E-LEARNING ADOPTION AND IMPACT ON ADULT WORKERS IN JORDAN: AN EMPIRICAL ANALYSIS

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ABSTRACT

The purpose of this study is to investigate e-learning adoption among adult workers in Jordan. More specifically, the objectives of the study are twofold: (a) To determine the extent of e-learning uptake among working adults in Jordan. (b) To examine the impact of e-learning adoption on adult learners and their job performance in Jordan. For purpose, an integrated theoretical framework for assessing e-learning adoption, beyond initial adoption was developed. The data were collected from adult workers in Arab Open University in Jordan were used to determine the relationships between impact on adult learners and their job performance and adoption of e-learning. It is found that higher explicitness and accumulation of technology can help the transfer of technological knowledge within the organization and can raise the capability to adopt innovative technologies.

Keywords: E-Learning; Online Learning; Learning; Literature Review; K-Means Cluster; Hierarchical Cluster

INTRODUCTION

Many governments around the world had acknowledged the importance of education to enhance their human capital in the era of globalization. Similarly, the Jordanian government has acknowledged the importance of e-learning as it offers solutions to the challenges that currently impede learning in Jordan (MoED, 2009). In fact, Jordan was the first country among all Arab countries to adopt e-learning that was implemented in year 2002. The initial effort started in 1999 when Jordanian Ministry of Higher Education launched a USD 65 million development program for the Kingdom's public universities. A significant part of the initial phase was to establish information technology infrastructure and to provide the universities with thousands of new computers (McGregor, 2004). One of the objectives for the development and implementation of e-learning in Jordan is to promote lifelong learning and fulfilling the demand for continuous professional development in Jordan (MoED, 2009).

E-learning is an alternative way to the traditional learning has been seen by the Jordanian institutions as an opportunity to overcome the challenges they face by using new technologies such as web-based authoring tools in delivering the content of educational programs (El-Seoud et al., 2007). Such approach has been long recognized as imperative for institutions and students in particular, the adult workers.

Past studies have provided different definitions for e-learning and used various terms for e-learning such as, Learning Management System (LMS), online learning, online education, distance education, distance learning and web-based learning (Hayen et al., 2004; Halawi and Mccarthy, 2009). However,

the synonym terms for e-learning is the used of information and communication technology (ICT) in the area of education, computer support instruction, online education or computer-aided enhance education (Mutula, 2002; Fallon and Brown, 2003). Generally, e-learning consists of two categorizes. Firstly, asynchronous e-learning which can be ensures interaction for individuals or groups anytime and anywhere. Secondly, synchronous e-learning which provides interaction among the instructors and the learners at the same time. E-learning can be used for factual learning or as integrated learning where it is blended with distance learning or face-to-face learning.

Mashal et al. (2008) stated that working adults with full-time jobs are the largest audience of online education because it provides them convenience, but with the flexibility to advance their education and career. Many adult workers are motivated to learn for various reasons. Many of them often want to involve in a full-time work and embarked on part-time learning. In this context, the benefits of e-learning as flexible tools of learning for adult workers and learners in general that offers students greater freedom with respect temporal and mobility have drawn interest researchers (Waight and Stewart, 2005).

This study aims to identify the impact of each on e-learning adoption among adult workers and aims to bridge the gap of the knowledge due to the lack of studies on this group of population namely the working adults in Jordan.

LITERATURE REVIEW

Researches often viewed adult as a single entity, and failed to take cognizant of the diverse background of the adults learning (Servage, 2005). Despite the growing body of literature on the factors that influencing the adoption of e-learning from the perspective of students, lecturers and educational institutions (e.g. Selim, 2007; Wang, Zhu, Chen and Yan, 2009; Ellis, Jarkey, Mahony, Peat, and Sheely, 2007; Lau, 2009; and Horn and Pierson-Balik, 2005); few studies have been carried out in order to examine the rate of e-learning uptake among working adults and investigate the impact of e-learning adoption as well as the factors that influence them to up take such initiative (Ho and Kuo 2010; Daneshgar1 et al., 2008; Waight and Stewart, 2005; Johnson and Aragon, 2003; lee et al., 2002). Also, previous studies have approach to examine the e-learning adoption by two perspectives which are "adopted or net adopted". These studies were focused just in one perspective in order to examine the e-learning adoption (e.g. Duan et al. 2010; Hung et al. 2009). While, this study has aimed to examine adoption by focusing on both the range of e-learning applications adopted and the extent of usage of each one in order to provide a comprehensive picture of the adoption of e-learning among adult workers in Jordan. Consequently, limited studies investigate the e-learning subsequent impact to adult workers outcomes in terms of study and job (Tsai, Shih & Feng, 2008; Halawi, Pires & Mccarthy, 2009; Chen, 2010).

There are numerous models that have been created in order to evaluate the process of learning such as Bloom's taxonomy namely education objective which can also be accepted in e-learning performance evaluation. Some of the studies have been conducted to evaluate the e-learning performance evaluation by using Bloom's taxonomy, such as (Chiu et al., 2008; Halawi and Mccarthy, 2009; Alonso et al., 2009; Fu et al., 2009; Ho and Kuo, 2010). Bloom's taxonomy has long been a means applied by instructional designers, educators, and those developing innovative courses to align and create purposes, lessons, and evaluation to fulfil all cognitive levels of the traditional classroom (Anderson and Krathworthl, 2001; Joyce and Weil, 1996).

Past studies, on online courses, educators have utilized Bloom's taxonomy to supply similarity to the objectives of the courses, the activities that the students achieved, and the evaluation that reveal whether the purposes have been fulfilled (Chyung, 2003). Moreover, there are many of researcher have also utilized Bloom's taxonomy an evaluation tool to assess students performance in traditional courses in return for online simulations (Boyd and Murphrey, 2002; Vidakovic, Bevis, and Alexander, 2003). In addition to course development, professors use Bloom's taxonomy as a device to verify the value of discussion (Wong and Wong, 1998).

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However, the taxonomy of educational objectives developed by Bloom (1956) in order to help instructors in assesses of their testing outcomes and course material. The original of Bloom's taxonomy of educational was a revolutionary model intended to offer systematic classifications of cognitive operators. Subsequently, the categorized learning has three domains of behaviour. These categories are as follows: cognitive domains, psychomotor, and affective (Bloom et al., 1956). Bloom further categorized these domains into complex and simple classifications.

The cognitive domain objective has received more attention due to its applicability in postsecondary education and secondary (Chyung, 2003). Under the cognitive taxonomy, Bloom et al. (1956) identified variety levels of purposes and organized them on the basis of hierarchy (Baker, 2003; Anderson and Krathwohl, 2001). The categories under the cognitive consist of: knowledge, comprehension, application, analysis, synthesis, and evaluation.

Knowledge, which is the ability to recognition, recall of information, and recall of information; comprehension, which focuses on interpretation of information, translation, and organisation of ideas; application which ability to application use of particulars, principles, and problem solving; analysis, which focuses on finding the division of a whole into components, and the underlying organisation; synthesis ,which is the ability to creating something unique whether verbal or physical, combination of ideas to form something new; and finally, evaluation, which is the highest level in the domain and focuses on resolving disparities or disagreements, and making judgments about issues (Bloom et al., 1956).

The category entails more intricate thinking than the one preceding it and integrates the previous levels of thought to advance to higher levels. Affective domain described as the way for individuals deal with things emotionally, for example, feelings, values, appreciations, motivations, and attitudes (Anderson and Krathwohl, 2001; Krathwohl et al., 1964).

In addition, they are aimed at the development of behaviour and attitudes, as opposed to the intellectual abilities forming the focus of the cognitive domain. Affective domain objectives are as follows: receiving, or paying attention to some stimulus; responding, or reacting to a stimulus in some way; valuing particular ideas; organising different values comparing different values and resolving conflicts between them, and beginning to develop a personal value system; and commitment to a coherent, internally consistent value system (Anderson and Krathwohl, 2001; Krathwohl et al., 1964).

Seels (1997) stated that many attempts have been done in order to classify the outcomes of the process of learning. Accordingly, Lenning (1977) has revised more than eighty models which regard with learning outcomes that have been published in the United States of America since 1918 to 1977. The result of this revision revealed that complexity, scope, logic, the foci, and the abstraction of the previously mentioned models differ extensively. Bloom's (1956) cognitive taxonomy, Gagné's (1985) overall taxonomy (with special emphasis on the cognitive domain) and Krathwohl, Bloom, and Masia's (1964) affective taxonomy are considered as the best taxonomies among those models and the most comprehensive models as well.

Validation of using Bloom's (1956) taxonomy education objective is a more powerful idea in the area of e-learning performance evaluation. To consider adults learner, the area of e-learning is also consists of performance objectives, formative and overviews and summative learning assessments or checks. Performance objectives are classified utilizing Bloom's taxonomy education reflecting simple to many complex learning outcomes (Waight and Stewart, 2005; Halawi and Mccarthy, 2009).

Halawi and Mccarthy (2009) E-learning is a growingly prevalent form of instructional delivery available and opportunities in business arenas and academic. Hence, the natures of e-learning are becoming very common in teacher education objective (Skylar, Higgins, Boone, and Jones, 2005). Due to of the rise in the utilized of Web course tools and technology, like eCollege, Blackboard and WebCT the number of online courses presented in universities and colleges has increased drastically (Kartha, 2006).

Moreover, Kartha (2006); Suanpang and Petocz (2006); Vidakovic et al. (2003) carried out a study the instructional and individual factors have an important influence on e-learning. Further, from the perspective of Bloom's taxonomy education objective, e-learning is an influential learning tool. In addition, this is more important due to Bloom's taxonomy provides an empirical measurement to account for varieties among traditional classroom-based instruction and online learning. In the same line, Halawi and Mccarthy (2009) highlighted that the Bloom's taxonomy has been utilized to assess the influence of e-learning and is widely accepted and known.

On the other hand, Organisations around the world are required to train as well as provide their employees with the most updated skills and knowledge in order to survive in the new global business environment. Due to the facts that these knowledge and skills that employees need to perform their jobs are changing so quickly, it is believed that knowledge nowadays become as an important measure of any organisation strength (Glass, 1998). Learning in the workplace cannot be separated from the context where the knowledge and skills are used and is expected to result in positive changes in workplace behaviours and job performance. Employees are required to learn continuously and further apply what they have learned in training to real job problems (Chute, Thompson, and Hancock, 1999). However, providing organisation's employees with the needed knowledge and learning is not an easy task as it is time and cost consuming. Under such conditions, E-learning has become a popular delivery method of workplace learning as it overcomes most of these barriers and organisations increasingly adopting it as the most suitable method to train and develop their employees (Chute, Thompson, and Hancock, 1999).

For example, Pollard and Hillage (2001) Chute et al. (1999); Davy (1998); Prime learning, 2001 and Schriver and Giles (1999) have mentioned several advantages of e-learning reported by organisations that are adopted e-learning programs for their employees such as no space needed, substantial cost savings due to the elimination of travel expenses, timely access to information, greater flexibility in the workplace, the methods can increase learners' interest, a high rate of course completion and knowledge retention, training of more people, more often, in short learning sessions that are easier to schedule and coordinate, the ability to add trainees and instructors as needed without incurring significant additional costs, delivery at work or home sites convenient to trainees, effective way to train global employees, the delivery of a consistent message companywide to all trainees or employees, the opportunity to use the best instructors and provide high-quality courses, Provision for real-time updates and just-in-time information access and Information for training is always up to date.

However, as it is increasingly adopted by organisations, some authors argued that organisations have to ensure that they implemented an effective e-learning program that enhancing their employee's knowledge and skills rather than simply adopting the latest fad by looking at e-learning impacts on employee's performance (see Besser and Bonn, 1996).

In sum, DeLone and McLean (1992) created out a model consist of six dimensions to explain the information system success (IS). The basic dimensions in their model are system quality, information quality, use, user satisfaction, individual impact and organizational impact. DeLone and McLean (1992) argued to move in the opposite direction and group all the impact measures into a single impact or benefit category called "net benefits". This model is a more comprehensive review of information systems success, due to it looking at information system performance in terms of individual outcomes within organization (Ballantine et al. 1996; Pitt et al. 1995; Rai et al. 2002; Seddon 1997). For example, Seddon (1997) argued to exclude the usage from the model and used also 'net benefit' in his characterisation of the outcome. Also, this study excludes the (system quality, information quality, use and use satisfaction) from their model and employed the net benefits. Due to the main goal of this research is to identify the factors that influence the uptake of e-learning among adult workers, rather than just an information system success (IS).

This study presents contributes to the literature by evaluating the usefulness of Bloom's taxonomy in e-learning outcomes. Every phase of e-learning was measured on the basis of the purposes contained in Bloom's taxonomy learning objective. Consequently, DeLone and McLean's impact in terms of

individual outcomes within organization will be used in the current study in order to evaluate the performance of adult workers.

RESEARCH FRAMEWORK AND METHODOLOGY

The drive of research framework was developed based on the research questions. Furthermore, this framework of this study is comprised of three major theories which are developed among several periods by various researchers (e.g. Roger's (1995) diffusion of innovation, Bloom's (1956) taxonomy of educational objectives, DeLone and McLean (1992) individual outcomes within organization).

In general, limited research has been conducted in the field of e-learning adoption among adult workers. The previous studies mainly attempt to identify the technology factor that influence e-learning adoption (Roffe, 2002), or at the best technological and organisational factors (Macpherson et al., 2005). While the participant personal factors in their interest in enrolment in e-learning process was neglected in literature (Andersson 2009). Limited studies investigated the e-learning subsequent impacts to performance in term of study and work (Halawi 2009; Chen 2010). Also, previous studies conducted on e-learning were focused on students not on workers adult who are work fulltime and work part time.

The important of this study is comprised of three major theories to develop an enhanced framework, which can describe the e-learning adoption among adult workers. In other words, the objective of this study is to identify the factors that drive e-learning extent, performance of e-learning on individuals and organization and e-learning adoption among adult workers in Jordan. Hence, this study hopes to provide information to the Jordanian government for future policy planning purposes to enhance the adoption of e-learning. Such a framework would benefit research in e-learning and also help to eliminate confusion as to where adult workers should focus its e-learning adoption and investments for optimum organizational and individuals performance.

In this study, impact of e-learning will be measured on 7 items adapted from Halawi et al. (2009) who used the Bloom taxonomy in the e-learning context. Generally, Bloom provided the instrument that researchers use to determine the learning preferred behaviour pattern of student after taking the course. In their study, Halawi et al. used 27 items that measure the e-learning outcomes and the factors that influence such outcomes such as individual and instructional factors. In the present study, the main focus is on the e-learning outcomes which are according to Halawi et al. 7 items. All 7 items were adopted and rated using a five-point Likert scale ranging from "Strongly Disagree" (1) to "Strongly Agree (5). Consequently, in order to measure the impact of e-learning on their job outcomes in the present study, 7 items were adapted from Yi-Shun et al., (2007) who was adopted from original IS success model proposed by DeLone and McLean (2003). These 7 items were developed by Yi-Shun et al., (2007) after intensive literature review and they show reliability (internal consistency) for job outcomes factor of 0.95. These items were rated using a five-point Likert scale with 1=strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5=strongly agree.

Figure3.3 *Impacts of E-Learning on Adult Learners and Job their Performance*

DATA COLLECTION AND DATA ANALYSIS

In this study, the target population is the adult workers who are working fulltime and learning part-time at the Open Arab University in Jordan (OAUJ). For the purpose of this study, a decision was taken to include all OAUJ students in the sample and was used E-mail. . A total of 335 responses were

received representing 44.4% response rate. Statistical Package for Social Science (SPSS) was used to determine the causal relationship among the variables as proposed in the framework.

Factor Analysis

Table 4.34 below showed the final factor structure and the component variables. Seven different factors with the variables in each factor were identified. The table also showed seven items were retained by the two factors which explained about 73.706 percent of the variance (Table 4.34 below). In order to provide meanings to each factor, these factors were labeled based on the meanings of the variables in each factor. Factor 1 consisted of four variables related to study performance of e-learning. Consequently, this factor was labeled as study performance of e-learning. Factor 2 consists of three components related to study satisfies of e-learning. Hence, this factor was labeled as study satisfies of e-learning.

Table 4.34 Loading on Final two Factors Using Varimax Rotation

	Component	
	1	2
Study4	.806	
Study6	.753	
Study5	.750	
Study3	.745	
Study7		.861
Study1		.855
Study2		.827

In terms of their job performance, Table 4.38 below showed the 7 variables for impact of e-learning on job were retained two factors. In order to provide meanings to each factor, these factors were labeled based on the meanings of the variables in each factor. Factor 1 consisted of four variables related to job performance of e-learning. Consequently, this factor was labeled as job performance of e-learning. Factor 2 consists of three components related to impact of e-learning. Hence, this factor was labeled as job efficiency of e-learning.

Table 4.38 Loading on Final two Factors Using Varimax Rotation

	Component	
	1	2
Job4	.848	
Job6	.839	
Job7	.835	
Job5	.834	
Job2		.854
Job3		.836
Job1		.825

Reliability of Scales

Hair et al. (2003) quoted from Robinson et al. (1973, 1991) that generally the lower limit for Cronbach's alpha is 0.7, and it may be decreased to 0.6 in exploratory researches. Nunnally (1978) further suggested that an average reliability score of 0.70 would suffice for basic research.

To determine the consistency of the constructs, reliability test was conducted using Cronbach's alpha. Table 4.35 shows the values of Cronbach's alpha for the final two factors resulted from factor analysis.

Table 4.35 Summary of Reliability Test for Final two Factors for Impact of E-Learning on their Study

Factor	No. of Variables	Alpha-Value
Study performance	4	0.736
Study satisfies	3	0.805

In terms of impact on job performance, to determine the consistency of the constructs, reliability test was conducted using Cronbach's alpha. Table 4.39 shows the values of Cronbach's alpha for the final two factors resulted from factor analysis.

Table 4.39 Summary of Reliability Test for Final two Factors for Impact of E-Learning on their Job

Factor	No. of Variables	Alpha-Value
Job performance	4	0.863
Job efficiency	3	0.794

Descriptive Analysis for Organization Performance

The means for overall impact of e-learning on adult workers in terms of their study dimensions were shown in Table 4.43. The results indicated that study satisfies had the highest mean (3.45) while the study performance had the lowest mean (2.84) with minimum score of (1) and maximum score of (5).

Table 4.43 Results of Descriptive Statistics of impact on adult workers in terms of their study

N.	Statement	N	Mean	Std. Deviation	Minimum	Maximum
	Study Satisfies					
1	Overall, I was satisfied with the e-learning	335	**3.48**	1.178	1	5
2	Use of e-learning changed how I learn	335	3.44	1.222	1	5
3	The use of E-learning has helped me develop new skills	335	3.44	1.217	1	5
Overall Study Satisfies		335	**3.45**	1.022	1	5
	Study Performance					
1	I feel that I will be able to apply what I have learned	335	2.77	1.434	1	5
2	Use of E-learning has helped me improve my computing skills	335	2.85	1.463	1	5
3	Using E-learning has helped me to learn my subject more quickly	335	**2.82**	1.452	1	5
4	I learned a good amount of knowledge	335	2.90	1.458	1	5
Overall Study performance		335	**2.84**	1.110	1	5

The descriptive statistics for e-learning impact on adult workers in terms of their study were conducted for each item. The results showed the highest score was 3.48 related to study satisfies which is related to overall, I was satisfied with the e-learning, while the lowest score 2.82 was related to study performance which is related to using e-learning has helped me to learn my subject more quickly. The mean for e-learning impact on adult workers in terms of their study were ranked based on their importance in the following order; study satisfies (3.45) study performance (2.84).

The means for overall impact of e-learning on adult workers in terms of their job dimensions were shown in Table 4.44. The results indicated that job efficiency had the highest mean (3.17) while the job performance had the lowest mean (3.16) with minimum score of (1) and maximum score of (5).

Table 4.44 Results of Descriptive Statistics of impact on adult workers in terms of their job

N.	Statement	N	Mean	Std. Deviation	Minimum	Maximum
	Job Efficiency					
1	E-learning helps me to provide better products/service to customers	335	3.12	1.359	1	5
2	E-learning helps me to enhance my job efficiency	335	3.08	1.315	1	5
3	E-learning enables me to respond more quickly to change	335	**3.29**	1.319	1	5
	Overall Job efficiency	335	**3.17**	1.121	1	5
	Job Performance					
1	E-learning helps me to improve my job performance	335	3.16	1.510	1	5
2	E-learning helps me to think through problems	335	**3.06**	1.396	1	5
3	E-learning helps me to achieve my goals	335	3.15	1.392	1	5
4	E-learning helps me to provide new products/service to customers	335	3.28	1.423	1	5
	Overall Job performance	335	**3.16**	1.205	1	5

The descriptive statistics for e-learning impact on adult workers in terms of their job were conducted for each item. The results showed the highest score was 3.29 related to Job efficiency which is related to e-learning enables me to respond more quickly to change, while the lowest score 3.06 was related to job performance which is related to e-learning helps me to think through problems. The mean for e-learning impact on adult workers in terms of their job were ranked based on their importance in the following order; job efficiency (3.17), job performance (3.16).

K-Means and Hierarchical Cluster

Everitt et al. (2001) hierarchical clustering is a one of the most significant and straightforward approaches for merges similar groups of points. It should be either divisive or agglomerative. Agglomerative hierarchical clustering begins with every case being a cluster unto itself. To achieve the method of hierarchical clusters, the researcher should specify how distance or similarity is defined, how many clusters are needed and how clusters are aggregated (or divided). In addition, Corter (1996) argued that the hierarchical clustering generates all possible clusters of sizes (1-k), but this method is utilized only for relatively small samples.

In hierarchical clustering, the clusters are nested rather than being mutually exclusive, as is the usual case, that is, in hierarchical clustering; larger clusters created at later stages may contain smaller clusters created at earlier stages of agglomeration (Sharma 1996). Hierarchical clustering which allows users to select a definition of distance, then select a linking method of forming clusters, then determine how many clusters best suit the data (Sharma 1996). Large datasets are possible with K-

means clustering, unlike hierarchical clustering, because K-means clustering does not require prior computation of a proximity matrix of the distance/similarity of every case with every other case (Hair et al, 2007).

Table: 4.45 Results of Hierarchical and K-means

No, of Sample	Email	Registration	Library	Grades	Video	Chat	Audio	Course	Assessment	Test	K-means	Hierarchical
30	1	3	3	2	2	1	1	2	1	2	1	2
37	1	3	3	2	2	1	1	2	1	2	1	2
64	2	3	3	2	2	2	1	2	2	2	1	2
100	1	3	3	2	2	1	1	3	1	2	1	2
145	1	3	3	3	2	1	1	1	1	3	1	2
149	2	3	3	2	2	2	1	2	2	2	1	2
162	1	3	3	2	1	1	1	2	1	2	1	2
186	1	3	3	2	2	1	1	2	1	2	1	2
239	1	3	3	2	2	1	1	2	1	2	1	2
310	1	3	3	2	2	1	1	2	1	2	1	2
332	1	3	3	1	2	1	1	2	1	4	1	2
58	1	4	4	2	4	1	2	3	2	2	2	1
121	1	4	4	2	4	1	2	4	2	2	2	1
123	1	4	4	2	4	1	2	4	2	2	2	1
166	1	4	4	2	4	1	2	3	2	2	2	1
173	1	4	4	2	4	1	2	3	2	2	2	1
241	1	4	4	2	4	1	2	3	2	2	2	1
278	1	4	4	2	4	1	2	4	2	2	2	1
318	1	4	4	2	4	1	2	4	2	2	2	1
47	3	3	4	3	4	3	3	4	3	4	3	2
69	2	3	3	2	3	2	3	3	2	3	3	2
88	1	4	4	1	3	1	4	2	4	2	3	2
89	2	3	3	2	2	2	3	2	3	2	3	2
117	3	4	4	2	4	3	3	3	3	3	3	2
139	3	3	3	2	4	3	3	3	3	3	3	2
178	3	3	4	3	4	3	3	4	3	4	3	2
184	1	4	4	1	3	1	4	2	4	2	3	2
198	2	3	3	2	3	3	3	3	3	3	3	2
228	1	4	4	1	3	1	4	2	4	2	3	2
258	3	3	3	1	3	3	3	3	3	3	3	2
268	2	3	4	2	3	2	3	3	3	3	3	2
276	2	3	4	2	3	2	3	3	3	3	3	2
296	3	3	3	1	3	3	3	3	3	3	3	2
311	3	3	3	2	4	3	3	3	3	3	3	2

Looking at the results shown in the table (4.45) above, the researcher has decided to use K-means analysis rather than hierarchical one due to many reasons. Initially, the results which have been gotten by using hierarchical analysis were inconsistent and not systematically analyzed. For example, hierarchical analysis has considered the low applications' adopters as moderate applications' adopters and vice-versa. In addition, the adopters who adopted all of the applications (10 out of 10) and who adopted of the applications (9 out of 10) have been considered as moderate adopters rather than high

applications' adopters. In a diverse way, the data obtained by using k-means analysis were more accurate and systematic as proven in the results of this study. K-means clustering method is much less computer-intensive and is hence often prefer to choose k-means when datasets are large (Sharma 1996). Therefore, the researcher has decided to use k-means analysis in order to get more consistent and systematic data, the k-means is appropriate for this study.

The study was aimed to exploratory study in the field of innovation diffusion. K-means method was used in this study to identify the different types of e-learning adoption patterns. Hair et al, (2007) stressed that the most important basis for k-means cluster is used Euclidean distance which is the most common distance measure. Nevertheless, the researcher should specify in advance the desired number of clusters, K. Initial cluster centers are chosen in a first pass of the data, and then each additional iteration group's observations based on nearest Euclidean distance to the mean of the cluster. Cluster centers change at each pass. The process continues until cluster means do not shift more than a given cut-off value or the iteration limit is reached (Corter 1996).

The determination of the appropriate K of clusters is a critical issue in cluster analysis. The researcher is a need to determine a natural K of clusters (2, 3 and 4) that are interpretable in terms of the research question of this study. Therefore, the K three-cluster solution was chosen for the results of this study due to it provides to group the respondents into different adoption groups such as low adopters, moderate adopters and high adopters. These three groups of adopters were more meaning full because it looks at three perspectives of their adoption.

Table (4.46) below, indicated the number of cases in each cluster, the first group consisted of 125 adult workers which presented 37.3%, and this group considered as low adopters. Second group consisted of 173 adult workers which presented 51.6%, and this group considered as moderate adopters. Third group consisted of 37 adult workers which presented 11%, and this group considered as high adopters.

Table: 4.46 Number of Cases in each Cluster

Cluster	1	125
	2	173
	3	37
Valid		335
Missing		000

Table:4.47 Initial Cluster Centers

	Cluster		
	1	2	3
E-mail	4	3	3
Online registration	2	3	3
Online library	1	4	2
Grades	1	4	2
Live video	1	4	2
Live chat	1	4	2
Live audio	1	2	4
Online course	1	2	4
Online assessment	1	1	3
Online test	1	1	4

Table 4.47 above revealed the initial cluster centers, which comprise of three clusters as desired, and gives the average value of each application in each cluster. It can be observed that the first cluster has the lowest averages with each application. The second cluster indicates a highest value, while cluster three reports the moderate average value.

Table:4.48 Final Cluster Centers

	Cluster		
	1	2	3
E-mail	3	3	3
Online registration	3	3	3
Online library	2	3	3
Grades	2	3	3
Live video	2	3	3
Live chat	1	3	2
Live audio	1	2	3
Online course	1	2	3
Online assessment	1	1	3
Online test	1	1	3

Table 4.48 above shows the final cluster centers, it gives the mean averages of each application in each cluster, which enables a descriptive name to be given to each cluster based on their dominant averages.

Exploring Relationship between e-learning adoption and its impacts on Businesses

As discussed in section 4.5 for measures have been derived to examine the impact on e-learning adoption among adult workers. Every measure was derived from a set of questions through factor analysis. The high reliability of these measures (Cronbach alpha > 0.70) provided confidence in the results obtained. The four measures of impact identified through factor analyses, namely study satisfies, study performance, job efficiency and job performance.

To find score for each factor, Singleton et al. (1993) proposed taking the average (mean) of the scores of the individual that constitute each factor. This method has been adopted by other similar studies (e.g. Waight and Stewart, 2005). Figure 4.11 reproduces a partial diagram of the research framework discussed previously.
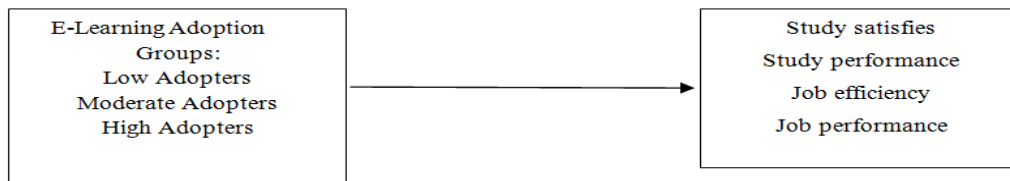

Figure 4.11 Relationship between E-learning Adoption and Impacts on Adult Workers

The mean objective of correlation analysis was used to inspect whether relationship exists between the extent of e-learning adoption and the four impact measures. A non-parametric correlation test, namely Spearman's rho, is used for this purpose because the variables used, i.e. e-learning adoption and impact measures, are comprised of an ordinal scale. The result in Table 4.53a and Table 4.53b show that there is a significant correlation between e-learning adoption and study satisfies (positive correlation of 0.151), study performance (positive correlation of 0.248), and job performance (positive correlation of). Further analysis is conducted to provide a better understanding on the differences of impacts gained by the various adoption groups.

Table 4.53a Correlation Coefficients between E-learning Adoption and Impact Measures

Impact	Study Satisfies		Job Efficiency		Study		Job Performance	
EL Adoption	**Sig.**	**r**	**Sig.**	**r**	**Sig.**	**r**	**Sig.**	**R**
Adoption	.006	.151[**]		.026	.000	.248[**]	.000	.218[**]

Table 4.53b Correlation Coefficients between E-Learning Adoption and Impact Measures

		Study Satisfies	Job Efficiency	Study Performance	Job Performance	Adoption
Study Satisfies	Pearson Correlation	1	-.047	-.055	-.055	.151[**]
	Sig. (2-tailed)		.395	.312	.313	.006
	N	335	335	335	335	335
Job Efficiency	Pearson Correlation	-.047	1	.101	-.168[**]	.026
	Sig. (2-tailed)	.395		.064	.002	.639
	N	335	335	335	335	335
Study Performance	Pearson Correlation	-.055	.101	1	.160[**]	.248[**]
	Sig. (2-tailed)	.312	.064		.003	.000
	N	335	335	335	335	335
Job Performance	Pearson Correlation	-.055	-.168[**]	.160[**]	1	.218[**]
	Sig. (2-tailed)	.313	.002	.003		.000
	N	335	335	335	335	335
Adoption	Pearson Correlation	.151[**]	.026	.248[**]	.218[**]	1
	Sig. (2-tailed)	.006	.639	.000	.000	
	N	335	335	335	335	335

On the other hand, the regression analysis was run to identify which variables were significant. Regression analysis was conducted between e-learning adoption's groups and the four impact measures of e-learning. The e-learning adoption's group namely low adopters, moderate adopters and high adopters were the dependent variable and the impact measures of e-learning namely study satisfies, job efficiency, study performance and job performance.

DISCUSSION

In this section discusses the result that emerged from the data analysis. Attempts will be made to explore how the result related to the findings from previous studies. The approaches adopted in this section are that the discussion will reiterate the highlights if the results are as expected, and if the results are unexpected, the discussion will be an attempt to reconcile. The results obtained from interpreting the adoption level and matrix will be discussed and followed by discussion on e-learning adoption and impact of adult workers.

Characterizing E-learning Adoption

This study has developed a framework to characterised and measure e-learning adoption on a two-dimensional matrix representing level of adoption and extent of usage. The level of adoption was represented by teen types of e-learning application. The extent of usage was measured using four category scale represented by not using, use sometime, use most of the time and use all the time with e-learning applications.

Previous studies have approach to examine the e-learning adoption by two perspectives which are "adopted or net adopted". Also, these studies were focused just in one perspective in order to examine the e-learning adoption (e.g. Duan et al. 2010; Hung et al. 2009). While, this study has aimed to examine adoption by focusing on both the range of e-learning applications adopted and the extent of usage of each one in order to provide a comprehensive picture of the adoption of e-learning among adult workers in Jordan.

In order to capture information on the extent of usage for each e-learning application, a K-mean clustering has been conducted for this study. Depend on a study sample of 335 responding adult workers; the K-mean has successfully identified diverse e-learning applications' adoption groups among adult workers in Jordan. These groups were considered as low adopters, moderate adopters and high adopters. The important of K-mean lies in its flexibility, without being restricted by the measurement scale when identifying adoption patterns. Also, this method enables various adoption patterns to be identified the two-dimensional.

The first group is the low adopters presented about 37.3% of the study sample. In this group, the choice of application being adopted by these adult workers is limited. Adult workers have mainly adopted e-learning adoption such as e-mail, registration, online library, grades and video. The findings of this study suggest that, these applications methods are more widely used by adult workers than others applications. Also, as discussed in the literature review (chapter two) many students including adult workers have a lack of experience with using the new technology especially in Jordan due to e-learning adoption is still innovation method of learning to numerous students (Abbad and Nahlik, 2009).

The next group is the moderate adopters presented about 51.6%, of the study sample. The adult workers have mainly adopted e-learning adoption such as e-mail, registration, online library, grades, video, online chat, audio and online course. This group of adopters is similar to the adoption stage (Hung et al. 2009). Moderate adopters have taken the first step to adopt more advanced internet technologies, and have partially integrated e-learning applications both internally and across-worker. However, full integration of e-learning applications has not been implemented. Rogers (2003) stated, "after being adopted by only a few people in a system, the innovation may ultimately be rejected, so that its rate of adoption level off and, through discontinuance, nose-dives". This made it worthwhile to analyze the rate of discontinuation of e-learning applications in this research study.

The third group is the high adopters which presented about 11% of the study sample. This group has placed a strong emphasis on the nine out of ten or ten out of ten applications adopted by other lower adoption groups. The adult workers have mainly adopted e-learning adoption such as e-mail, registration, online library, grades, video, online chat, audio, online course, online assessment and online test. Third group of this study is that adult workers are more likely to adopt e-learning applications than lower and moderate adopters, due to Adult workers who are frequent and/or heavy users of the Internet are more likely to use e-learning systems, adult workers who are confident in their ability to master an e-learning system, without help, are more likely to become users, adult workers are reassured by the availability of back-up technical support and adult workers believe that an e-learning system will be more useful to them if it is easy to use.

In terms of extent of usage, we could observe the extent to which adult workers migrate from traditional methods of conducting learning to adopt internet technologies. As proposed by Chin and Marcolin (2001), actual usage of the innovations provides a clearer understanding on innovation diffusion but has been neglected in previous innovation adoption studies. In this study, the adoption is described as triggering usage of applications on a limited basis leading to the final stage whereby an application would be substituted for an existing traditional business transaction method.

Findings from present study showed that most of the e-learning applications provided by the Arab Open University in Jordan (AOUJ) to Adult workers are mainly used on most of the time. This trend suggests that the outcomes of adoption depend how adopters have accumulated knowledge and experience in using these applications. When adult workers have adopted e-learning applications on a most of the time, positive feedback would reinforce their usability, and would set the stage for subsequent usage of the application, and application from other levels.

For the low adopters, they mainly adopt applications that indicate their web presence, mainly on a use most of the time and use sometime. Numerous adult workers from this group have substituted e-learning applications for traditional methods of conducting learning.

Moderate adopters, however, they are using a majority of applications indicating their web presence on a use most of the time. A number of adult workers from this group have substituted e-learning applications for traditional methods of conducting learning. Compared to the moderate adopters, high adopters are using the e-learning applications adopted on a use most of the time, while very few adult workers from high adopters have substituted e-learning applications for traditional methods of conducting learning. The findings from the matrix table (4.45) also reveal a number of adult workers which have adopt e-learning applications ranging from e-mail to online audio, solely on use most of the time.

E-Learning Impact on Adult Learners in term of their Study

From the perspective of Bloom's taxonomy, e-learning is an effective learning tool (Kartha, 2006; Suanpang & Petocz, 2006; Vidakovic et al., 2003). This is significant because Bloom's taxonomy provides an empirical measurement to account for differences between online learning and traditional classroom-based instruction. Bloom's taxonomy has been used to evaluate the effectiveness of e-learning and is widely known and accepted.

Nevertheless, the results of factor analysis on impact on adult learners in term of their study variable had identified two new factors and were labeled as study satisfies and study performance. The empirical results of the present study there were revealed significant differences between the three adoption groups on the basis of study satisfy and study performance. However, evidence of contrasting gains accrued by different adoption groups is also being observed. The findings show that high-adopters have gained higher study satisfy and study performance compared to low-adopters and low-adopters. The results of the study is similar to that of the study carried out by Halawi & Pires (2009) which revealed significant difference on the basis of study satisfy and study performance between learners in different levels of information systems specifications.

E-Learning Impact on Adult Learners in term of their Job

Performance of the adult learner with the e-learning adoption is important to motivate learners. Learners that can quickly access and navigate courses and see the relevance of what they are learning with their jobs will be more likely to become engaged with e-learning. The types of analyses that are conducted at the beginning of the e-learning solution can help to create learning experiences that will make the learner feel comfortable, and motivated to learn.

If learners' lack of basic skills (computer skills, reading skills, for example) and their belief that they cannot be successful (low self-efficacy) has not been uncovered via analyses, the likelihood that learning and transfer of learning on the job may occur could be minimal. Ensuring, then, that adult learners and performance problems are explored within their contexts is critical to providing the best e-learning solution.

Nevertheless, the results of factor analysis on impact on adult learners in term of their job variable had identified two new factors and were labeled as job efficiency and job performance. The empirical results of the present study there were revealed no significant differences between the three adoption groups on the basis of job efficiency. While, in terms of job performance revealed significant differences between the three adoption groups. However, evidence of contrasting gains accrued by different adoption groups is also being observed. The findings show that high-adopters have gained higher job performance compared to low-adopters and low-adopters.

In addition, the results suggest a valid connection between e-learning adoption use and job performance. The results indicate adult workers' acquisition of knowledge, skills and work attitudes through e-learning adoption. E-learning is associated with training transfer, which facilitates job performance and satisfaction. E-Learning adoptions are designed to implement the process of learning. In the virtual learning context, the results show that users benefit from the use of e-learning adoption. E-learning adoption among adult workers facilitates the transfer of acquired knowledge, skills and

work attitudes from the training period to the job, and thus helps in problem solving, thereby enhancing overall job outcomes. The results of the study is similar to that of the study carried out by Waight & Stewart (2006), Wang et al. (2007) and Chen (2010) which revealed significant difference on the basis of study satisfy and study performance between learners in different levels of information systems specifications.

CONCLUSION

The Arab Open University in Jordan (AOUJ) should enhance the quality of e-learning and at the same time consider relative advantages and trialability, when introducing new technologies. Consistent with Wild et al. (2002), it is agreed that combining the characteristics of effective traditional learning with those of effective online learning will provide a rich and varied presentation environment that will satisfy individual need of users. In addition, it can also be enhanced by educating the lecturers and also students including adult workers about the importance and advantages of using e-learning in teaching and learning processes. In addition, the e-learning adoption profile described in this study provided an overview of e-learning adoption among adult workers.

In terms of extent of usage, the parallel usage of most of the e-learning applications provided by the (AOUJ) highlighted significant recommendations need to be taken into consideration. Particularly, when adult workers have a positive experience and feedback from using these applications, this would set the stage for subsequent usage of the application, and application from other levels by reinforcing their usability. In addition, errors in IT implementation might be much more costly for adult workers to absorb due to their limited resources and assists. As such, beside promoting e-learning applications, (AOUJ) is required to ensure a positive experience, error free, and positive feedback for their adult workers when they using their e-learning websites and applications. Such approach would increase the since of trust as well as the reliability from the workers point of view which in turns helps in moving their extent of usage from the parallel to full range usage.

As far as the author can establish this are the fewest studies of e-learning adoption which has utilized the statistical technique of cluster analysis to classify, or group, learners which were the basis of the study. The particular cluster analysis technique which was utilized was the K-means clustering method.

The implication for theory concerned the assumption that adoption of e-learning would enhance adult workers' performance. It was found that positive impacts increased as e-learning penetration increased. This study has provided evidence of the association between adoption and performance in terms of study and job. The study has shown that high-adopters had significant gains in study satisfy, study performance and job performance compared to low and moderate adopters.

Even though a rigorous research procedure was used, there are some limitations that should be addressed in future studies. The results of this study should be interpreted with some caution due to the lack of random selection from the population. The findings of this study and implications were inferred from a very limited set of organizations in Jordan that use different e-learning adoption. Thus, one should carefully interpret the results when generalizing the findings and extending the discussion to other organizations. With a more controllable environment, researchers can also manipulate some moderating factors (e.g.,) that were not examined in this study to verify whether or not these factors are significant in influencing employees' e-learning adoption. In future studies, researchers can also investigate and compare the employees' adoption of different e-learning systems to generalize the findings of this study.

Moreover, a cross-cultural validation involving another sample pool is strongly suggested for further examination of the present results. There may be a need to search for additional variables that will affect the employees' acceptance of e-learning systems, such as leadership, user satisfaction, learning orientations, and mental models of learning. However, additional variables should be selected with reference to the appropriate theories. Besides, an issue that is worth revisiting in an organizational

context is whether or not a difference exists between social influence of authorities (e.g., managers) and social influence of peers (e.g., co-workers). Separating the construct of social influence into those due to authority and peer and investigating their individual effects will allow e-learning system designers or trainers to fine-tune training programs and should be a worthwhile research issue. Finally, self reported measurement was used in this study. In reality, there could be differences between how the participants responded and what they actually did in terms of using the e-learning systems.

To summarize, this study had contributed to the body knowledge by providing empirical evidence that supported the related theories. Moreover, the aim of this study is to fill the gap in the literature by investigating the e-learning adoption among adult workers.

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