An Examination of ICT Skills Possession and Adoption amongst Faculty Members at Jordan University of Science and Technology (JUST) in Relation to Rogers' Diffusion of Innovation Model

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***Abstract*:** This study aimed at examining possession and adoption of Information and Communications Technology (ICT) amongst faculty members at Jordan University of Science and Technology (JUST). The study further sought to identify JUST faculty members' ICT adoption Categories according to Roger's adoption theory and the motivation factors that affect their ICT adoption. The population for this study consisted of all faculty members teaching at JUST. A questionnaire and a structured interview were developed to gather the required information. Cronbach alpha procedure was used to obtain the reliability estimate of the internal consistency of the questionnaire, which was found to be 0.95. Findings revealed that JUST faculty members had low to high levels of both their ICT skills and the degree to which they incorporated ICT in their instruction. This study also identified several innovation factors that influenced JUST faculty members' adoption and use of ICT in instruction. The study indicated that the JUST faculty members were encouraged to adopt and use current ICT as a teaching tool by their degree of innovativeness. The largest proportion of the JUST faculty members in this study identified themselves as early adopters of ICT in instruction.

Key Words: Higher Education, Information and Communications Technology, Diffusion of Innovation Theory.

Background for the Study

It is well recognized that Information and Communication Technology (ICT) has immense plausible potential for the structural growth of a country. The new information and communication technologies of Internet and multimedia have revolutionized the field of education. According to Zandvliet & Straker (2001), ICT use is increasing in nearly all facets of life in the developing world and its use is now progressing rapidly in many educational institutions. In order to equip students with professional knowledge and skills in line with the goals of higher education, It is quite important that faculty members at universities use ICT in their courses and reach related sources when necessary (Cagiltay & Yildirim, 2007). ICTs are

the most important of all the technologies that enrich and facilitate the learning experiences of students from various abilities (Roberson, 2001). However, some researchers assert that higher education institutions have been slow to adopt such technological change (Mehra and Mital, 2007; Shuva, 2010). This is because the successful integration of technology is not simple as it may seem because of its dependence on several inseparable variables (Roblyer, 2006). In addition to being time consuming and expensive, technology may confuse, intimidate and frustrate learners and users (Mehra and Mital, 2007) resulting in slow adaptation. Educators have additional needs in this learning process as they are urged to immediately and proficiently bring the new learning to significant educational applications in their classrooms. Consequently, successful technology integration depends on overcoming issues with staff development (Holland, 2001; Ray, 2009; Shuva, 2010), investment in hardware and software (e.g., Casey, 1995), leadership (Leigh, 2000; Akbaba-Altun, 2004), curriculum (e.g., Hakkarainen, 2000). In line with this argument, Colins (1990) stated that ICT integration is not merely the installation of software or hardware in schools, stressing that the integration process should include a number of factors like curriculum for the effective use of technology in education, in-service training, and the infrastructure. In higher education, this comprehensive integration process primarily includes students, faculty members and the administrators of the institution. In order to increase ICT use at universities, first of all, the faculty members should be willing to use these technologies in their courses and be able to reach sources when necessary (Cagiltay & Yildirim, 2007). Studies in the related literature revealed that for an effective integration of ICT into the teaching learning process, it is necessary to give in-service training to faculty members who play key roles in the school and that the in-service training activities should meet the individual needs of the faculty members (Galanouli, Murphy & Gardner, 2004). While determining the individual needs regarding the use of ICT in the teaching-learning process, it is necessary to determine what individuals say, desire and do. Therefore, it is necessary to take especially the views of participants like administrators and faculty members who take place in the ICT integration process.

To understand the stages in which faculty members progress to adopt ICT in their instruction, it is important to consider Rogers' diffusion and adoption of innovation Theory. Rogers' diffusion of innovation research (2003) provides a framework for understanding the diffusion process, the decision-making process related to adoption, and the varying adoption categories within a social system. Rogers identified five factors that strongly influence whether or not someone will adopt an innovation. These factors are: relative advantage, complexity, compatibility, trialability and observability. The relative advantage is the degree to which the adopter perceives the innovation to represent an improvement in either efficiency or effectiveness in comparison to existing methods. Trialability refers to the capacity to

experiment with the new technology before adoption. Observability or visibility refers to the ease and relative advantage with which the technology can be seen, imagined, or described to the potential adopter. Rogers identified four main elements that affect the adoption of innovation: (1) the innovation, (2) communication channels, (3) time, and (4) the social system. The innovation is the new product or service. The communication channel is the means by which messages are transmitted from one individual to another. Time refers to the amount of time it takes to adopt the new innovation. The social system is the set of interrelated units that are devoted to joint problem-solving, to accomplish a common goal (Rogers, 2003).

Problem of the Study

The research has been conducted at Jordan University of Science and Technology (JUST). JUST is a comprehensive, state-supported university located on the outskirts of Irbid at Ar Ramtha region, in northern Jordan. Since its establishment in 1986, JUST has been at the forefront of institutions of higher learning in the Arab world, it also maintains a high reputation and standard amongst the universities of the Middle East. At the present time, the university comprises 12 faculties and 55 departments providing 52 bachelor's degree and 95 postgraduate programs. Students at the university are inspired by an outstanding and rewarding academic environment not only in Jordan but also in the region.

Jordan University of Science and Technology (JUST) is increasingly looking to ICT as a technical aid in the development of new models of teaching and learning to equip students with professional knowledge and skills in line with the delineated goals of higher education in Jordan. To effectively integrate ICT in teaching practices of the faculty members, JUST has invested millions of Jordan Dinars to build world-class ICT infrastructures. However, a close observation of the faculty members' teaching practices revealed that they may not be effectively integrating ICT into their instruction as a teaching tool. Also, the integration of ICT into curriculum and instruction at JUST is a rather slow process. Informal discussions with faculty members revealed several factors for the slow integration and adoption of ICT in instruction at JUST. Faculty members' willingness to use ICT in their courses, lack of time, lack of knowledge and training in ICT and the inability to reach sources when necessary were among the main factors limiting the integration of ICT into faculty members' own way of teaching. Moreover, close observation of faculty members' practices at JUST showed that they do not consider ICT necessary for their teaching activities but use technology to support their traditional applications.

Significance of the Study

The results of this study provide a baseline measurement of the level of ICT possession and integration by faculty members within the overall curriculum for each specialization offered at JUST. This measurement provides useful information for decision makers at JUST and faculty members examining their own ICT integration efforts, as well as establishing a focus for future curriculum development endeavors in all program areas offered at JUST. Furthermore, there was a lack of research through a review of the literature that shed light on how faculty members at JUST utilize ICT in their instruction.

Purpose and Study Objectives

The purpose of this study was to determine the level of ICT possession and use by faculty members at JUST. The study further sought to determine the barriers to ICT integration in JUST. Specifically, objectives of the study were to:

1. Identify the personal characteristics of faculty members at JUST.
2. Identify Faculty members' ICT level.
3. Identify the extent to which Faculty members adopt ICT as a teaching tool?
4. Identify if there is a significant difference within the personal characteristics of JUST faculty members and their level of ICT possession.
5. Identify if there is a significant difference within the personal characteristics of JUST faculty members and the extent to which they use current ICT as a teaching tool?
6. What are the innovation factors that influence Just Faculty members' adoption of Computer technology for instructional delivery?
7. Identify JUST faculty members' ICT adoption categories in accordance with Rogers' (2003) adopter categorization theory.

Review of the Related Literature

ICT revolution has brought drastic changes to the area of education. It has revolutionized the way students learn and how instructors teach in the classrooms. The permeation of ICT into classrooms has created the opportunities for students to be active learners and allowed instructors to be facilitators (Aduwa-Ogiegbaen and Iyamu, 2005). There is no doubt that computer can aid the instructional process and facilitate students' learning. Many studies have found positive effect associated with technology aided instruction (Fitzgerald and Warner, 1996). In the more advanced industrialized nations, there has been astounding amount of research and publication related to ICT use for educational purposes during the past two decades. Two meta-analysis studies of early research efforts investigating computer-based instruction reported increased achievement scores, reductions in necessary learning times, and improved attitudes toward

instruction (Kulik & Kulik, 1987) and statistically positive effects on a majority of the areas examined (Roblyer, 2006). Kang (1995) concluded that wise selection of ICT materials for instruction plays a crucial role in developing students' critical thinking skills. Waschauer (1996) contend that ICT can enhance students' motivation by helping them gain knowledge and skills about using computers, giving plenty of opportunities to communicate electronically, and carefully integrate computer activities into the regular structure of the lesson for meaningful learning. ICT can enhance research skills in finding relevant resources; organizational skills in analyzing information; and presentation skill in communicating information efficiently and effectively (Morrall, 1999).

Incorporating ICT into instruction can provide learners in higher education institutions with potential access to the world of work outside of the institutions. For instance, using the World Wide Web instructors and learners can be connected to the workplace. Multimedia technology can be utilized to create a problem-solving environment. Career exploration and on-the-job experiences can be facilitated using video conferencing by connecting learners to a wide range of staff and workers in various companies and other workplaces. Thus, instructors and learners can be kept updated concerning knowledge and skills needed in the workplace. Incorporating ICT into higher education institutions provides an alternative training method that has the potential to revolutionize the training process of our future workers in all fields. Some of the benefits that can be achieved include less time to complete; self-paced learning; automated testing, grading, and reporting of results; and an opportunity to update previous training materials (Hoffman, 1998).

However, the process of ICT integration at higher education institution faces a myriad of barriers. In their research, Jenson, Lewis & Smith (2002) summarized these barriers as limited equipment, inadequate skills, minimal support, time constraints, and the educators' own lack of interest or knowledge about computers. Aduwa-Ogiegbaen & Iyamu (2005) reported the effort of ICT usage and obstacles to use ICT in Nigeria. They claimed the obstacles for ICT use in higher education institutions as cost, weak infrastructure, lack of skills, lack of relevant software, and limited access to the Internet. In addition, Warschauer (2003) and Al-Senaidi, Lin, & Poirot, (2009) found that technology integration is constrained by political, cultural, and economic factors.

Aoki (2010) claimed that the application of technologies in higher education in Japan is far behind of other developed countries. Lack of interest of students towards their study prevails and teachers continue ignoring such student attitudes. E-learning, which is supposed to revolutionalize the way people learn as it has potentials to enable more student-centered learning, has not been realized in Japan and mostly used to perpetuate the teacher-centered teaching in a different format. According to the study conducted in 2008 by the National Institute of Multimedia Education (2009), 73.1 percent

of the higher education institutions surveyed have implemented ICT in teaching and learning while 16.9 percent of the institutions responding had no plan of implementing. As for the implementation of e-learning, 39.1% of the respondents said they were offering e-learning in combination with classroom instructions (i.e., blended learning). In terms of the development of actual contents of learning materials, 69.1 percent of those surveyed said faculty members create on their own without any institutional help. Only 36.1 percent said some institutional unit is responsible for the creation. In terms of the use of ICT tools, 48.1 percent of the universities and 27.1 percent of junior colleges said they had used an authoring tool to create educational content. As for the use of learning management systems (LMS), 52.8 percent of the universities and 46.4 percent of the junior colleges are using it.

Alba and Zubillaga (2010) conducted a study to investigate the use of ICT in different teaching and research activities among academic staff of the Complutense University of Madrid (Spain). The results showed large differences among the technologies used and the extended presence of the communication tools. Results also revealed the instrumental orientation of the training already received, and the identified training needs, in order to integrate these resources in their teaching and to actively participate in building the European Higher Education Area. Data from the study also indicated the need of suitable training for relevant educational uses of ICT in faculty members' teaching, to support learning and methodological integration of technology resources.

Krishnaveni and Meenakumari (2010) evaluated the usage of ICT for information administraton in higher education institutions in INDIA. The study found that current level of usage indicates a clear integration of ICT for managerial or information-based administration in higher education institutions. The study also revealed that demographic factors do not have major impact on Information administration in higher education institutions . Vajargah, Jahani, and Azadmanesh (2010) conducted a study to explore faculty members' ICT use in Higher education in Iran. Findings revealed unfamiliarity of academics with software, lack of culture of working in web environment, and faculty and student disability in using ICT in teaching and leaning. Findings also revealed that there are several challenges pertaining to ICT application in Iran such as lack of National Policy for using ICT in Higher Education, lack of adequate investments, cultural obstacles, financial challenges, lack of continuity in ICT use, and lack of systematic training and development programs.

According to Tearle (2004), for an effective ICT integration it is important that an appropriate, flexible, strategic and functional plan should be developed that touch on all the aspects of ICT integration; enough time should be allocated to determine the needs; the developed plan should be disseminated among faculty members responsible for the integration process; the current and future needs of faculty members should be

determined; and the needs for cooperation, reflection and examination should be determined to increase the effectiveness of ICT use. In addition, Colins (1990) has stated that ICT integration is not merely the installation of software or hardware in schools, stressing that the integration process should include a number of factors like curriculum for the effective use of technology in education, in-service training, and the infrastructure.
Rogers' diffusion and adoption theory relates specifically to this paper and will provide the theoretical framework to assess the faculty members' adoption of ICT in their teaching at JUST.

Methodology

This study employed both quantitative as well as qualitative procedures and data were collected by two types of data collection instruments: questionnaires and interviews.

Population and Sample of the Study

The population of this study consisted of all faculty members teaching at JUST, (n= 618), 555 males and 63 females working at 12 faculties in the second semester of the academic year 2009/2010. Of those, 193 faculty members (163 males and 60 females) were chosen as the sample of the study using a multi-stage random sampling approach.

The Questionnaire

The study used a survey through a self–rating questionnaire containing two checklists which examine the degree of ICT competencies faculty members have and the extent to which they incorporate ICT skills in various teaching learning situations in schools. This insight may help the authorized personnel at JUST to better appreciate Faculty members' ICT needs and to provide appropriate support in in-service professional development programmes. The responses were recorded using a 3-point continuous Likert rating scale with values ranging from 1 to 3, with 1 representing "to a low extent" and 3 representing "a great extent".
The development of the instrument was accomplished through the following two stages:

1. A preliminary list was compiled consisting of ICT competencies elicited through a documentary study on literature of ICT application in higher education.
2. Eight members of ICT teaching staff at Yarmouk University were asked to review the revised list and provide feedback.

Validity and Reliability of the Questionnaire

Seven technology education specialists content validated all the items in the questionnaire. The items were also checked for clarity. Five qualified persons with vast experience in the field of computer technology were also

asked to validate the items. All twelve content validators found the items to be suitable for the Jordanian context.

An English translation was carried out on items to ensure that their contents in Arabic language were equivalent to the English version. Experts in translating Arabic into English were asked to translate the questionnaire. They examined all translated statements for appropriate language and word usage and made suggestions about items terminology to enhance clarity and brevity.

The experts also agreed that the meanings of both versions were consistent. The instrument was pilot tested on a group of faculty members at JUST (n=20) who belong to various program areas. Faculty members selected for the pilot study were not included in the main study. Reliability tests utilizing the SPSS Version 16.0 for Windows program were conducted on the total questionnaire as well as the four sub-domains included. An overall reliability alpha coefficient of 0.92 was calculated. Reliability alpha coefficients on the four domains of the questionnaire were: instructional software use, 0.91; information literacy skills, 0.90; modification of instructional delivery, 0.90; and assessment of student performance, 0.92.
To ensure the internal reliability Coronach alpha was utilised for the purpose of obtaining the correlation coefficient, which was found to be (0.95). This value is considered acceptable in educational studies.

Data Collection Procedures

One of the researchers, who is a faculty member at JUST, distributed the questionnaires in person. Prior to the administration of the questionnaire, the researcher verbally explained the study background and purpose and instructed JUST faculty members on how to fill in the questionnaire**.** The presence of the researcher in JUST was useful in obtaining a rich picture of ICT-related activities and an understanding of the realities of ICT use.

The Interviews

Structured interviews were developed to gain a deeper insight into faculty members' general attitudes towards computers and their ICT skills and the degree to which they applied these skills in their teaching. Moreover, there was a need to identify factors affecting faculty members' use of ICT and the types of knowledge training sessions and expertise which they considered important and were likely to promote their ability to integrate ICT into their teaching. The main purpose of the structured interviews was to elicit responses related to the following issues:

1. Identifying How important certain innovation factors would be in encouraging JUST faculty members to adopt emerging computer technology for instruction.

2. Identifying how important certain factors have been in JUST faculty members' decision to adopt emerging computer technologies in the delivery of instruction.
3. Exploring JUST faculty Members' dispositions Toward the Adoption of Computer Technology.

Eighty-two faculty members from various program areas were selected. Structured interviews were held with the faculty members individually in their offices at JUST. All faculty members were asked the same core questions and the interviewer ticked in the category that corresponds with their responses. For each category of responses, the interviewer probed JUST faculty members for the meaning of their responses.

Validity and Reliability of the Interviews

Questions for the study were pre-written in both Arabic and English and were read to the participants in Arabic. If participants requested, the interview schedule was shown to them to aid in the process of understanding. During the interview, Arabic was the primary language used for communication. When necessary, English was added to improve understanding.

The interviews were translated into English and analyzed quantitatively by the researchers based on frequencies and percentages of responses on the issues relevant to this study. In addition, two members of the teaching staff at Yarmouk University with language proficiency in both Arabic and English were invited to check the translation so as to eliminate translation errors or semantic misunderstanding.

It is also worth mentioning that the study addressed JUST faculty members during their regular work throughout the semester, rather than under special circumstances, such as teaching a new curriculum or participating in an in-service course. Therefore, we believe that the context of the study described above contributed to the validity of the outcomes.

Data Analysis

The responses which required a tick response were coded numerically and entered on an SPSS database. To analyze the data gathered from faculty members, mean scores and standard deviations were computed for responses to each item on the questionnaire. The questionnaire covered four ICT-related areas. These were instructional software use, information literacy skills, modification of instructional delivery, and assessment of student performance. For interpretation purposes and in accordance with the Likert scale used in the questionnaire, faculty members' ICT level was segmented into three categories high, moderate, and low. Teachers with a high ICT ability level were those whose rating among the items pertaining to a certain ICT related area averaged at least 2.5. Teachers who possessed a moderate level of ICT ability were those whose ratings among the items pertaining to a certain ICT related area averaged from 1.5 to less than 2.5.

Teachers who possessed a low ICT ability level were those whose rating among the items pertaining to a certain ICT related area averaged less than 1.5. The same procedure was applied for faculty members' degree of the use of ICT for instructional delivery.

The t-test was used to determine statistically significant differences attributed to "gender" variable on the responses of the participants. One way ANOVA-test was used to determine statistically significant differences attributed to "specialization" and "ICT related training" variables on the responses of the participants.

Frequencies and percentages for the issues related to the main purpose of the interviews were provided.

Findings and Discussion of the Study

Findings and Discussion from the questionnaires

The first objective of the study was to determine the perceived ICT skill levels possessed by JUST faculty members and the degree to which they use these skills in their instruction. With regard to possession, Table 1 revealed that JUST faculty members rated themselves (between 1.72 and 2.77) on all the ICT skills related to the area of basic computer skills. This range indicates moderate to high level of possession of the listed ICT skills among faculty members. The respondents rated themselves in the moderate category regarding the use of the listed basic computer skills with average scores between 1.62 and 2.37.

Table 1: Means and Standard Deviations for Items in the Domain of Basic Computer Skills

N	Items	Possession			Use		
		Mean	SD	Rank	Mean	SD	Rank
1	Setting-up the computer and its peripheral devices	2.76	0.57	2	2.14	0.87	5
2	Loading various software	2.31	0.78	7	2.12	0.91	7
3	Utilizing a printer	2.76	0.43	2	2.37	0.87	1
4	Using various operating system tools	2.56	0.50	4	2.10	0.89	8
5	Troubleshooting simple computer malfunctions	2.01	0.81	11	2.07	0.85	9
6	Using a digital camera	2.14	0.88	9	1.98	0.86	11
7	Formatting disks	2.37	0.74	5	2.22	0.87	4
8	Operating two pieces of software simultaneously	2.34	0.81	6	2.13	0.92	6
9	Choosing computer software suitable for students with special needs	2.00	0.93	12	1.94	0.93	12
10	Assisting others to use basic computer operating systems	2.04	0.81	10	2.07	0.88	9
11	Using the Internet	2.72	0.62	3	2.31	0.93	3
12	Designing a Home Page	1.72	0.90	13	1.62	0.87	13
13	Using E-mail	2.77	0.46	1	2.33	0.92	2
14	Using a scanner to insert pictures, graphs and drawings into instructional software	2.27	0.84	8	2.01	0.90	10

Table 2 indicates that JUST faculty members' ratings of their ICT level in the area of designing instructional software lessons fell in the low to moderate category with mean scores ranging from 1.40 to 2.23. Designing instructional software lessons using PowerPoint was the single listed computer resource in this domain to receive the highest mean possession score (M=2.23). It also appears that this computer skill was the most widely used in the classroom by JUST faculty members. This skill achieved a mean score of 2.10 indicating a moderate degree of use of this skill by JUST faculty members in Jordanian vocational schools. Regarding JUST faculty members' ratings of the ICT skills pertaining to this domain, Table 2 indicates that JUST faculty members' level of use fell in the low to moderate categories with mean scores ranging from 1.27 to 2.10. Nine ICT skills in this domain were rated above 1.50 (moderate category). The remaining skills were rated in the low category with mean scores ranging from 1.27 to 1.47.

Table 2: Means and Standard Deviations for Items in the Domain of Designing Instructional Software Lessons

N	Items	Possession			Use		
		Mean	SD	Rank	Mean	SD	Rank
15	Designing a Web Page	1.53	0.86	11	1.47	0.85	8
16	Designing instructional software using a video and digital camera	1.55	0.86	10	1.38	0.76	12
17	Designing instructional software that suits students' characteristics	1.60	0.85	7	1.47	0.76	8
18	Designing instructional software appropriate to various instructional settings	1.67	0.90	6	1.62	0.85	4
19	Designing and developing instructional software using programming languages	1.55	0.84	10	1.40	0.81	11
20	Designing instructional software suitable for students with special needs	1.40	0.74	15	1.38	0.71	12
21	Getting students involved in designing and developing multimedia-based projects	1.59	0.77	8	1.38	0.74	12
22	Designing instructional software using authoring tools	1.44	0.75	14	1.27	0.65	13
23	Designing instructional software lessons using PowerPoint	2.23	0.93	1	2.10	0.91	1
24	Incorporating sound and animation effects into the instructional software	1.90	0.84	2	1.52	0.66	7
25	Hyper linking PowerPoint-based instruction with Visual Basic	1.73	0.84	4	1.44	0.64	9
26	Recording audio materials into instructional software suitable for the content	1.50	0.75	12	1.40	0.63	11
27	Publishing instructional software on the Internet	1.53	0.77	11	1.52	0.71	7
28	Designing an instructional web site on the Internet	1.69	0.88	5	1.55	0.76	6
29	Use personally designed web-based lectures, notes, and tutorials	1.58	0.77	9	1.60	0.77	5
30	Use personally designed web-based tests or quizzes	1.77	0.89	3	1.73	0.88	2
31	Enable and support student group work in virtual environments	1.46	0.79	13	1.42	0.69	10
32	Enable and support collaboration among students via web-based programs	1.53	0.79	11	1.60	0.83	5
33	Conduct academic advising in virtual environments (e.g., email, discussion board)	1.58	0.80	9	1.71	0.87	3

The findings pertaining to JUST faculty members' perceived skill levels and use of ICT in instruction relating to the area of computer software use are presented in Table 3. The findings indicate that power point appears to be the computer software most widely possessed (M=2.74) whereas, word processor was the most widely used in the classroom by faculty members (M=2.05). In terms of possession the teachers rated themselves in the high category with mean scores ranging from 1.94 to 2.74. With regard to the degree of the use of these ICT skills, JUST faculty

members' rated themselves in the low to moderate category with mean scores ranging between 1.46 and 2.05.

Table 3: Means and Standard Deviations for Items in the Domain of "Computer Software Use"

N	Items	Possession			Use		
		Mean	SD	Rank	Mean	SD	Rank
34	Using a word processor	2.18	0.92	5	1.93	0.98	5
35	Using a word processor for typing documents	2.17	0.94	6	1.96	0.90	4
36	Using a word processor to edit, spell-check and change the format of a document	2.54	0.71	2	2.05	0.94	1
37	Asking students to do their assignments using a word processor	2.07	0.79	9	1.60	0.72	10
38	Using a word processor to help students improve their communication skills	2.05	0.75	10	1.52	0.66	12
39	Creating simple pictures using the paintbrush program	2.13	0.81	8	1.47	0.76	13
40	Creating pictures using drawing tools.	2.03	0.79	11	1.54	0.74	11
41	Editing pictures (color, size and placement)	1.96	0.79	12	1.46	0.66	14
42	Incorporating drawings and clarifying pictures into the content of instructional software	2.37	0.78	3	1.93	0.89	5
43	Using electronic tables for data entry	2.16	0.82	7	1.92	0.87	6
44	Using formulas to carry out calculations on students' grades including means, standard deviations, frequencies, and percentages	2.13	0.85	8	1.99	0.87	3
45	Using various statistical packages to carry out appropriate statistical analysis	1.94	0.79	13	1.83	0.81	8
46	Creating charts	2.13	0.75	8	1.86	0.79	7
47	Using Microsoft PowerPoint	2.74	0.58	1	2.02	0.85	2
48	Use of ICT tools for self, academic and professional development	2.31	0.80	4	1.74	0.86	9

In the domain of students' assessment, the data in Table 4 indicate that JUST faculty members rated themselves as having a low to moderate ability level with mean scores (between 1.24 and 2.02) on all the ICT skills related to this area. Regarding the use of the computer skills related to the domain of students' assessment JUST faculty members rated their degree of the use of these skills in the low and moderate categories with average mean scores ranging between 1.16 and 1.65.

Table 4: Means and Standard Deviations in the Domain of Students' Assessment

N	Items	Possession			Use		
		Mean	SD	Rank	Mean	SD	Rank
49	Understanding ways of computer applications in students' assessment	2.02	0.95	1	1.53	0.85	5
50	Using the computer to follow-up students' progress	1.85	0.81	3	1.60	0.84	4
51	Identifying students' weaknesses by the computer	1.61	0.83	6	1.61	0.83	3
52	Employing the computer in the delivery of various instructional strategies	1.79	0.71	4	1.62	0.76	2
53	Evaluating small groups' performance using the computer	1.59	0.75	7	1.34	0.73	6
54	Identifying students' self-assessment instructional software	1.42	0.75	9	1.16	0.54	8
55	Using instructional technology resources (instructional software) to cater for students who do not respond to traditional teaching methods	1.65	0.87	5	1.25	0.59	7
56	Using the computer as a remedial tool for students' weaknesses to enhance their achievement level	1.47	0.79	8	1.25	0.59	7
57	Providing drill and practice instructional software	1.24	0.80	10	1.16	0.54	8
58	Use of instructional materials on the Internet to enrich curriculum	1.93	0.84	2	1.65	0.90	1

The t-test was utilized to compare the level of ICT possession between male and female respondents on each ICT area and the total ICT skills of the scale. Findings of the t-test, as shown in Table 5, indicate no significant difference at the 0.05 level between the two groups regarding basic computer skills, designing instructional software lessons, computer software use and the total skills in the questionnaire. Significant statistical differences appeared to be related to the area of students' assessment. The difference was in favor of the male group. The male level of possession of the skills related to this area is higher than that of the female group.

Table 5: T-Test Results of Computer Skills Possession by Jordanian JUST faculty members Related to Gender

	Gender	No.	Mean	SD	t	df	Sig.
Basic computer skills	Male	163	33.0061	7.99344	0.933	191	0.352
	Female	30	31.5333	7.69117			
Designing instructional software lessons	Male	163	31.0184	13.24437	0.497	191	0.620
	Female	30	29.7667	8.81880			
Computer software use	Male	163	33.0736	7.95555	0.596	191	0.552
	Female	30	32.1667	5.74806			
Student assessment	Male	163	16.7055	6.67308	0.679	191	0.50
	Female	30	15.8333	5.18009			
Total	Male	163	113.80	33	0.71	191	0.48
	Female	30	109.30	24.60			

The t-test was utilized to compare the level of ICT possession according to the teaching experience of respondents on each ICT area and the total ICT skills of the scale. Findings of the t-test, as shown in Table 5, indicate no significant difference at the 0.05 level between the two groups regarding basic computer skills, designing

instructional software lessons and the total skills in the questionnaire. Significant statistical differences appeared to be related to the area of students' assessment. The difference was in favor of the faculty members group having nine years of teaching experience or more.

Table 6: T-Test Results of Computer Skills Possession by Jordanian JUST faculty members Related to Teaching Experience

	Teaching Experience	No.	Mean	SD	t	df	Sig.
Basic computer skills	Eight Years Or Less	89	31.7753	8.05486	-1.628	191	0.11
	Nine Years or More	104	33.6346	7.78729			
Designing instructional software lessons	Eight Years Or Less	89	29.1236	11.79832	-1.737	191	0.08
	Nine Years or More	104	32.2788	13.21404			
Computer software use	Eight Years Or Less	89	32.5169	6.82594	-.698	191	0.49
	Nine Years or More	104	33.2885	8.30449			
Student assessment	Eight Years Or Less	89	15.3258	5.95203	-2.509	191	0.01
	Nine Years or More	104	17.6346	6.71046			
Total	Eight Years Or Less	89	108.7416	30.08871	-1.772	191	0.08
	Nine Years or More	104	116.8365	32.90177			

The t-test was utilized to compare the level of ICT possession between faculty members who belong to science faculties and those who belong to arts faculties on each ICT area and the total ICT skills of the scale. Findings of the t-test, as shown in Table 5, indicate significant difference at the 0.05 level between the two groups regarding basic computer skills, designing instructional software lessons, computer software use, students' assessment and the total skills in the questionnaire. In all areas, the difference was in favor of the faculty members who belong to science faculties. The level of ICT skills possession among faculty members who teach at science faculties is higher than that of the faculty members who teach at arts faculties.

Table 7: T-Test Results of Computer Skills Possession by Jordanian JUST faculty members Related to Type of Faculty

	Teaching Specialty	No.	Mean	SD	t	df	Sig.
Basic computer skills	Science	171	33.8129	7.85606	5.407	191	0.000
	Arts	22	24.7273	.98473			
Designing instructional software lessons	Science	171	32.3450	12.65856	4.934	191	0.000
	Arts	22	19.0000	.00000			
Computer software use	Science	171	33.4737	7.95525	2.788	191	0.006
	Arts	22	28.7273	1.27920			
Student assessment	Science	171	17.3743	6.43339	5.131	191	0.000
	Arts	22	10.3182	.47673			
Total	Science	171	117.0058	31.75300	5.044	191	0.000
	Arts	22	82.7727	1.77098			

The t-test was utilized to compare the degree of ICT use between male and female respondents on each ICT area and the total ICT skills of the scale. Findings of the t-test in Table 8 indicate no significant difference at ($p < 0.05$) between the two groups regarding basic computer skills, designing instructional software lessons, computer software use, students' assessment, and the total skills in the

questionnaire. This means that gender has no bearing on the degree of the use of ICT skills by JUST faculty members.

Table 8: T-Test Results of Computer Skills Use by Jordanian JUST faculty members Related to Gender

	Gender	No.	Mean	SD	t	df	Sig.
Basic computer skills	Male	163	29.0613	10.93002	-1.056	191	0.292
	Female	30	31.2667	7.80775			
Designing instructional	Male	163	28.6074	11.23181	-1.037	191	0.301
software lessons	Female	30	30.8333	8.05191			
Computer software	Male	163	26.9755	10.31118	.480	191	0.632
use	Female	30	26.0333	6.96040			
Student assessment	Male	163	14.3497	6.22275	1.033	191	0.632
	Female	30	13.1333	3.90166			
Total	Male	163	98.9939	35.39137	-.341	191	0.733
	Female	30	101.2667	19.93772			

The t-test was utilized to compare the level of ICT use according to the teaching experience of respondents on each ICT area and the total ICT skills of the scale. Findings of the t-test, as shown in Table 5, indicate no significant difference at the 0.05 level between the two groups regarding basic computer skills, designing instructional software lessons and the total skills in the questionnaire. Significant statistical differences appeared to be related to the area of students' assessment. The difference was in favor of the faculty members group having nine years of teaching experience or more.

Table 9: T-Test Results of Computer Skills Use by Jordanian JUST faculty members Related to Teaching Experience

	Teaching Experience	No.	Mean	SD	t	df	Sig.
Basic computer skills	Eight Years or Less	89	29.2472	9.76576	-.191	191	.849
	Nine Years or More	104	29.5385	11.16854			
Designing instructional	Eight Years or Less	89	27.8652	8.29456	-1.296	191	.197
software lessons	Nine Years or More	104	29.8846	12.53834			
Computer software	Eight Years or Less	89	26.2697	8.65338	-.728	191	.467
use	Nine Years or More	104	27.3077	10.79831			
Student assessment	Eight Years Or Less	89	13.0112	4.17649	-2.526	191	.012
	Nine Years or More	104	15.1442	6.96652			
Total	Eight Years Or Less	89	96.3933	26.26206	-1.136	191	.257
	Nine Years or More	104	101.8750	38.47044			

The t-test was utilized to compare the level of ICT use between faculty members who belong to science faculties and those who belong to arts faculties on each ICT area and the total ICT skills of the scale. Findings of the t-test, as shown in Table 5, indicate significant difference at the 0.05 level between the two groups regarding basic computer skills, designing instructional software lessons, computer software use, students' assessment and the total skills in the questionnaire. In all areas, the difference was in favor of the faculty members who belong to science faculties. The level of ICT skills use among faculty members who teach at science faculties is higher than that of the faculty members who teach at arts faculties.

Table 8: T-Test Results of Computer Skills Use by Jordanian JUST faculty members Related to Type of Faculty

	Type of Faculty	No.	Mean	SD	t	df	Sig.
Basic computer skills	Science	171	30.8713	10.11672	5.851	1911	0.000
	Arts	22	18.0000	5.41603			
Designing instructional software lessons	Science	171	30.2339	10.84182	4.849	191	0.000
	Arts	22	19.0000	.00000			
Computer software use	Science	171	27.6491	9.85093	3.305	191	0.001
	Arts	22	20.4545	7.38549			
Student assessment	Science	171	14.6959	6.09831	3.604	191	0.000
	Arts	22	10.0000	.00000			
Total	Science	171	103.4503	33.06627	5.048	191	0.000
	Arts	22	67.4545	12.80152			

Findings from the study showed that just faculty members rated themselves between low and moderate levels with regard to the possession and use of the ICT skills in the questionnaire. However, there was an exception regarding six ICT skills in the domain of "basic computer skills." JUST faculty members rated themselves in the high category level in the possession of these skills. JUST faculty members also rated themselves in the high category level in two skills related to the area of "computer software use." Therefore we could say that JUST faculty members in this study moderately adopted current ICT as a teaching tool into their instruction; however, some of the technologies were used more by larger number of faculty members than others. The JUST faculty members used Microsoft powerpoint, word processing, the Internet and E-mail more than any other ICT tools. It was also encouraging that the JUST faculty members used email as the primary source to communicate with their students outside the classroom. Since many classrooms are equipped with computers and portable projectors, it was anticipated that JUST faculty members would use a computer and projector in their teaching on a frequent basis. This finding supports Vannatta (2000) and Carter's (1998) research, which found high levels of faculty proficiency and integration in word processing, email, and the Internet. The findings from this study support Keengwe's (2006) and Chowdhury's (2009) findings. These studies reported that faculty often used productivity tools, multimedia presentation, web browsers, computers project devices and email. The findings from this study confirmed Brill and Galloway's (2007) findings that overhead projectors, the Internet, and computer workstations are among the top technologies used by instructors. The findings from this study also support Al-Zoubi, A.; Kahhaleh, B.; Hasan, O.; and Kharouf, H. (2007) research conducted to investigate ICT status in the Jordanian universities. They found that almost half respondents used the internet for teaching specific subjects, making presentations and lectures or preparing lessons, but a lower percentage used the internet for communicating with other professors and students or monitoring and evaluating their progress. The findings from this study are consistent with a study done by Dawam, Ahmad, Jusoff, Tajuddian, Elias & Mansor (2009) that showed most of the educators in Malaysian universities use computer

on a regular basis for common computer packages such as word processing, spreadsheet, and for internet services such as search engine.

However, JUST faculty members rated themselves in the low category with regard to possession and use of many of the ICT skills. The low use of these ICT skills suggests that the JUST faculty members may need specific training, adequate time to prepare, and technological support to help them infuse ICT tools into their delivery of instruction or the ICT tool may not be relevant to their goals and/or purposes in the classroom.

The personal and employment characteristics that served as independent variables include gender, years of teaching experience, and type of faculty. The following are conclusions based on the findings regarding the analysis of these differences.

The literature revealed contradictory findings concerning the possession and adoption of ICT based on gender. However, based on the findings in this study, there was no difference between the female and male respondents in their level of possession of ICT and the degree of adoption of these technologies as a teaching tool. Findings from this study agree with Gushing et al (2010) who found no significant difference between genders regarding their use of technology for assessment or instructional purposes, nor was there a difference between age groups and their use of technology for assessment purposes. The findings from this study are not in line with the findings from Chowdhury (2007) and Onasanya, Shehu, Oduwaiye & Shehu (2010) research who found that females' level of ICT possession is less than that of males'.

Regarding the years of teaching experience, there are conflicting findings in the literature concerning this variable and the extent of ICT use in instruction. Based on the findings of this study, JUST faculty members regardless of the years of teaching experience, possessed the same level of ICT skills and had the same level of adoption of ICT skills in instruction. These findings do not accord with Onasanya et al (2010) findings. Onasanya et al reported that the less experienced lecturers are more disposed towards the use of ICT facilities than their senior colleagues. The findings from this study are not in line with the findings from Chowdhury (2007) who found that the level of use of ICT by faculty is directly proportional to the years of teaching experience.

It was concluded from the findings of this study that there was a difference in the extent of possession and adoption of ICT as a teaching tool according to the type of faculty in which the respondents were employed. Just faculty members who were employed in the faculty of Science possessed a higher level of ICT than those employed in the faculty of Arts. In addition, JUST faculty members who were employed in the faculty of Science adopted ICT in instruction more frequently than those employed in the faculty of Arts.

Findings and Discussion from the Interviews

The study examined the importance that the innovation factors would have in encouraging the JUST faculty members to adopt emerging ICT for instruction. The JUST faculty members identified how important the innovation characteristics would be in motivating them to adopt emerging ICT in their instruction. The innovation characteristics include relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003).

Table 10: Frequencies and Percentages of the factors that were Important in Encouraging JUST faculty members to adopt emerging computer technology for instruction.

Rank	Factors	Frequency	Percentage (%)
2	The innovation is consistent with your values, past experience, and needs	78	95
13	Access to a computer in your office at school with software installed for use in your teaching	57	70
8	Seminars/workshops are provided	70	85
4	The innovation can be used on a trial basis	75	91
11	One-on-one technology training specific to course content	64	78
6	In-house training is provided	72	88
1	The innovation is better than the one used previously	80	98
5	Other people can see the results of the innovation	73	89
7	Ability to teach yourself new applications	70	85
9	Online tutorials are provided	68	83
10	Adequate time in training sessions	67	82
12	Access to a computer at home with software installed for use in your teaching	61	74
3	The extent that the innovation is perceived to be easy to use	76	93
14	Access to a computer, technological equipment, and software in your classroom for use in your teaching	57	70

The JUST faculty members indicated that relative advantage (the innovation is better than the one used previously) was very important in influencing their adoption of new ICT for use in the delivery of instruction. The JUST faculty members considered compatibility (the innovation is consistent with their values, past experience, and needs) as being, the next highest in importance in encouraging them to adopt an innovation. In addition, the respondents reported that complexity (the innovation is easy to use), trialability (the innovation can be used on a trial basis), and observability (other people can see the results of the innovation) as the next highest in importance, respectively.

In conclusion, the findings in this study maintain that certain innovation characteristics were important in encouraging the JUST faculty members to adopt emerging computer technology for instruction. The study's results support Rogers' theory (2003) that certain innovation factors are important in encouraging an individual to adopt an innovation.

JUST Faculty members also considered the importance of access to computers in influencing them to adopt and use ICT in their teaching. Survey results indicated that access to computers in their homes, offices, and classrooms, with sufficient technological equipment and software, were very important factors in encouraging the JUST faculty members to adopt computer technology for use in their delivery of instruction. This supports Dusick and Yildirim's (2000) research, which found that access to computers, was positively correlated with technological competency and computer use in the classroom.

According to Hasselbring, Smith, Glaser, Barron, Risko & Snyder (2000), educators may have the best hardware and software available; however, they must be properly trained to effectively adopt and use the technology in their instruction. When the JUST faculty members considered access to training, they indicated that

the ability to teach themselves new technological applications was very important in encouraging them to adopt emerging ICT for instruction. This finding supports the research of McEwen (1996) and Reddman, Kotrlik, Harrison, & Handley (1999) who found that the majority of business educators were using self-directed learning. The JUST faculty members further indicated that in-house training, seminars, and on-line tutorials were important factors that motivated them to adopt ICT for instructional use. In addition, the respondents indicated that one-on-one technology training specific to the courses they were teaching and specific technical training related to their teaching were not as important as self-directed instruction. This result agrees with Bartlett and Kotrlik's (2001) research, which suggested that self-instruction in technology use has increased in importance in recent years because ICT such as the Internet promotes self-directed learning.

The JUST faculty members identified specific organizational variables that would encourage them to adopt an innovation, which included technological support, mandate from the university, institutional reward system, formal recognition, and physical resources.

Table 11: Indicate how important the following factors have been in your decision to adopt emerging computer technologies in the delivery of instruction

Rank		Frequency	Percentage (%)
7	Peer support	71	87
8	Shared values	69	84
3	Technological support	78	95
1	Physical resources (infrastructure such as Internet connectivity)	80	98
2	Physical resources (hardware)	79	96
2	Physical resources (software)	79	96
3	Personal interest in computer technology use in my teaching	78	95
4	Personal interest in improvement in my teaching	77	94
4	Personal interest in enhancing student learning	77	94
6	Course management software ease of use (e.g. Blackboard, WebCT)	72	88
5	Adequate time to prepare to teach with technology	75	91
5	Specific technological training related to your teaching (e.g., web-based instruction)	75	91

The study found that physical resources (infrastructure such as Internet connectivity), physical resources (hardware), physical resources (software) and technological support were the most influential of the organizational variables in influencing adoption of an innovation.

This study examined personal motivational factors and found that personal interest in computer technology use in teaching, personal interest in improvement in teaching, and personal interest in enhancing student learning were very important in encouraging JUST faculty members to adopt emerging ICT for use in their teaching. This result supports Klassen's (2010) study, which found that the personal motivational factors were statistically significant in influencing a faculty member to adopt and use electronic technologies in distance education.

Other personal motivational factors that were examined in this study included adequate time to prepare to teach with technology and ease of using course

management software (i.e., Blackboard). The JUST faculty members indicated that it was very important for them to have time to prepare to teach with technology. The finding in this study is supported by previous research, which indicated that in order for teachers to be effective in the use of computer technology in their instruction, they must have adequate time to prepare to teach with the new technology (Deng & Yuen, 2009; Jenkins, Browne, Walker and Hewitt, 2010; Athar and Iqbal, 2009; Lai, & Chen, 2010). The respondents also indicated that ease of use of course management software (Blackboard) was important in influencing them to adopt computer technology for instructional delivery (Deng & Yuen, 2009; Lai, & Chen, 2010) . This result was encouraging since educators use ICT to help them deliver their instruction, manage their courses, and perform administrative tasks (Chowdhury' 2009; Al-Senaidi et al, 2009; Shuva, 2010). Rogers (2003) contended that faculty members in a department are dependent on each other and peers can positively or negatively influence a decision to adopt an innovation. Also, individuals who have their colleagues' respect and provide peer support in large social networks can speed up innovation decisions (Havelock & Zlotolow, 1995). Furthermore, this finding supports Lai, & Chen (2010) research, which found that social factors such as shared values within the department and peer support were important influences that encouraged faculty members to adopt electronic technologies in instruction. The findings of this study agree with previous research that educators regard shared values and peer support to be important influences that encourage them to adopt an innovation.

Rogers' innovation theory categorized adopters into five categories of a social system in a bell-shaped curve. The adopter categories range from individuals who are almost obsessed with trying new innovations and are the first to adopt a new idea into their social system to those who resist new innovations until they are certain that they will be successful. The adopter category percentages that the JUST faculty members reported in the study do not agree with Rogers' adopter category percentages.

Table 12: Frequencies and Percentages for JUST Faculty Members' Disposition Toward the Adoption of Computer Technology

Category No.	Category Description	Frequency	Percentage (%)
1	Resist new innovations until certain that they will be successful (Laggards)	0	0
2	Require convincing of the economic necessity of a change, uncomfortable with uncertainty (Late Majority)	2	2.4
3	Consider fully all consequences, interact frequently with peers, willing to change to a new method but not willing to be a leader in the change process (Early Majority)	4	5
4	Make judicious innovation decisions, decrease uncertainty by fully evaluating new things, use interpersonal networks within your immediate area to gain more instruction (Early Adopters)	62	76
5	Almost obsessed with trying new innovations, seek instruction outside of the immediate area, and can cope with uncertainty (Innovators)	14	17

This study revealed that the majority of the JUST faculty members were early adopters of ICT. This finding relates to Rogers' (2003) theory that early adopters are opinion leaders and serve as change agents in the local social system and are among the first individuals to adopt an innovation. The next largest category of ICT adopters in this study were respondents who are first to adopt an innovation in a social network.

These respondents indicated that they are almost obsessed with trying new innovations, seek instruction outside of the immediate area, and are able to cope with uncertainty. This finding indicated that the JUST faculty members within this study might be among the first to adopt the innovation of ICT for the delivery of their courses. Therefore, they have the potential to serve as role models or change agents for their student clientele, peers, and others.

According to Rogers (2003), individuals can be categorized in a specific adopter category. Rogers' (2003) adopter categorization theory would have predicted that the JUST faculty members' degree of innovativeness would result in a bell-shaped curve. However, the JUST faculty members in this study were skewed on the left side of the curve toward the earlier innovators. Rogers maintained that the innovators represent the first 2.5% of the individuals to adopt a new technological innovation. However, in this study, a much higher percentage (14=17%) of the JUST faculty members indicated that they considered themselves the first to adopt ICT as a teaching tool. According to Rogers' theory, these faculty members would be considered the gatekeepers and control the flow of technological innovations into their educational environments. Rogers' theory further contended that the early adopters represent the next 13.5% to adopt a new idea in their social system. This study revealed that 62= 76% of the JUST faculty members indicated that they tend to be early adopters of ICT in their environment. Rogers' (2003) theory supported the fact that this subset of JUST faculty members serve as opinion leaders for individuals to obtain technological advice before adopting a new innovation. Also, these early adopters of ICT were respected by their peers, sped up the adoption process, and were role models for other individuals in their environment. Furthermore, Rogers' theory maintained that the early majority consists of the next 34% of the adopters. However, only 4=5% of the JUST faculty members in this study indicated that they would adopt an innovation before the average member of their social system. In addition, Rogers theorized that the late majority adopter category represented the next 34% to adopt an innovation in their social system. However, only 2= 2.4% of the JUST faculty members indicated that they were skeptics who resist adopting new ICT tools until the majority of the faculty members in their educational organization have done so. Finally, Rogers theorized that laggards represent the last 16% of their social system. However, none of the JUST faculty members considered him/herself to be the last to adopt an innovation in their educational institutions.

The study indicated that the JUST faculty members were encouraged to adopt and use current ICT as a teaching tool by their degree of innovativeness, which was classified into a specific adopter category. The largest proportion of the JUST faculty members in this study identified themselves as early adopters.

Furthermore, the JUST faculty members may be concerned about their students' achievements and were early adopters of ICT tools in their instruction; however, the JUST faculty members must have adequate physical resources in order to incorporate emerging ICT tools in their teaching. Physical resource support such as

hardware has been examined in many studies based on Rogers' (2003) innovation diffusion theory (Brace & Roberts, 1996; Kelly, 1996; Medlin, 2001). Banks (2002) contended that university and college administrators must provide up-to-date physical resources to their faculty members on a planned, systematic basis in order to enable the faculty members to infuse ICT tools into their teaching. However, findings in this study suggest that physical resources such as hardware may not have the expected outcome of faculty members integrating ICT tools in their teaching.

Conclusion and Recommendations

Although the majority of the JUST faculty members were early adopters of ICT, they appeared to be moderately prepared to use ICT effectively. This study identified several weaknesses in JUST faculty members' possession and use of ICT for instructional purposes. In order to promote more successful ICT integration in instruction by JUST faculty members, training on the use of current and emerging ICT should be provided. Faculty training initiatives should be framed as an avenue to empower educators with a wider range of pedagogical options. Most ICT tools are multifunctional and can be used for a variety of learning objectives. Training should not minimize the fact that technological advances present faculty with a host of challenges or that higher education as a whole has a lot to learn about how ICT can enhance student learning. In fact, ICT innovation may be occurring faster than our understanding of its use in practice. To respond to the impact of this phenomenon, ICT implementation must be approached more as an on-going organizational learning process than as a technology acquisition process. Effective ICT use involves a continual process of: 1) identifying pedagogical goals, 2) determining what activities will serve this goal, and 3) selecting the appropriate ICT tools to implement the activity. The fundamental question driving ICT adoption must ask what the best methods to teach our students are at any given point in time.

ICT training should be well grounded in JUST educational mission. The creation of a thriving ICT environment across the faculty should be the central theme running throughout ICT training efforts in the faculty. The goal should be to provide a situation in which faculty, staff, and students clearly perceive the benefits of their interaction with ICT tools available to them. In addition, we should seek to create an environment that is not stagnant, but rather be repeatedly modified by users to optimize teaching and learning. Thus, we should be aspired to add evolution to our ICT adoption development model. Higher education institutions are increasingly being seen as constantly learning and evolving entities. Thus, we should consciously seek a way to maximize the learning process. A wide variety of tools to communicate new ICT opportunities effectively should be applied. As Bagshaw & Bagshaw (1999) state, the individuals who are of highest worth to our new ICT environments are not merely those with expert knowledge, but those who are willing to share their knowledge freely with others. Early adopters of ICT innovation at JUST should be identified. An ICT committee with the responsibility of disseminating ICT knowledge among faculty members should be set up. The ICT committee should include early adopters of ICT innovation in addition to ICT specialists and ICT support staff. All faculty members regardless of their level of ICT knowledge should be encouraged to share their knowledge. To enhance the potential for this type of interchange, continuous open communication between faculty members is required. This can be achieved through several means. These

include continuous ICT resources orientation for faculty members; traditional mailings and use of the faculty listserv to distribute ICT information (announcements, bulletins, invitations, etc.); seminars on ICT tools can be held through the year; short ICT presentations and training sessions can be conducted; and the identification of technology gurus adept at the implementation, evaluation, and demonstration of technology. Inbuilt in all of these activities should be an ethos of volunteerism. This approach may pave the way for enthusiastic faculty members to occupy the forefront of ICT adoption while other faculty members will be propelled by their own impetus can benefit by observing ICT early adopters integrating ICT in instruction.

New faculty should be oriented to ICT at the university. Information on the hardware, software, and Web-based resources available across the faculty and university should be distributed, and technology support contacts should be introduced. Initial orientation is especially important in acculturating new faculty members to an ICT environment. From the start, faculty members should be made aware that ICT literacy is an essential element of the JUST educational mission.

Building upon the information that should be continuously provided, members of the educational technology committee (and any faculty member who may come across helpful ICT information) regularly inform faculty members of ICT updates throughout the year using mailings and the university listserv. This activity will be largely informational, yet the researchers believe will prove quite valuable in developing an on-going ICT presence. These vehicles will not only be used to announce informational and training sessions, but they should be deliberately used to ensure that faculty members are consistently reminded of the ICT tools they may use to enhance their pedagogy. For example, web sites of interest for various JUST faculty members' content areas may regularly be posted, and any changes or new acquisitions in hardware will be shared expediently. These venues can take on a simplistic instructional role as well. For example, difficulties encountered by current ICT users will be troubleshot in advance for those who will be using the tools in the future. When a problem is uncovered that others might run across, an explanation of the difficulty and its solution will be presented through these forums.

The bulk of the structured ICT training to be provided in the university should include various types of instructional ICT tools. Faculty members should be presented with multiple opportunities to take part in ICT seminars to be offered by technology support staff, and ICT gurus to be identified. ICT training seminars should be strategically scheduled at the times and locations throughout the academic year that will maximize ICT information dissemination among faculty members. At the start of each term, ICT orientation seminars can be held to introduce new arrivals both students and new faculty members, to the ICT resources available in the university. Throughout each term, instructional seminars on applications of a variety of ICT tools should be conducted for faculty, staff, and students.

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