

Full Length Research Paper

Examining E-learning barriers as perceived by faculty members of Engineering Colleges in the Jordanian Universities

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Employing computer's technology that includes e-learning system in the field of Engineering is a vital issue which needs to be discussed. Therefore, this study purposed to examine e-learning barriers as perceived by faculty members of engineering in three major universities in Jordan (Yarmouk University, Jordan University of Science and Technology, and Al-Balqaa Applied University) in the second semester of 2012. Also, the study aimed to find whether the barriers domains (institutional, faculty, and student) are different due to the study's independent variables. The survey utilized to run this study consists of 36-items, using four-point Likert scale ranging from (1) no impact for this barrier (2) minor impact, (3) moderate impact, and (4) major impact. The study's instrument was distributed to collect the data from a sample of 176 faculty members who are involved in delivering online courses through web-based management tool. The data collected was analyzed and shows a multivariate effect for the faculty members' perceptions in the relation to the country degree (Jordan versus Arab countries). The finding of the study shows that, overall, the three barriers domains were high on the Likert rank. However, the results show that online degree experience and the gender of participants' variables were nonsignificant. Based on the results, the study suggested that institutions of higher education should set a vision and a strategic plan to encourage faculty members to offer online courses and provide them with training and professional development to follow up with technology.

Key words: E-learning barriers, higher education, engineering faculty members, Jordan.

INTRODUCTION

Although there has been some growth in e-learning and distance education in Jordanian higher education institutions, an assessment of the actual situation did not take place yet. Computer technology has emerged very quickly in most Jordanian universities and community colleges; however, managing online courses is still beyond the acceleration in this segment.

Moreover, a quick glance of the related literature shows that e-learning encounters different kinds of challenges. Newcomer learners to e-learning programs need technical

and instructional support in order to be familiar with such programs. Also, there are challenges and rejection from faculty members as well—most of the faculty members with many years of experiences reject the change and may be fearful of new technology (Maise, 2002).

Online education provides an access to learners who do not have access, which will prove the education equity and will democratize education (Carr, 2005; Jones, 1997; Daniel, 1996). According to Winner (1998), in the coming decade, higher education seems likely to split into two

distinctly different sectors: two hundred or so institutions that deliver high quality, face-to-face teaching for those slated to become social elites; and (2) several thousand semi-campus, semi-cyberspace, hybrid organizations-colleges universities and business firms- ready to pump instruction and credential to a flexible global workforce (p. 9).

Indeed, what is obvious today is that the blackboard of the old days is disappearing, the concept of the classroom as number of desks in a closed room is changing, and the image of the instructor in the past days is changing as well. Today, we see all types of technology in our students' hands such as iphone, itouch, ipad, pocket-size lab-top and much more. This enables them to access their e-mails, see and download movies and videos from youtube, participate in socializing networks like facebook, twitter, myspace, as well as type and fax documents to anywhere in the world in a very convenient time and place.

Therefore, the educational system should not be isolated from the context. That is, using online education should not be just an option for higher education institutions; but rather, there will be an actual need to extend an e-learning system to adapt quickly to change.

In the purpose of utilizing this available technology in a beneficial way, it is our obligation as instructors to learn all what we need to be able to deliver the content through "electronic highways". As Hess (1988) puts it, "it costs less to move information than people. Electronic highways can carry instruction to students as asphalt highways can carry students to instruction- only they can do it less expensively" (1988, p.18). Likewise, the current push is to integrate all types of multimedia technology in the learning process for the purpose of "making meaning" (Jonassen et al., 1999). However, technology can best enhance meaningful learning when knowledge perceived as "constructed, not transmitted" (p.3).

In general, one of the purposes of colleges of engineering is to prepare labor market leaders. In that sense, faculty members who are equipped with knowledge, information technology, and computer application skills can deliver online courses and will transfer this knowledge and skills to their students. Consequently, investment in computer technology in higher education will result in well educated and highly skilled engineers to lead and to develop the workforce in Jordan.

Higher education sector in Jordan plays a key role in the process of comprehensive development. During the last ten years, higher education in Jordan witnessed a significant progress in terms of the diversity of study programs and an increase in the number of higher education institutions. The number of students who enrolled in 4-year university reached (260,000) studying in (27) public and private universities with more than (4,600) faculty members (Ministry of Higher Education, 2013). These universities provide graduate and undergraduate degrees in Science, Medicine, Engineering,

Social sciences and Humanities etc. However, the strengths and weaknesses of e-learning is still debatable.

Faculty members' points of view differ on the effectiveness of e-learning in comparison with face-to-face method of teaching, taking into consideration the country's economic status, students' ability to learn online courses, as well as the faculty members' desire to deliver online courses. It is assumed that many factors play a role in this differentiation which this study may reveal.

Significance of the study

This study is significant because it addresses one of the important educational issues in Jordan, which is the embedding and integrating technology in the learning and teaching process. It seems that using technology for educational purposes is moving fast in many countries; studying the case in Jordan may explore the real barriers of embedding technology in the teaching styles as viewed by faculty members in the higher education institutions.

Moreover, using technology in the instruction process is an important, and could be, an urgent demand in the educational setting, in general, and specifically in colleges of engineering and career and technical education. These fields emphasize theoretical and practical methods to deliver related courses. According to Jonassen, in today's learning and teaching approaches, we need to couple facts and concepts with modules, photos, videos, and constructed process to explain and clarify themes not just transmit them as a dry content (Jonassen et al., 1999). In addition, the expenses of using material, tools, instrument and machines can be reduced by delivering content over and over through using multimedia technology over the Internet.

This article examines the faculty of engineering perceptions on the barriers that face them from using technology as one of their teaching methods and whether these perceptions are different based on the assigned independent variables.

Research questions

The purpose of this study is to examine faculty members of Engineering Colleges on the e-learning barriers as they are perceived. Therefore, the study aimed to answer the following question:

R.Q. *Are there significant differences in faculty members of engineering perceptions toward barriers associated with delivering online courses due to variables of country, degree, online experience, and gender of participants?*

Theoretical framework

The theoretical framework for this study was based on

the work of Cross (1981). Cross pointed out some of the reasons – either barriers or motivation to participate in distance learning. Cross refers to these barriers as situational, institutional, and dispositional. After about thirty years, a similar category is still utilized to refer to some of these barriers such as students' barriers, faculty and instructional barriers, and institutional barriers (Zirkle, 2003).

Students' barriers may include, but are not limited to, their ability to access the internet, credibility of online courses, and interactivity with the instructor. Faculty barriers could be the ability of instructors to deliver online courses, time consumption, the rapid changes in technology that disables them from following up with new trends in technology. Barriers may also include lack of courses in digital forms, and colleagues' knowledge and support of online teaching and learning. The institutional barriers include the high cost of distance education, institution's strategic plans to implement online courses, and technology infrastructure such as classrooms and computer laboratories (Zirkle, 2003).

Using the same category in Cross (1981) and Zirkle (2003), distance learning barriers could be the same in Jordan. In some recent studies (Berge and Muilenburg, 2003) the barriers in distance learning has been discussed to examine what some of the frequent barriers that encounter the educational system are. The current study examines those factors in the Jordanian context in addition to other factors such faculty members, students, and administrators that may hinder them from using technology to deliver online courses.

LITERATURE REVIEW

Historic perspective

Monolescu et al. (2004) reported that distance education, in its current concept, has a rich history of over 200 years. The pioneer in the field of correspondence during the late 1800s was Illinois Wesleyan, offering bachelors, master's and doctoral degrees. Between 1881 and 1890 Illinois Wesleyan enrolled 750 students, yet by 1900, enrollment had dropped to 500 students. And by 1910 there were two hundred correspondence schools in the United States.

In 1878, John Vincent created a home reading circle for adults that eventually evolved into the Chautauqua Movement, a popular education society based on the idea of expanding access to education to all Americans (Moore and Kearsley, 1996). Five years later, the Chautauqua College of Liberal Arts awarded academic degrees to students who completed the required summer institutes and correspondence courses. Thus, Chautauqua became known as the first significant distance education effort in America. After that, and in 1892, Penn State University was one of three universities

to initiate a new way of reaching to students, capitalizing on the newly developed system of Rural Free Delivery (Monolescu et al., 2004).

The University of Wisconsin experienced the same temporary fate when its correspondence study program was discontinued in 1899 (Hanson et al., 1997; Moor and Kearsley, 1996; Verdun and Clark, 1991). However, the University of Wisconsin eventually became the nation's leader in correspondence programming when correspondence study was reinstated seven years later within the school's University Extension Division (Harroff, 2002).

According to Melton (2002), over thirty years ago, the United Kingdom Open University was established to provide undergraduate courses at a distance. At the time, there were many who were extremely skeptical, not only about the concept of open distance learning, but also about the quality of any learning materials to be studied at a distance. In the intervening years, evidence has been demonstrated that not only is the concept of distance learning valid, but high quality materials can be assembled that allow learners of all ages and all disciplines to fulfill their potential.

Despite all that rich history of distance education in developed countries, the educational system in Jordan has recently become familiar with this kind of education. Therefore, the future promises an equal opportunity for each learner and will not stigmatize learners whether they took online or face-to-face courses as the current globally trend moves toward online education in schools and higher education systems.

Distance education

The idea of distance education is based on the process of teaching and learning at distance (Keegan, 1983). That is, both the learner and the instructor are separated from each other. According to Picciano (2001), the term distance education is used interchangeably with many other terms. Picciano pointed that distance education, distance teaching, distance learning, distributed learning, asynchronous learning, telelearning, mobile-learning, and flexible learning are some of the terms used to describe an educational process in which the teacher and the learner are being separated.

An early definition of distance teaching was put forward by Moor (1973): "Distance teaching may be defined as a family of instructional methods in which the teaching behaviors are executed apart from the learning behaviors, including those that in a contiguous situation would be performed in the learner's presence, so that communication between the teacher and the learner must be facilitated by print, electronics, mechanics or other device."

After about 20 years another definition by Verduin and Clark (1991) define distance education as "formal

instruction in which the majority of the teaching occurs while educator and learner are at a distance from one another" (p.19). Also, Zalenski (2000) extended the definition by adding that the same quality of instruction should occur between student and teacher even though they are separated by distance. In general, the basic meaning is still used, for instance, Allen et al. (2004) defined distance learning as a course in which the expectation is that student and instructor will not be physically present in the same location. Distance education might involve one instructor with more than two classes in the same time by using multimedia and hypermedia technology to facilitate this sort of education.

According to Neighbors (2004) learners enroll in an online program because of two factors: the first is an employment option that includes job security and getting a job. The second factor identified was convenience and flexibility of distance learning.

Keegan (1996) reported that distance education includes the following five basic requirements:

1. The quasi-separation of teacher and learner through the period of the learning process.
2. The influence of an educational organization for the planning of courses of study and preparation of materials, and for providing academic and students support services.
3. The use of technology and media print, video, audio, or computer to carry the content of the course and provide a mechanism for interaction.
4. The provision of two-way interaction and communication.
5. The quasi-permanent absence of a learning group so that students are taught more as individuals than groups.

Moreover, Jonassen et al. (1999) reported important facts about some rules of using technology: technology is a tool to support knowledge construction, and as vehicle for exploring knowledge. In addition, it is a context to support learning-by-doing which is most needed in engineering field.

For successful achievement, enhancing the motivation of learners required skillful and helpful instructors (Wlodkowski, 1993). Moore (1998) added that successful distance learners must be self-motivated, autonomous, emotional, dependent and capable of coping with learning problems on their own in order to conquer the barriers of physical separation. Because of the change in the demography and the raise in the number of students enrolled in postsecondary education, the classrooms became so crowded and learning became less interesting, less effective, and, consequently, the learning occurred out of its context.

Motivation occurs when the learners feel that learning is useful, applicable, and related to their needs. However, learning will be more effective if the motivation comes

from both sides, the learner and instructor. For successful achievement, enhancing the motivation of learners requires skillful and helpful instructors (Wlodkowski, 1993). However, the pressing question is: will the instructor and the learners continue to be motivated at the end of the leaning experience?

In that stream, Willen (1984) indicates that self-directed learning data can help to develop distance education in a useful direction, both for learners and for organizations. Willen suggests the possibility of using self-directed learning to get valid and reliable knowledge about the learner's own methods of planning their learning process, and the outcomes. Students can use their knowledge to improve their approaches to learning activities.

Also, Moore (1998) pointed that educators should allow more independence to students who follow their own self-directed strategies as opposed to those who require more precise structure in the distance learning course. Distance learning courses are supposed to appeal to and serve self-motivated learners. In support of that approach, distance learning course developers promote student autonomy, which ultimately leads to self-directed learning. In the same direction, Prudy (1986) pointed the success of distance education delivery lies in understanding individual participants and their varying requirements for successful instructional delivery.

According to the National Center of Education Statistics (1998), more than half of the higher education institutions in the United States offer courses via print, audio, video, computer or internet based technologies and this percentage was expected to increase dramatically. However, there is no one statistic that showed the percentage of providing online courses in Jordan universities.

Distance education has many benefits to "democratize education" according to Carr (2005) because of overcoming the geographic location, job status, or physical handicap. And students would like to enroll in online education for financial aid and proximity of a college center. Another factor could be encouragement from friends and families.

Also, distance education helps women to pursue higher education because of their special needs. Furst (2001) states that women were returning to college primarily for job-related reasons. Women were deliberately selecting programs delivered via distance education because of the convenience associated with online course or other distance learning courses that are offered near their homes. Furst adds that those programs enabled women to receive their degrees and balance work and family demands.

Allen (2004) discusses the use of distance education or technological means of delivering instructional materials and believes that distance education is going to continue and expand. Although there are significant arguments about the cost and effectiveness of such efforts, especially when compared to other means of instruction, flexibility of new communication technology affords

greater access to educational opportunities at all levels of education. A critical issue facing designers of educational systems is the question of purpose and outcomes for evaluating the success of those systems. Moreover, in a recent study by Saud et al. (2011) on effective of integration of information and communications technologies (ICTs) in technical education, the authors affirmed that the ICTs are globally recognized tools that needs to be fully integrated in all educational fields. Also, Tas (2010) discussed the "ICT for development", and assured that ICT education is "must" for the growing and changing global economy.

Barriers of distance education

Neighbors (2004) pointed out that the primary barrier to participation in distance education for both genders is the lack of face-to-face interaction. The second most influential factor is concern for quality of the Web-based course offerings—that is, the accuracy of the course content and richness of the offering. Lack of technical support from student services and administration, lack of confidence in comparison with face-to-face, prior educational experience, or general lack of time are traditional reasons given as barriers to participation in distance education. More barriers would be categorized and related to institutional barriers, faculty barriers, and student barriers.

A study by Yap (1996) showed that the institutional barriers may occur because of program costs, and lack of equipment that is needed to deliver the content and technical assistance. Moreover, Hall (1996) and Van Dusen (2000) referred to ongoing cost as one of the significant barriers educational institution takes into consideration when thinking about providing online courses. Zirkle (2002) pointed out some other barriers that encounter applied engineering students such as scheduling general required courses by the university. Zirkle added other institutional barriers can include student advising, library services, and registration.

Moreover, Berg et al. (2002) reported that the effectiveness of institutional network of technical assistance can be a significant barrier to offering distance education. It is vital to note that online courses need full technical support system either from the administration or from the faculty member.

In terms of faculty barriers, many faculty are rejecting offering online courses because they won't change their style of teaching by traditional method (Dillon and Walsh, 1992) and because of the size of work that is needed to be done to deliver online courses (Birnbaum, 2002; Picciano, 2001). Also, according to Zirkle (2002) many faculties are in need of professional development related to technology. Motivation, moreover, of some type could be a factor of deploying online courses (Franklin and Kaurman, 1999; Picciano, 2001; Wolcott, 1999).

In this study, the researcher chose the field of

Engineering to examine those barriers because this field is supposed to be an applied field which needs to provide and train students on theoretical, technical, and interpersonal skills. The question is whether faculty members of engineering believe in the effectiveness of such a method for students to acquire those skills (Zirkle, 2002; Fann and Lewis, 2001). With the emerged virtual three dimension (3D) technology, theoretical knowledge and practical skills can be and explained and delivered effectively online. However, it is very important to clarify that some of these skills and some other skills can be more effective if mixed as an online and face-to-face for more interaction between the educator, students, and equipment (Zirkle, 2002).

Students also face barriers when using online courses. Galush (1998) referred to students' barriers in distance education such as cost and motivation, feedback and interaction with instructor, technical support, and lack of experience. Despite the flexibility and convenience of techniques of distance education, students are not always met with enthusiasm and can cause anxiety in students who are unfamiliar with learning online (Exter et al., 2008).

Also, students see instructors' feedback and communication as a barrier in distance education (Zirkle, 2002). According to Dooley et al. (2000) and Flowers (2001) there is a need for feedback and more interaction between instructor and students and between students themselves. Moreover, Zirkle (2002) and Flowers (2001) noted the sense of isolation and the lack of interaction between colleagues and students at a distance. In general, Saud et al. (2011) reported the components of ICTs that could be barriers for implementation in TVET such as "strategic readiness, pedagogical readiness, organization readiness and technical readiness".

METHODOLOGY AND PROCEDURES

Sample selection

Participants for this study were selected from all faculty members in engineering from three major universities in Jordan: Yarmouk University, Jordan University of Science and Technology, and Al-Balqa Applied University. The researcher obtained a list of faculty members from each university's website and determined the faculty member involved in online engineering courses. The total number of the study's population was 375 faculty members. The sample of the study was selected from the population as a convenience sample and the questionnaire was distributed to all faculty members available at the time of conducting this study. The questionnaires were handled to 176 faculty members, the number of retain questionnaires were 165 as a rate of 93%.

Table 1 shows the number and levels of independent variables (IV) and the participants according to: (1) country's issued the degree; from Jordanian's universities (64), Arabs countries' universities (45), and Non-Arab countries' universities (56) that represents the independent variables of the study and their percentage for each category; (2) Online experience, which shows that 139 of the participants never deliver full-online courses; and (3) Gender of the participants as 114 males and 51 females.

Table 1 also shows that (64) of the participants graduated from

Table 1. Number and percentage of demographic factors.

IV	Levels of IV	Frequency	Percent
Country degree	Jordan	64	39
	Arab Countries	45	27
	Non-Arab Countries	56	34
Online experience	No	139	84
	Yes	26	16
Gender	Male	114	69
	Female	51	31
Total		165	100.0

Table 2. Cronbach's Alpha coefficient for the overall and each barriers' domains.

Scale and its domains	Cronbach's Alpha	Number of items
Institutional barriers	0.65	12
Faculty barriers	0.63	12
Student barriers	0.57	12
Overall	0.82	36

Jordan universities, (45) graduated from universities in Arab countries, and (56) graduated from Non-Arab countries. Also, most of the participants (114) are male, and a high number of the participants (139) have never had the opportunity to deliver full-online courses.

Instrumentation

The original survey utilized to run this study was adapted from Zirkle (2004). The first section of the survey questionnaire consisted of instructions to help participants in responding to the questionnaire. The second section addresses three domains of barriers to distance education: Institution, instructional, and student barriers (Garland, 1993; Yapn, 1996; Galusha, 1998; Zirkle, 2002; Waits and Lewis, 2003; Zirkle, 2004).

Thirty-six items developed by Zirkle (2004) were adopted to run this study on a Likert scale of four-point ranging from (1) no impact for this barrier (2) minor impact, (3) moderate impact, and (4) major impact. The final section of the survey asked the respondents demographic information regarding country's degree, online experience, and gender of the participants.

Instrumentation validity and reliability

The original survey utilized to run this study was adapted from Zirkle (2004); however, the population of the study is Arab native speakers. Therefore, an identical version in meaning, construction, and in conception was needed. The researchers translated the original English version by an accurate method that includes backward and forward translation. After the translation process, the questionnaire was examined for face validity by a panel of experts

in teaching with enough knowledge of distance education. Seven faculty members (four faculty members from the department of curriculum and instruction and three faculty members from the department of psychology) reviewed the questionnaire for face and construct validity for clarity and preciseness.

Because of the translation of the questionnaire from English to Arabic, the research instrument was examined for face validity by a panel of experts. Eight faculty members at Yarmouk University (3), Jordan University of Science and Technology (2), and Al-Balqa Applied University (3) with teaching expertise and research interests in distance education comprised the panel and reviewed the survey questionnaire. Minor changes were suggested regarding the wording of the barriers and incorporated into the survey.

Also, the internal consistency was examined by Cronbach's Alpha method which revealed that institutional barriers internal consistency was 0.65, faculty barriers was 0.63, and the students barriers was 0.57. However, the overall internal consistency was 0.82 which is acceptable as a sign of reliability of the questionnaire. Table 2 shows the reliability of the questionnaire and number of the items for each domain.

FINDING OF THE STUDY

Institutional distance education barriers

The questionnaire was distributed to faculty members in three of Jordan's universities who were asked to rank their perceptions of the impact of each item that is related to institutional barriers. Table 3 shows the results of the means and standard deviations for the listed 12 items that represent barriers in their institutions.

Moreover, participants of this study were asked to rank their perceptions of the impact of the 12 listed items regarding the faculty barriers of distance education. Table 4 shows the means and standard deviations of the faculty barriers.

In addition, respondents were asked to rank their perceptions toward the impact of each of the 12 students' barriers of distance education. Table 5 shows the means and the standard deviations for each of these barriers.

The finding of the study shows the category and the rank order of these barriers. Overall faculty members' perceptions of the institutional, faculty, and students

Table 3. Institutional barriers to distance education as perceived by faculty members.

Domain	Item ID	Content of Items Scale according to their domains	Mean	Std. Dev.
Institutional barriers	8	Technology-enhanced classrooms, labs or infrastructure	2.764	0.99
	4	Funds to implement distance education programs	2.745	1.00
	5	Shared vision for distance education in the institution	2.691	0.95
	3	Strategic planning for distance education	2.679	0.99
	6	Technical support	2.667	0.97
	7	Climate for organizational change	2.636	0.98
	11	Security issues (computer crime, hackers, piracy, viruses)	2.618	1.05
	2	Start-up costs for distance education programming	2.582	1.00
	10	Local versus out-of-state tuition	2.570	1.04
	9	Library access to get resources for class	2.473	1.03
	12	Registration-students' ability to register for classes	2.424	0.89

Table 4. Faculty barriers to distance education as perceived by faculty members.

Domain	Item ID	Content of Items Scale according to their domains	Mean	Std. Dev.
Faculty barriers	14	Faculty training to implement distance education	2.752	1.01
	15	Faculty compensation, incentives, etc. to implement distance education	2.721	0.94
	18	Resistance to online teaching methods	2.691	1.02
	20	Colleague knowledge/support of distance education	2.661	1.00
	16	Ability to teach career/technical content at a distance	2.618	0.97
	24	Job security issues (faculty will be replaced by technology)	2.606	1.06
	22	Ability to monitor identity of distance education students	2.606	0.99
	19	Keeping up with technological changes	2.600	0.97
	21	Concerns with evaluation, testing, assessment, outcomes	2.515	0.95
	23	Intellectual property issues	2.473	0.97
	13	Time commitment	2.364	0.90
	17	Faculty level of technical expertise	2.358	1.06

Table 5. Student barriers to distance education as perceived by faculty members.

Domain	Item ID	Content of Items Scale according to their domains	Mean	Std. Dev.
Student barriers	31	Technology fees (increased costs associated with distance education courses)	2.758	0.95
	32	Student support services (help with advising, admissions, financial aid, etc.)	2.727	1.01
	29	Student's level of technical expertise	2.703	1.04
	27	Isolation from other students and faculty	2.655	0.97
	30	Student's availability of technology (Internet service, computer access, etc.)	2.612	0.95
	26	Absence of an instructor (creates motivation, quality of student work issues)	2.606	1.07
	33	Monetary issues-paying for courses	2.552	0.95
	35	Instructor availability (students' ability to contact instructor to discuss concerns)	2.545	0.98
	25	Ability to learn career/technical content at a distance	2.539	1.02
	28	Time constraints associated with job responsibilities	2.509	1.02
	36	Obtaining grades, transcripts and other course-related records	2.436	1.08
	34	Transferability of credits	2.406	0.90

barriers were high and came according to the following rank: first, students barriers, second, faculty barriers, and third, institutional barriers as Table 6 shows.

The purpose of this study was to examine the

engineering faculty's perceptions on barriers that hinder them from delivering online courses. Therefore, the study aimed to answer the following question:

Are there significant differences ($\alpha=0.05$) in faculty of

Table 6. Rank and category of the barriers.

Rank	Domain ID	Content of items scale according to their domains	Mean	Std. Dev.
1	3	Student barriers	2.587	0.42
2	2	Faculty barriers	2.580	0.44
3	1	Institutional barriers	2.555	0.45
Whole Scale			2.574	0.37

Table 7. Results of MANOVA of faculty members' perception toward distance education barriers due the study's variables.

Source	Sum of squares	df	Mean square	F	Sig.
Country Degree	1.358	2	0.679	5.295	0.006
Online Experience	0.430	1	0.430	3.349	0.069
Gender	0.000	1	0.000	0.000	0.998
Error	20.522	160	0.128		
Total	22.383	164			

Table 8. Scheffe's post-test results of participants' perceptions based on the country degree.

Country degree		Arab Countries	Non-Arab Countries
Scheffe	Mean	2.465	2.534
Non-Arab Countries		0.069	
Jordan		0.221	0.152

Engineering perceptions toward barriers associated with delivering online courses.

To test the hypothesis of the study at ($\alpha=0.05$) between the means of faculty members perceptions toward institutional, faculty, and students barriers based on the study's variables (country degree, online experience, and gender), a follow-up MANOVA examined associations between the dependent and independent variables described earlier. It showed a significant multivariate effect for the faculty members' perceptions in the relation to the country degree (Jordan versus Arab countries: $\alpha=0.05$). However, online degree experience and gender of the participants variables were non significant as shown in Table 7.

Due to the levels of the variables, Scheffe's test was conducted to compare the means and to examine the real variance in participants' perceptions toward the study's barriers as shown in Table 8

Table 8 shows that the difference was to the advantage of Jordanian universities graduates over the participants who graduated from Arab countries' universities.

Moreover, means and standard deviations of faculty members' perceptions on barriers of institutional, faculty members, and students were calculated according to the study's variables (Table 9).

Table 9 shows that there is a significant difference

between faculty members' perceptions on barriers domains as a result of the difference between the study's variables. For the purpose of identifying the most suitable statistic to determine the actual variance, Bartlett's test was conducted to test for equality of variances across groups.

Table 10 shows that there is an actual variance ($\alpha=0.05$) between the matrix elements of the other variances and the elements of the unit matrix (Identity Matrix) according to the study's variables; therefore, MANOVA analysis (no interaction) was conducted to determine the degree of participants' perceptions on the barriers domains according to the study's variables as shown in Table 10.

Table 11 shows that there are no significant differences found at ($\alpha=0.05$) for each of the study's variables (Country Degree, Online experience, and Gender) on the participants' perceptions on all domains.

RESULTS

The data was collected from three educational institutions in Jordan. This research could be the first step for an extended research to examine where some of the barriers as perceived by faculty members in Jordan

Table 9. Means and standard deviations of faculty members' perceptions according to the study's variables.

IV	Levels of IV	Institutional Barriers		Faculty Barriers		Student Barriers	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Country Degree	Jordan	2.677	0.41	2.665	0.46	2.716	0.41
	Arab Countries	2.454	0.46	2.478	0.37	2.463	0.40
	Non-Arab Countries	2.497	0.47	2.565	0.46	2.540	0.41
Online Experience	No	2.568	0.46	2.607	0.44	2.619	0.43
	Yes	2.487	0.44	2.436	0.42	2.420	0.31
Gender	Male	2.553	0.46	2.583	0.44	2.569	0.43
	Female	2.560	0.45	2.575	0.44	2.627	0.40

Table 10. Values of intercorrelation results of barriers' domains perceptions and Bartlett's test results.

Correlation	Institutional barriers	Faculty barriers
Faculty Barriers	0.56	
Student Barriers	0.53	0.55
Bartlett's Test of Sphericity		
Approx. Chi-Square	df	Sig.
136.808	5	0.000

Table 11. Results of MANOVA analysis of the domains' scale according to the study's variables.

Effect	MANOVA test	Value	F	Hypothesis df	Error df	Sig.
Country Degree	Wilks' Lambda	0.925	2.105	6	316	0.052
Online Experience	Hotelling's Trace	0.037	1.969	3	158	0.121
Gender	Hotelling's Trace	0.006	0.296	3	158	0.828

universities are. Also, this research provided necessary information on numbers and percentages of faculty member who are involved in distance education.

Generally speaking, distance education programs in the current view do not exist in Jordan. That means not one of the three surveyed universities offer an online degree. In other words, a student cannot be a full time distance learner and obtain an online degree. However, many public and private universities offer some online courses in its simple way such as using e-learning system to put some material, deliver assignments, address announcements, etc... and allowed students to submit their work to the instructor, send e-mails, and chat with the instructor and other students. Despite the acceleration of technology in all of the aspects of life, distance education is considered as an emerging learning method in Jordan, and there appears to be a great need to deliver more courses using the internet and the computer applications which will have many advantages for the institution, the faculty members, and for the

students.

The finding of the study shows that, overall, the three barriers domains (institutional, faculty, and students) were high on the Likert rank. In terms of the institutional barriers, support staff to help course development item reported as the highest, while the ability to register to the class reported as the lowest item. That affirms the universities' abilities to provide access to all students as the faculty members perceived.

In terms of faculty members' barriers, faculty training to implement distance education scored the highest among the other items in this domain which refers to the difficulties that faculty members encounter in case of the desire to implement distance education. However, the faculty members do not believe that the job security (faculty will be replaced by technology) is one of their fears or their barriers.

Moreover, faculties perceived students barriers in their ability to learn engineering related courses at a distance as the highest barriers, while faculty members perceived

obtaining grades and transcripts as the lowest concern of all barriers.

Overall, the study shows that the mean score is relatively high which indicates that faculty members of engineering rate distance education barriers as high. Moreover, the results show that there is a significant difference in participants' perceptions toward distance education barriers due to independent variables.

Regarding the participants' perceptions on the three domains of barriers (institutional, faculty, and students), the results (Table 8) displayed that there was a significant difference between faculty members who graduated from Jordan universities and those who graduated from Arab countries' universities to the advantage of the graduates from Jordan universities. However, Table 10 shows that no significant differences were found to each of the variables (Country degree, Experience, and Gender) overall the three domains.

Faculty members who graduated from Jordanian universities have a different perception on barriers from those who graduated from Arab countries universities and they rated the barriers as high. That could be explained due to the lack of emphasis on using technology to deliver online courses from Jordan universities on the one hand. On the other, those who graduated from Arab countries' universities could have more experiences because of the nature of their study abroad and the communication and other processes in using technology to pursue their higher education. Graduates from Jordan universities mostly learn by the face-to-face method and the process of submitting homework, assignments, and other works by the traditional method.

DISCUSSION

It is clear that the number of faculty members who offer online courses is very small and it is an individual effort with no impact from the university to offer those courses. Reviewing the websites of those three institutions show that less than one percent of the courses offered by the universities were taught online using e-learning system.

Some of those courses offering online may be developed based on individuals' experiences and they do not meet the criteria of online courses' instructional design. It seems that those institutions have some online learning resources such as libraries, registration, e-mail account that could help the instructors to utilize these facilities as a part of distance education.

Students barriers were ranked as the highest barriers as perceived by the faculty members. That could be as a result of lack of students' services and technical support, students' experiences of technology and internet, and the most important issue is the isolation of instructor from students. That finding aligned with some other studies (Zielinski, 2000; Ndahi, 1999; Simonson et al., 2000). The

traditional method of teaching has occupied the major teaching methods in Jordan, and may be it will need more time to offer more online courses by e-learning system. Nonetheless, faculty members ranked items such as ability to learn engineering course, obtaining grades, transcripts, and transferability of credits at the bottom of the students' barriers domain.

The second rank of the barriers' domains was faculty barriers. Distance education is an emerging method of teaching and learning. Training faculty to implement distance education is perceived as the highest priority. Without training faculty on using technology and on how to construct and design online courses will not take the distance education to the next step. Faculty also perceived the compensation and incentives as one of the motivation to deliver online courses. Moreover, faculty resistance to online teaching methods was ranked as high which could be a result of their little knowledge and experiences of distance education and their rejection to any change in their traditional method of teaching. However, faculty members have less concern about evaluation, testing, and assessment processes and the quality of distance education. Also, they perceived the intellectual property of online courses as less important than other issues mentioned earlier.

In terms of institutional barriers, faculty members ranked them in the third place. However, it is clear that specific issues related to institutional barriers were ranked high by the faculty members. In particular, technology-enhanced classroom, labs and infrastructure, funds to implement distance education programs, and shared vision and strategic planning for distance education in the institution were on the top of the barriers. That could be explained by the economic situation of the country and the ability of the universities to provide technology and programming, technology-enhanced classrooms, and other multimedia equipment. Also, this finding, lack of resources and economic status, associated with other studies such as (Zirkle, 2004).

Consequently, it is worth to note, that faculty members who graduated from Jordan universities perceived barriers of distance education higher than those who graduated from Arab countries' universities. That could be explained by their knowledge of the technology and online learning in Jordan and the difficulties that they could encounter when thinking about delivering online courses on one hand. On the other hand, that could be explained because the graduates from Arab countries' universities have more experience in the e-learning and distance education system.

RECOMMENDATIONS AND IMPLEMENTATIONS

In light of the results and based on the conclusion reached, the following would be some of the recommendations:

Institutions of higher education should set a vision and a strategic plan to encourage faculty members to offer online courses and provide support staff to help course development. That could save time and effort of the students and make the learning process occur on-campus and off-campus. This plan may take account of funds of distance education, technical support, and access to library's book. All that needs to open library's doors extra hours to allow students with job responsibility get benefit from this time on campus. The institutions' responsibility is to make sure that those online courses are effective as well as other methods of teaching and learning.

It is also recommended to provide faculty members with training and professional development to follow up with new technology. More important is to train senior faculty members on the principles of designing online courses. It is not only about using technology but it is also a process of integration learning theories with acquiring and keeping up with technological changes.

Moreover, it is about time to fill the gap between students and faculty members in terms of utilizing technology. Nowadays, students come to the university with various skills of using all multimedia technology. That should be met with more skills from the faculty members who can show the ability of using all they need to deliver online courses. Therefore, students, as well as faculty members, will need help in the process of registration, advising, to be provided with internet services and computer access. The quality of online courses should be high to compensate the instructors' absence. Also, students should have a full access to online material and their grades and transcripts.

Implications

The finding of the study has implications to the three researched institutions and it may be good for other institutions because of the similarities in many aspects such as sources of financing, admission procedures, teaching styles, etc.. Therefore, if institutions are to be competitive and to be more productive, they have to provide all what is needed to promote the distance education process. The research revealed that many barriers could encounter faculty members in distance education which will, in result, affect the students' quality and the education system in general. The circle of technology as a media, the students as a learner, and the faculty member as facilitator should be strengthened as following:

1. More attention needs to be given to the faculty members in terms of their computer skills and knowledge which will be the first step to provide online courses.
2. Students also need to be provided with orientations about quality of online courses so they can choose what fits their needs.

3. Educational institutions should continue to provide financial support to enhance online learning through setting a strategic plan to apply more online courses.

4. More studies should be conducted to find the effectiveness and reliability of distance education comparing that with the traditional method of teaching in Jordan environment.

5. The study's sample was faculty members' perceptions in three Jordanian universities; however, students' perceptions are essential as well, and students' voices should be heard.

6. To this moment, literature review revealed a lack of studies on distance education and educational technology in engineering. It is vital to conduct some other studies in this field because of the specialty as a disciplinary field mixed between theoretical knowledge and on hand skills.

While limited to three institutions, the findings of this study may have broader implications, especially for those colleges and universities seeking to utilize distance education. Taking account of the results will benefit all stakeholders in the higher education and using technology to provide online courses should be one of higher education institutions priorities.

REFERENCES

- Allen M, Mabry E, Mattrey M, Bourhis J, Titsworth S, Burrell N (2004). Evaluating the effectiveness of distance learning: A comparison using meta-analysis. International Communication Association. Online article from: <http://www.personal.psu.edu/users/k/h/khk122/woty/F2FHybridOnline/Allen%202004.pdf> (p.403).
- Berg ZL, Muilenburg LY (2003). Barriers to distance education: Perceptions of K-12 educators. Proceedings of the Society for Information Technology and Teacher Education International Conference. Albuquerque, New Mexico.
- Berg ZL, Muilenburg LY, Haneghan JV (2002). Barriers to distance education and training. Survey Results. Q. Rev. Distance Educ. 3(4):409-418.
- Birnbaum B (2002). Foundations and Practices in the use of distance education. Lewiston. NY: Edwin Mellon Press.
- Cross P (1981). Adults as learners. San Francisco: Jossey-Bass.
- Daniel JS (1996). Mega-universities and knowledge media: Technology strategies for higher education. London: Kogan Page.
- Dillon CL, Walsh SM (1992). Faculty: The neglected resource in distance education. Am. J. Distance Educ. 3(6):5-21.
- Dooley K, Patil B, Lineberger RD (2000). An evaluation of a multidisciplinary course delivered at a distance: Prescriptive principles to challenge our profession. San Diego, CA: Proceedings of the 27 Annual Agricultural Education Research Conference (ERIC Document Reproduction No. 449 351).
- Exter M, Harlin N, Bichelmeyer B (2008). Story of a conference: Distance education students' experiences in a departmental conference. Internet Higher Educ. 11:42-52.
- Fann N, Lewis S (2001). Is online education the solution? Business Education Forum, 55(4):46-48.
- Flowers J (2001). Online learning needs in technology education. J. Technol. Educ. 13(1):17-30.
- Franklin N, Kaufman D (1999). Transforming faculty for distance learning. Proceeding of the Annual Conference on Distance Teaching and Learning, USA 15:271-274.
- Furst-Bowe J (2001). Identifying The Needs of Adult Women in Distance Learning Program. Int. J. Instr. Media 28(4).

- Galusha J (1998). Barriers to learning in distance education. Hattiesburg, MS: The University of Southern Mississippi. (ERIC Document Reproduction No. ED 416 377).
- Hall J (1996). The convergence of means. *Educ. Rev.* 30(4):42-45.
- Hanson D, Maushak NJ, Schlosser CA, Anderson ML, Sorensen C, Simonson M (1997). *Distance Education: Review of the Literature* (2nd ed.). Bloomington, Indiana: Association for Educational Communications and Technology.
- Harroff PA (2002). Dimensions of quality for web-based adult education. Unpublished doctoral dissertation, University of Georgia, Georgia.
- Jonassen DH, Peck KL, Wilson BG (1999). *Learning with Technology: A Constructivist Perspective*. Upper Saddle River, NJ: Prentice Hall, Inc.
- Jones GR (1997). *Cyberschools*. Englewood, CO: Jones Digital Century.
- Keegan D (1996). *Foundations of distance education* (3rd ed.). London: Routledge
- Keegan DJ (1983). On defining distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), *Distance education: International perspectives* (pp. 6-33). London: Croom Helm.
- Melton RF (2002). *Planning and Developing Open and Distance Learning*, Routledge Falmer, NY.
- Monolescu D, Schifter C, Greenwood L (2004). *The Distance Education Evolution: Issues and Case Studies*. Information Science Publishing, Hershey, PA.
- Moor MG (1973). Toward a Theory of independent Learning and Teaching, *J. Higher Educ.* 44:661-679.
- Moor MG (1998). 'Introduction,' In: Gibson CC (ed) *Distance learner in higher education: Institutional responses for quality outcomes*, Madison: Atwood publishing pp.1-7.
- Moore MG, Kearsley G (1996). *Distance education: A systems view*. Belmont: Wadsworth Publishing.
- Ndahi H (1999). Utilization of distance learning technology among industrial and technical teacher education faculty. *J. Ind. Teacher Educ.* 36(4):22-33.
- Neighbors LS (2004). *Apart but a Part in Adult Distance Study: Persistence in an Online Cohort Graduate Certificate Program*. (Doctoral Dissertation, university of Wisconsin 2004). dissertation Abstract International.
- Picciano AG (2001), *Distance Learning (making connections across virtual space and time)*, Prentice-Hall. Inc, New Jersey. *Int. J. Instr. Media* 32(2):143-156.
- Prudy LN (1986). Tele course: Using technology to serve distance learners. In: Vogel GH (Ed), *Advances in Instructional Technology*.(pp. 3-12) New directions for community college. No.55 San Francisco; Jossey-Bass.
- Saud MS, Shu'aibu B, Yahya N, Yasin A (2011). Effective integration of information and communication technologies (ICTs) in technical and vocational education and training (TVET) toward knowledge management in the changing world of work. *Afr. J. Bus. Manage.* 5(16):6668-6673.
- Simonson M, Smaldino S, Albright M, Zvacek S (2000). *Teaching and learning at a distance*. Upper Saddle River, NJ: Merrill.
- Tas EM (2010). *ICT education for development- a case study*. *Procedia Social Behavior and Science*. Elsevier Ltd. 3:507-512.
- Van Dusen GC (2000). *Digital dilemma: Issues of access, cost, and quality in media-enhanced and distance education*. Washington, D.C. : Office of Education Research and Improvement (ERIC document Reproduction No. 443371).
- Willen B (1984). Self-directed learning and distance education. Can Distance Education be a good alternative for the self-directed learners? (ERIC) Document Reproduction No. Ed 257.430).
- Winner L (1998). Tech knowledge review. *NetFuture: Technol. Hum. Responsibility* 72:4-10.
- Wlodkowski RJ (1993). *Enhance Adult Motivation to Learn*. Jossey-Pass Inc. San Francisco, California.
- Wolcott L (1999). *Assessing faculty beliefs about rewards and incentives in distance education*. Pilot study results. Montreal, Quebec, Canada: paper presented at the Annual meeting of the American Educational Research Association (ERIC Document Reproduction No. 435271).
- Yap K (1996). *Distance education in the Pacific Northwest: Program benefits and implementation barriers*. New York: Annual Meeting of the American Educational Research Association. (ERIC Document Reproduction No. 395 563).
- Zielinski D (2000). Can you keep learners online? *Training*, 37 (3), 64-75.
- Zirkle C (2002). Identification of distance education barriers for trade and industrial teacher education. *J. Ind. Teacher Educ.* 40(1):20-44.
- Zirkle C (2003). Access barriers in distance education. *Contemp. Educ.* 72(2):39-42.
- Zirkle C (2004). Utilization of distance education in two-year colleges: Implication for technical education. *Am. Technical Educ. Assoc. J.* 31(4):12-14.