	S4_Q3	S4_Q4	S4_Q5	S4_Q6
S4_Q1RC	0.532					
S4_Q2	-0.035	1.901				
S4_Q3	0.117	0.603	0.687			
S4_Q4	0.011	0.689	0.551	1.232		
S4_Q5	-0.286	0.050	-0.078	0.111	1.294	
S4_Q6	-0.696	0.310	-0.186	0.230	1.956	4.124
S4_Q7	-0.538	1.138	0.044	-0.042	1.461	2.479
S4_Q8RC	-0.119	0.341	-0.082	-0.027	0.387	0.395
S4_Q9	-0.363	0.093	-0.027	0.060	0.423	0.872
S4_Q10	-0.522	0.571	0.067	0.123	0.780	1.597
S4_Q11	-1.311	1.520	0.220	0.528	1.517	2.958
S4_Q12	-0.570	0.689	0.222	0.387	0.626	1.344
S4_Q13	-0.524	0.516	0.072	0.206	0.784	1.378
S4_Q14	-0.833	0.312	0.001	-0.150	1.017	1.963
S4_Q15	-0.355	0.295	-0.056	-0.039	0.514	0.853
S4_Q16	-0.542	0.603	0.065	0.102	0.807	1.419
S4_Q17	-0.551	0.616	0.056	0.100	0.748	1.357
S4_Q18	-0.333	0.578	0.142	0.152	0.785	1.552
S4_Q19	-0.091	0.158	-0.014	-0.035	0.305	0.322
S4_Q20	-0.052	0.396	0.133	0.025	0.261	0.290
S4_Q21	-0.096	-0.036	-0.082	-0.082	0.252	0.237
S4_Q22	-0.038	-0.001	-0.075	-0.322	0.188	0.141
S4_Q23RC	0.043	-0.069	0.040	-0.044	0.381	0.609
S4_Q24	-0.357	0.426	0.143	0.126	0.336	0.926
S4_Q25RC	-0.132	0.290	0.051	0.119	0.395	0.511
S4_Q26	-0.251	0.450	0.163	0.058	0.392	0.794
S4_Q27	-0.356	0.124	0.124	-0.211	0.543	0.745
S4_Q28	-0.316	0.100	0.051	-0.070	0.603	0.983
S4_Q29	-0.219	0.255	0.013	0.011	0.378	0.887
S4_Q30	-0.419	0.445	-0.163	0.180	0.831	1.714
S4_Q31	-0.155	0.045	-0.021	0.172	0.449	0.932
S4_Q32	-0.277	0.578	-0.025	0.036	0.467	0.976
S4_Q33RC	-0.162	0.237	-0.042	0.000	0.067	0.290
S4_Q34	-0.063	0.590	-0.121	0.256	0.378	0.702
S4_Q35	-0.267	0.042	-0.089	-0.030	0.258	0.530
S4_Q36	-0.077	0.137	0.047	-0.075	0.362	0.443
S4_Q37RC	-0.209	0.119	-0.185	-0.192	0.250	0.626

S4_Q38	-0.090	0.140	-0.012	-0.022	0.360	0.641
S4_Q39	-0.066	-0.380	-0.110	-0.416	0.295	0.214
S4_Q40RC	-0.137	-0.033	-0.026	0.084	0.395	0.601
S4_Q41	-0.235	-0.284	-0.142	-0.450	0.293	0.529
S4_Q42	-0.314	-0.034	-0.239	-0.455	0.400	0.674
S4_Q43	-0.261	0.668	-0.060	0.079	0.294	0.742
S4_Q44	-0.301	-0.037	0.002	-0.099	0.294	0.355
S4_Q45	-0.412	0.536	-0.009	0.004	0.749	1.465
S4_Q46	-0.210	0.100	0.164	-0.025	0.447	0.617
S4_Q47RC	-0.068	-0.154	-0.101	-0.019	0.166	0.436
S4_Q48RC	-0.211	-0.348	-0.315	-0.393	0.419	0.711
S4_Q49RC	-0.282	0.266	-0.119	-0.069	0.424	0.783
S4_Q50	-0.023	-0.008	-0.218	-0.340	0.050	0.247

	S4_Q7	S4_Q8RC	S4_Q9	S4_Q10	S4_Q11	S4_Q12
S4_Q7	9.595					
S4_Q8RC	2.892	2.580				
S4_Q9	1.264	0.397	0.876			
S4_Q10	2.600	0.695	1.392	2.637		
S4_Q11	6.339	1.949	3.166	5.823	16.358	
S4_Q12	2.842	0.671	1.034	1.865	5.329	3.486
S4_Q13	2.537	0.456	0.777	1.434	4.170	2.375
S4_Q14	3.131	0.342	1.078	2.037	5.423	2.374
S4_Q15	1.798	0.574	0.703	1.291	3.573	1.480
S4_Q16	2.946	0.590	1.110	2.142	5.269	1.960
S4_Q17	3.373	0.989	1.314	2.433	6.473	2.533
S4_Q18	2.927	0.800	0.734	1.545	3.505	1.438
S4_Q19	0.824	0.380	0.377	0.744	1.794	0.653
S4_Q20	1.041	0.509	0.425	0.840	1.730	0.524
S4_Q21	0.195	0.019	0.094	0.047	0.318	0.252
S4_Q22	0.923	0.514	0.192	0.243	1.068	0.281
S4_Q23RC	0.924	0.467	-0.034	0.193	-0.131	0.280
S4_Q24	2.432	1.401	0.542	1.273	3.328	1.293
S4_Q25RC	1.727	1.193	0.313	0.770	1.779	0.372
S4_Q26	2.014	0.905	0.361	1.005	2.190	1.023
S4_Q27	1.716	0.525	0.522	0.850	2.084	0.842
S4_Q28	1.205	0.741	0.414	0.717	1.858	0.917
S4_Q29	1.698	1.126	0.448	0.991	2.800	1.071
S4_Q30	2.328	1.436	0.821	1.500	4.202	1.442

S4_Q31	1.483	0.673	0.451	0.811	2.200	0.898
S4_Q32	1.815	0.991	0.317	0.784	2.037	1.022
S4_Q33RC	1.003	0.609	0.270	0.721	1.238	0.540
S4_Q34	0.757	0.328	0.048	0.267	0.356	0.684
S4_Q35	0.612	0.341	0.299	0.433	1.350	0.798
S4_Q36	0.936	0.335	0.048	0.281	0.612	0.281
S4_Q37RC	1.318	0.612	0.221	0.409	0.942	0.464
S4_Q38	0.948	0.221	0.271	0.463	0.745	0.545
S4_Q39	0.378	0.070	0.021	0.033	-0.087	0.016
S4_Q40RC	1.649	0.519	0.213	0.401	0.980	0.649
S4_Q41	0.446	0.388	0.161	0.305	0.836	0.272
S4_Q42	0.794	0.733	0.368	0.662	1.745	0.895
S4_Q43	1.473	0.754	0.253	0.772	1.789	0.914
S4_Q44	0.188	0.140	0.196	0.250	0.766	0.581
S4_Q45	2.492	1.193	0.450	1.057	2.262	1.465
S4_Q46	0.621	0.671	0.487	0.752	1.444	0.554
S4_Q47RC	0.284	0.011	-0.014	0.058	-0.006	-0.055
S4_Q48RC	0.679	0.306	0.083	0.277	0.536	0.222
S4_Q49RC	0.699	0.392	0.098	0.372	0.892	0.231
S4_Q50	0.692	0.214	0.083	0.241	0.595	0.521

	S4_Q13	S4_Q14	S4_Q15	S4_Q16	S4_Q17	S4_Q18
S4_Q13	2.435					
S4_Q14	2.562	5.156				
S4_Q15	1.246	1.780	1.567			
S4_Q16	1.743	3.251	1.739	4.326		
S4_Q17	2.232	3.526	1.910	4.007	5.156	
S4_Q18	1.527	1.782	1.101	1.999	2.436	3.062
S4_Q19	0.556	0.804	0.380	0.960	1.147	1.288
S4_Q20	0.678	0.908	0.451	0.819	1.115	1.527
S4_Q21	0.324	0.399	0.151	-0.027	0.208	0.575
S4_Q22	0.232	0.573	0.379	0.339	0.653	0.720
S4_Q23RC	0.247	0.510	0.173	-0.181	0.032	0.139
S4_Q24	1.091	1.743	0.879	0.783	1.142	0.598
S4_Q25RC	0.491	0.510	0.565	0.396	0.593	0.557
S4_Q26	0.764	1.511	0.824	1.347	1.216	0.722
S4_Q27	0.766	1.639	0.569	1.668	1.736	0.810
S4_Q28	0.915	1.189	0.595	0.715	1.126	0.746
S4_Q29	0.752	1.498	0.789	1.221	1.629	0.933
S4_Q30	1.278	1.829	1.052	1.646	2.146	1.087

S4_Q31	0.820	1.120	0.821	0.973	1.266	0.714
S4_Q32	1.000	0.987	0.755	1.008	1.283	1.114
S4_Q33RC	0.430	0.329	0.111	0.411	0.627	0.091
S4_Q34	0.526	0.383	0.207	0.403	0.622	0.541
S4_Q35	0.857	1.134	0.510	0.742	0.989	0.700
S4_Q36	0.435	0.780	0.138	0.761	0.761	0.607
S4_Q37RC	0.314	0.317	0.389	0.194	0.298	0.170
S4_Q38	0.460	0.354	0.240	0.511	0.687	0.707
S4_Q39	0.078	0.254	0.024	0.279	0.255	0.110
S4_Q40RC	0.556	0.395	0.149	0.325	0.506	0.596
S4_Q41	0.171	0.796	0.362	0.713	0.551	0.211
S4_Q42	0.703	1.164	0.497	0.861	0.887	0.442
S4_Q43	0.681	1.010	0.644	1.007	1.225	0.795
S4_Q44	0.497	1.139	0.384	1.030	0.791	0.437
S4_Q45	1.098	1.035	0.858	0.962	1.334	1.178
S4_Q46	0.372	0.905	0.500	1.242	1.586	0.936
S4_Q47RC	0.199	0.471	0.023	0.354	0.009	-0.013
S4_Q48RC	0.294	0.580	0.262	0.410	0.270	0.149
S4_Q49RC	0.371	1.026	0.314	0.562	0.293	-0.171
S4_Q50	0.497	0.648	0.356	0.573	0.476	0.623

	S4_Q19	S4_Q20	S4_Q21	S4_Q22	S4_Q23RC	S4_Q24
S4_Q19	1.504					
S4_Q20	1.289	2.689				
S4_Q21	0.584	1.217	1.390			
S4_Q22	0.712	1.375	1.013	3.043		
S4_Q23RC	-0.113	-0.228	-0.258	0.288	1.654	
S4_Q24	-0.005	0.170	-0.678	1.513	1.808	6.899
S4_Q25RC	0.002	-0.109	-0.367	0.536	1.038	3.068
S4_Q26	0.141	-0.175	-0.433	-0.238	0.873	2.174
S4_Q27	0.562	0.477	0.137	0.154	-0.070	1.400
S4_Q28	0.507	0.511	0.356	0.240	0.393	1.471
S4_Q29	0.359	0.689	0.268	0.380	0.404	1.479
S4_Q30	0.143	0.367	0.410	0.461	0.158	1.245
S4_Q31	0.213	0.448	0.336	0.550	0.489	1.233
S4_Q32	0.413	0.405	0.074	0.704	0.638	1.780
S4_Q33RC	-0.198	-0.213	-0.496	0.036	0.706	2.354
S4_Q34	0.207	0.367	0.183	0.560	0.242	1.070
S4_Q35	0.486	0.440	0.241	0.340	0.001	0.328
S4_Q36	0.712	0.510	0.223	0.780	0.226	1.147

S4_Q37RC	-0.249	-0.430	-0.506	0.335	0.759	2.172
S4_Q38	0.389	0.101	-0.176	-0.003	0.075	0.523
S4_Q39	0.441	-0.015	0.136	0.498	0.112	0.154
S4_Q40RC	0.283	-0.104	-0.223	0.326	0.818	1.656
S4_Q41	0.359	-0.185	-0.198	0.009	0.288	1.000
S4_Q42	0.724	-0.086	-0.003	-0.322	0.210	0.727
S4_Q43	0.591	0.489	0.203	0.206	0.134	0.683
S4_Q44	0.536	0.072	0.073	0.005	-0.050	-0.056
S4_Q45	0.591	0.402	0.177	0.347	0.602	1.393
S4_Q46	1.061	0.941	0.471	1.230	0.051	0.226
S4_Q47RC	-0.259	-0.299	-0.160	-0.396	0.283	0.199
S4_Q48RC	0.087	-0.150	0.057	0.069	0.327	0.119
S4_Q49RC	-0.174	-0.039	0.150	-0.104	0.365	0.173
S4_Q50	0.362	0.109	-0.158	0.152	-0.065	0.691

	S4_Q25RC	S4_Q26	S4_Q27	S4_Q28	S4_Q29	S4_Q30
S4_Q25RC	2.397					
S4_Q26	1.285	3.066				
S4_Q27	0.304	1.052	3.429			
S4_Q28	0.652	1.008	1.826	2.553		
S4_Q29	0.683	1.237	1.223	1.676	2.660	
S4_Q30	0.821	0.977	1.237	1.404	2.233	4.244
S4_Q31	0.716	0.874	0.393	0.570	1.265	1.663
S4_Q32	1.130	0.687	0.521	0.771	0.755	1.167
S4_Q33RC	1.431	0.974	0.338	0.751	0.786	0.560
S4_Q34	0.520	1.295	-0.047	0.233	0.823	0.564
S4_Q35	0.207	0.224	0.686	0.690	0.556	0.520
S4_Q36	0.579	0.167	0.965	0.885	0.559	0.516
S4_Q37RC	1.247	0.936	0.087	0.232	0.220	-0.119
S4_Q38	0.503	0.802	0.663	0.488	0.480	0.823
S4_Q39	0.123	0.008	0.671	0.456	-0.098	-0.106
S4_Q40RC	1.140	0.689	-0.057	0.150	0.141	0.165
S4_Q41	0.480	1.077	0.841	0.694	0.475	0.162
S4_Q42	0.347	1.125	1.233	1.376	0.982	0.808
S4_Q43	0.513	0.803	0.410	0.734	1.133	0.846
S4_Q44	-0.080	0.377	0.876	0.543	0.373	0.360
S4_Q45	0.907	0.921	0.899	1.054	0.986	1.471
S4_Q46	0.363	-0.039	0.766	0.456	0.144	0.569
S4_Q47RC	0.237	0.337	0.237	0.177	0.271	0.599

S4_Q48RC	0.247	0.381	0.561	0.587	0.418	0.794
S4_Q49RC	0.172	0.200	0.317	0.594	0.679	0.756
S4_Q50	0.155	0.648	0.682	0.281	0.319	0.359

	S4_Q31	S4_Q32	S4_Q33RC	S4_Q34	S4_Q35	S4_Q36
S4_Q31	1.802					
S4_Q32	0.777	2.109				
S4_Q33RC	0.277	0.950	2.797			
S4_Q34	0.700	0.119	0.537	3.711		
S4_Q35	0.525	0.484	0.103	-0.038	1.401	
S4_Q36	0.049	0.631	0.390	0.239	0.408	1.786
S4_Q37RC	0.384	0.822	1.404	0.404	0.436	0.349
S4_Q38	0.692	0.442	0.475	1.104	0.305	0.328
S4_Q39	-0.196	0.301	-0.167	-0.181	0.180	0.725
S4_Q40RC	0.464	0.783	0.923	0.399	0.235	0.371
S4_Q41	0.116	-0.030	0.316	0.571	0.119	0.245
S4_Q42	0.220	0.488	0.460	-0.214	0.775	0.505
S4_Q43	0.540	0.543	0.484	0.732	0.714	0.546
S4_Q44	0.156	0.162	-0.198	0.015	0.527	0.300
S4_Q45	0.916	1.181	0.191	0.681	0.551	0.804
S4_Q46	0.330	0.880	-0.086	0.242	0.508	0.793
S4_Q47RC	0.262	-0.011	0.025	0.010	0.084	0.176
S4_Q48RC	0.356	0.374	0.020	-0.232	0.270	0.432
S4_Q49RC	0.178	0.428	0.013	-0.126	0.382	0.399
S4_Q50	0.294	0.287	0.183	0.558	0.425	0.391

	S4_Q37RC	S4_Q38	S4_Q39	S4_Q40RC	S4_Q41	S4_Q42
S4_Q37RC	2.580					
S4_Q38	0.421	1.942				
S4_Q39	0.134	0.220	1.366			
S4_Q40RC	1.220	0.638	0.425	2.012		
S4_Q41	0.717	0.679	0.711	0.365	2.253	
S4_Q42	0.483	0.525	0.783	0.079	1.598	3.249
S4_Q43	0.474	0.268	0.179	-0.036	0.687	1.508
S4_Q44	-0.145	0.413	0.636	0.133	0.902	1.161
S4_Q45	0.576	0.572	0.351	0.746	0.312	0.999
S4_Q46	-0.024	0.179	0.718	0.355	0.246	0.535

S4_Q47RC	0.118	0.181	-0.101	0.045	0.233	0.246
S4_Q48RC	0.395	0.454	0.383	0.175	0.661	0.883
S4_Q49RC	0.359	-0.153	0.222	0.021	0.400	0.481
S4_Q50	0.437	0.783	0.308	0.090	0.657	0.914

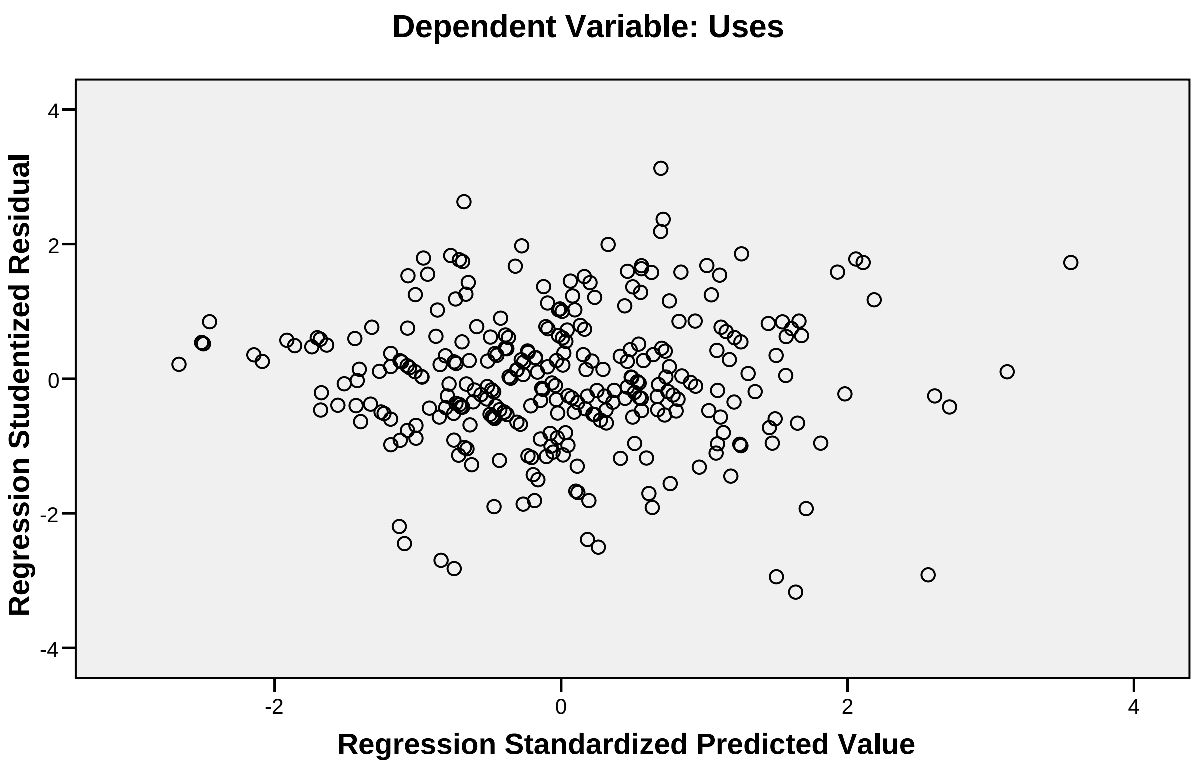
	S4_Q43	S4_Q44	S4_Q45	S4_Q46	S4_Q47RC	S4_Q48RC
S4_Q43	2.660					
S4_Q44	0.824	1.642				
S4_Q45	1.164	0.442	3.486			
S4_Q46	0.709	0.521	1.253	3.343		
S4_Q47RC	-0.054	0.116	0.194	-0.276	1.083	
S4_Q48RC	0.237	0.370	0.637	0.061	0.722	1.531
S4_Q49RC	0.430	0.375	0.815	-0.050	0.719	1.005
S4_Q50	0.797	0.550	0.490	-0.068	-0.045	0.253

	S4_Q49RC	S4_Q50
S4_Q49RC	2.081	
S4_Q50	-0.084	1.997

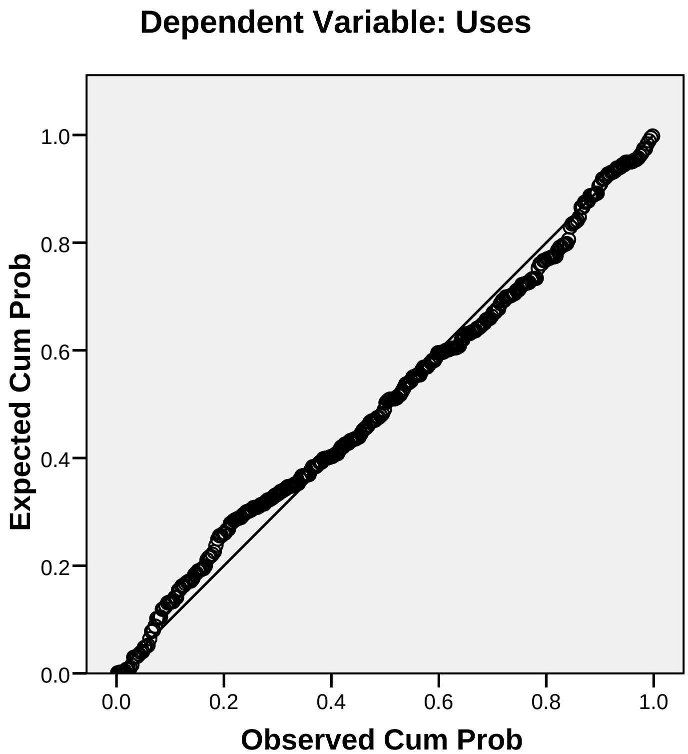
APPENDIX I

THE RESIDUAL PLOTS AND NORMAL PROBABILITY PLOTS

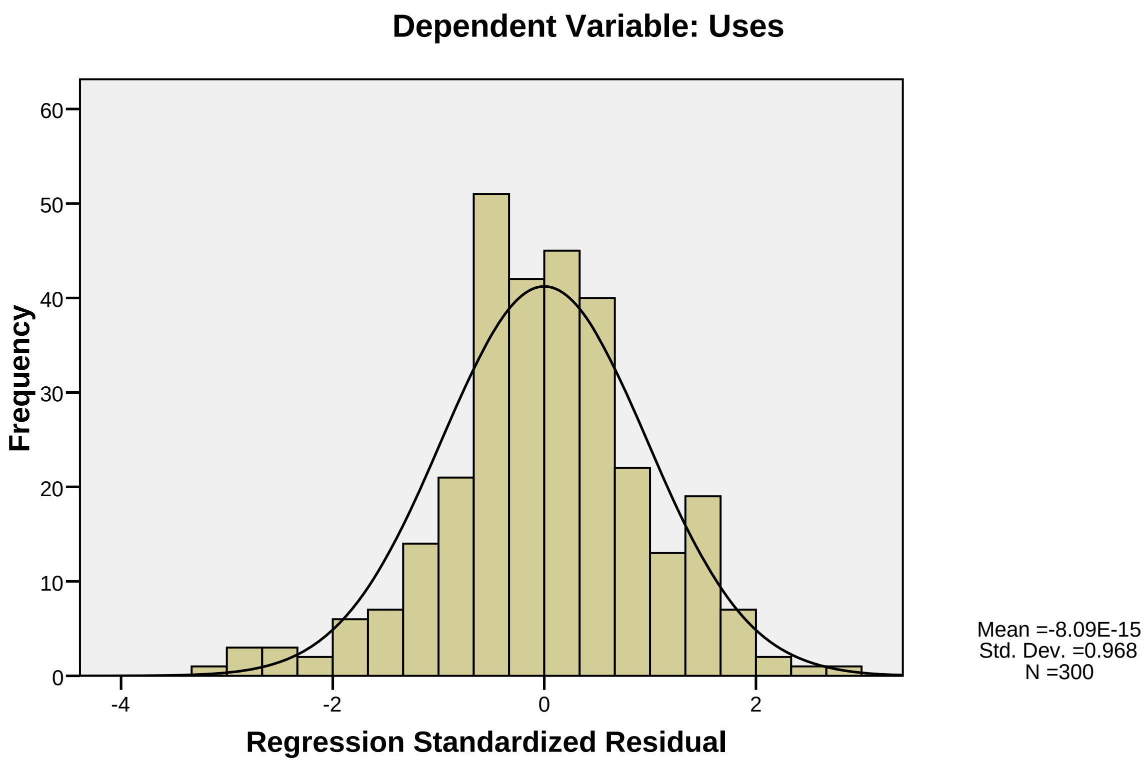
Scatterplot



Normal P-P Plot of Regression Standardized Residual



Histogram



Dependent Variable: Uses
Frequency
60
50
40
30
20
10
0
-4
-2
0
2
Regression Standardized Residual
Mean =-8.09E-15
Std. Dev. =0.968
N =300

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