An Exploratory Investigation of Instructors Acceptance of E-Learning

Hassan M. Selim, United Arab Emirates University, Al Ain P.O. Box 17555, United Arab Emirates; E-mail: hassan.selim@uaeu.ac.ae

ABSTRACT

The use of e-learning and information technologies in teaching have changed the instruction approaches. There are several factors that need to be considered while developing or implementing E-learning environment. This paper is intended to identify and measure e-learning critical factors as perceived by instructors. In line with the literature, five factors were identified and measured, namely instructor self efficacy, student perceived benefits, instructor attitude towards information technologies used in e-e-learning, instructor attitude towards the technical support of e-learning tools, and e-learning acceptance and usage by instructors. A sample of 606 instructors was used to validate the proposed e-learning factors. The results revealed that 40% of the instructors perceived technical support as the most critical factor in e-learning success. The instructor self efficacy was viewed as the most critical factor by 30% of the participants, while 31% viewed it as the third most critical factor. The items used in measuring each factor were validated and showed acceptable reliability and discriminant measures.

Keywords: Improving classroom teaching; e-learning; Evaluating CAL systems; Teaching/learning strategies.

INTRODUCTION

The use of E-learning and information technologies as teaching tools have expanded and changed the instruction approaches (Alavi, 1994; Selim, 2003, 2004, 2006). E-learning concept has been around for decades and is one of the most significant developments in the information systems industry (Wang, 2003). E-learning is the delivery of course content via electronic media, such as Internet, Intranets, Extranets, satellite broadcast, audio/video tape, interactive TV, and CD-ROM (Urdan & Weggen, 2000). Fostering e-learning acceptance among individual instructors remains a critical challenge for universities and e-learning service providers. E-learning acceptance by instructors is needed to develop an environment with minimum resistance.

Instructor attitudes towards e-learning are vital factors of developing efficient and effective e-learning environments for teaching. There are very few articles in the literature that address the acceptance of e-learning from the instructor's perception (Hu, Clark, & Ma, 2003; Kollias, Mamalougos, Vamvakoussi, Lakkala, & Vosniadou, 2005; Liaw, Huang, & Chen, 2006). This paper reports on an exploratory study aims to identify and measure the critical factors affecting e-learning acceptance by instructors. The exploratory study will lead to the development of an instructor e-learning acceptance model.

METHOD

Participants

An online survey was available on the World Wide Web and advertised to universities in the United Arab Emirates (Dubai, Abu Dhabi, and Sharja). Respondents for this study consisted of 606 instructors. Table 1 summarizes the demographic profile and descriptive statistics of the respondents. Instructor ages ranged from 22 to 61 years, with a mean age of 42.3 years (S.D. =8.3). Male respondents represented 81%. Instructors came from 31 different countries (see Table 2). Participants represented 11 colleges namely, business, engineering, medicine, law, science, humanities & social, education, food & agriculture, libraries, information technology, and general requirements. The majority of the participating instructors had 5 years or more experience with personal computers (89.1%).

Table 1. Demographic profile and descriptive statistics of surveyed instructors

Item		Frequency	Percentage
Gender	Male	490	80.9
	Female	116	19.1
Age	22-29	38	6.3
	30-37	126	20.8
	38-41	252	41.6
	46-49	100	16.5
	50-57	72	11.9
	58-61	18	2.9
Years at current university	0-4	392	64.7
	5-9	154	25.4
	10-14	44	7.3
	15-19	12	2.0
	> 22	2	0.3
Title	Professor	68	11.2
	Associate Prof.	104	17.2
	Assistant Prof.	214	35.3
	Instructor	182	30.0
	Other	38	6.3
Years of PC use	1-2 years	28	4.6
	3-4 years	38	6.3
	> 4 years	540	89.1
College	General Requirements	122	20.1
	Business	120	19.8
	Humanities & Social Science	96	15.8
	Science	80	13.2
	Engineering	66	10.9
	Medicine	32	5.3
	Food & Agriculture	28	4.6
	Education	26	4.3
	Information Technology	22	3.6
	Law	10	1.7
	Libraries	4	0.7

Table 2. Participants' countries

Country	Frequency	Percentage	Country	Frequency	Percentage
Egypt	110	18.2	Ghana	6	1.0
UAE	80	13.2	New Zealand	4	6.6
USA	76	12.5	Greece	4	6.6
UK	56	9.2	Pakistan	4	6.6
Canada	56	9.2	Lebanon	4	6.6
Jordan	50	8.3	Austria	4	6.6
Algeria	32	5.3	South Africa	4	6.6
Afghanistan	28	4.6	Libya	2	3.3
Sudan	18	3.0	Panama	2	3.3
Palestine	12	2.0	Belgium	2	3.3
Iraq	10	1.7	Morocco	2	3.3
India	8	1.3	Turkey	2	3.3
Australia	6	1.0	Bangladesh	2	3.3
Syria	6	1.0	Singapore	2	3.3
Ireland	6	1.0	France	2	3.3
Ireland	6	1.0			

Instrument

This study proposed four factors that could lead to the acceptance of teaching using e-learning tools by instructors. The four factors are: (1) instructor self efficacy - ISE, (2) student benefits as perceived by instructors - SPB, (3) instructor attitude towards Information technology as an enabler of e-learning - IAIT, and (4) instructor attitude towards technical support provided by e-learning providers - IATS. A fifth factor was used to represent the e-learning usage - ELU. Each factor was represented by a latent construct that was observed via a number of indicators. Several survey instruments have been developed to measure e-learning satisfaction and acceptance (Angeli, 2005; Hu et al., 2003; Lee, Cheung, & Chen, 2005; Liaw et al., 2006; Selim, 2003, 2004, 2005, 2006; Shih et al., 2003). Therefore, various potential indicators exist to measure each factor. A survey instrument was developed that consisted of 6 sections, one for each one of the five factors in addition to a demographic characteristics section.

The instructor self efficacy (ISE) construct section included 6 items (ISE1-ISE6). The ISE factor was operationalized and validated by previous research (see Appendix for the item details). items ISE1 to ISE6 were adopted from (Compeau & Higgins, 1995; Hu et al., 2003) to capture instructor's self efficacy. The items were reworded to fit the e-learning context.

Six items were used in assessing the perceived students' benefits construct (PSB1-PSB6). The 6 items measured how the instructor perceives students' benefits of attending e-learning enabled classes. The items are listed in the appendix. Seven items were developed to measure the instructor's attitude towards information technology (IAIT) tools such as Internet, personal computers, course management systems, and student information system. The instructor's attitude towards technical support section consisted of 5 items (IATS1-IATS5) and all of them were developed to capture the effectiveness and efficiency of the provider's technical support. The last section was dedicated to capturing the perceived acceptance and usage of e-learning by instructors via 6 items (ELU1-ELU6), see the appendix.

The items were randomly arranged and some of them were negatively worded. All items used a five-point Likert-type scale of potential responses: strongly agree, agree, neutral, disagree, and strongly disagree. The instrument was pre-tested by a random sample of 100 instructors. Minor changes to the order and wording of the items resulted from the pre-testers opinions. A website was developed to publish the instrument. Emails were sent to instructors and faculty members of 4 major universities in the United Arab Emirates (Dubai, Abu Dhabi, and Sharja). The participants were informed that all data were anonymous and were to be used in assessing the acceptance and usage of e-learning technology. Table 3 shows the mean and variance of each item in the e-learning assessment instrument.

Instructors were asked to rank the four factors (ISE, PSB, IAIT, and IATS) based on their level of importance and criticality to the success of e-learning.

Table 3. Descriptive statistics of e-learning assessment indicators

Item	*Mean*	*S.D.*
ISE1	3.98	0.958
ISE2	3.81	0.986
ISE3	3.58	1.039
ISE4	3.44	1.075
ISE5	4.20	0.937
ISE6	3.34	0.989
PSB 1	3.53	0.972
PSB 2	3.46	0.940
PSB 3	3.96	0.910
PSB 4	3.50	0.946
PSB 5	4.03	0.905
PSB 6	3.50	0.907
IAIT 1	3.88	1.093
IAIT 2	3.55	1.043
IAIT 3	3.54	1.001
IAIT 4	3.37	0.963
IAIT 5	3.68	1.013
IAIT 6	3.52	0.926
IAIT 7	3.70	0.944

Item	*Mean*	*S.D.*
IATS1	3.38	1.050
IATS2	3.10	0.929
IATS3	3.32	0.910
IATS4	3.26	0.942
IATS5	3.07	1.026
ELU1	4.07	0.879
ELU2	4.09	0.804
ELU3	4.06	0.929
ELU4	4.23	0.865
ELU5	3.95	0.938
ELU6	4.03	0.890

The rating for each factor was placed between 1 and 4. Table 4 shows the rank of the four e-learning factors as perceived by instructors. The instructor attitude towards the technical support factor was given the most critical rank by 40% of the surveyed instructors. Perceived student benefits (PSB) and Instructor attitude towards information technology were perceived to be the least critical to the success of e-learning in teaching as perceived by 34% and 35% of the surveyed instructors, respectively. Instructor self efficacy was viewed as the most critical and important factor by 30% of the participants while 31% viewed it as the third important factor.

Table 4. E-leaning critical factors ranking

	1	2	3	4	Average
ISE	30% (184)	23% (140)	31% (186)	16% (96)	2.33
PSB	18% (108)	28% (168)	20% (124)	34% (206)	2.70
IAIT	20% (122)	23% (142)	21% (130)	35% (212)	2.69
IATS	40% (244)	29% (176)	22% (132)	9% (54)	2.00

Exploratory Factor Analysis

Exploratory factor analysis was conducted to identify the underlying critical items in each of the e-learning critical factors (ISE, PSB, IAIT, IATS, and ELU). The same factor analysis was used to validate the e-learning critical factors. LISREL version 8.54 was used to develop the polychoric correlation and asymptotic covariance matrices used in generating the factor loadings because all the items were represented by ordinal variables. Table 5 shows the output results for the Promax-rotated factor loadings. Items intended to measure the same e-learning factor must demonstrate a factor loading of >0.50.

The 6 items (ISE1-ISE6) proposed to measure the instructor self efficacy factor as a critical factor of e-learning success were highly correlated with it, as indicated by the factor loading values of >0.65 in Table 5. This testifies to the validity of the indicators used to capture the instructor self efficacy. The items comprised in this factor were related to the instructor's capabilities of implementing and using e-learning methods such as Internet, PCs, and LCD projectors. This factor was ranked as the most critical factor by 30% of the participants and third most critical factor by 31% of the participants (see Table 4).

The exploratory factor analysis applied to the 6 indicators used in measuring the perceived student benefits by using e-learning yielded good results. All items correlation values (loadings) with the identified factor (PSB) were >0.60. This factor captured instructor's perception about the effect of e-learning on student interactivity, quality of coursework activities, usefulness, and readiness.

The instructor's attitude towards the information technologies (IAIT) used in e-learning was measured by 7 indicators, all of them loaded with correlations of values >0.50. The indicators used in this factor were related to the ease of Internet access and navigation, web-based course management system, computer networks, student information system, and the information technology infrastructure reliability and effectiveness. Most of the instructor responses to the 7 items were positive. The instructors were mostly satisfied with the on-campus Internet access, and course websites available via the course management system used.

The instructor attitude towards the technical support (IATS) was measured using 5 indicators; all of them had factor loadings of > 0.60. All the items were related to the helpdesk and e-learning training. The last factor was related to the instructor perceived usage of e-learning in teaching as an indicator of their acceptance of this technology. The e-learning usage (ELU) factor was measured by 6 indicators; all of them had high factor loading values of > 0.65. The ELU factor included the intention of teaching e-learning based courses in the future, how e-learning fits into the instructor's teaching style, and the instructors' perception about e-learning in general. Instructors indicated positively that they will teach e-learning based courses in the future which indicated a positive attitude toward accepting the e-learning technology. Finally, it can be concluded that the indicators used in e-learning critical factors assessment instrument truly represented the concepts of interest.

E-learning assessment instrument's reliability was measured using Cronbach alpha. Table 6 shows Cronbach alpha values for the 5 e-learning assessment factors emerged from the factor analysis given in Table 5. The suggested accepted value of Cronbach alpha is ≥ 0.70 (Hair, Anderson, Tatham, & Black, 1998). All factors exhibited a high degree of internal consistency as the alpha values were ≥ 0.847. It was concluded that the indicators could be used to measure the factors with acceptable reliability. The average variance extracted, which reflects the overall amount of variance in the items accounted for by the factor. The average variance extracted is more conservative than Cronbach alpha as a composite reliability measure and its accepted value is 0.5 or above (Fornell & Larcker, 1981). As shown in Table 6, all the average extracted variance values are ≥ 0.69. Average extracted variance can be used to evaluate the discriminant validity. The square root of the average extracted variance for each factor should be greater than the correlations between that factor and all the other factors (Fornell & Larcker, 1981). Table 7 shows the correlation matrix of the e-learning assessment factors and the square root of the average extracted variance. The discriminant validity does not reveal any problems.

Table 5. Factor loadings

	ISE	PSB	IAIT	IATS	ELU
ISE1	***0.729***	-0.015	-0.052	0.039	0.016
ISE2	***0.825***	0.020	-0.040	-0.019	-0.025
ISE3	***0.758***	-0.053	0.139	0.000	0.127
ISE4	***0.705***	0.065	-0.054	0.012	0.087
ISE5	***0.901***	-0.015	0.007	-0.046	-0.018
ISE6	***0.685***	0.043	0.094	0.012	-0.030
PSB1	0.088	***0.601***	0.086	0.001	0.196
PSB2	0.093	***0.679***	0.184	-0.067	0.063
PSB3	-0.124	***0.700***	-0.006	-0.011	0.357
PSB4	-0.049	***0.726***	0.017	0.082	0.168
PSB5	0.047	***0.745***	-0.022	0.014	0.071
PSB6	0.065	***0.688***	-0.076	0.096	0.015
IAIT1	0.071	0.084	***0.808***	-0.074	-0.098
IAIT2	0.042	0.142	***0.824***	-0.125	-0.123
IAIT3	-0.148	0.095	***0.784***	0.077	0.122
IAIT4	-0.079	-0.170	***0.644***	0.103	0.074
IAIT5	0.051	-0.194	***0.809***	-0.099	0.187
IAIT6	-0.032	-0.026	***0.662***	0.314	0.067
IAIT7	0.221	-0.051	***0.564***	0.179	-0.049
IATS1	0.036	0.081	0.094	***0.635***	0.003
IATS2	-0.057	0.011	-0.079	***0.932***	-0.040
IATS3	-0.025	0.018	-0.025	***0.785***	0.011
IATS4	-0.002	-0.134	-0.028	***0.814***	-0.009
IATS5	-0.028	0.080	0.077	***0.783***	-0.015
ELU1	0.192	0.005	0.006	-0.051	***0.695***
ELU2	-0.045	0.067	0.001	-0.078	***0.926***
ELU3	0.262	0.025	-0.015	-0.012	***0.680***
ELU4	-0.069	0.084	-0.033	0.009	***0.861***
ELU5	0.121	0.010	0.031	0.082	***0.718***
ELU6	0.101	0.050	-0.071	0.117	***0.750***

CONCLUSIONS AND FUTURE WORK

Information technology and intense competition are reshaping higher education institutions worldwide. E-learning has been integrated in several higher education institutions. Consequently, several adoption-related factors must be carefully

Table 6. E-learning survey instrument reliability

Factor	Cronbach Alpha	Variance Extracted
ISE	0.893	0.771
PSB	0.901	0.691
IAIT	0.888	0.730
IATS	0.847	0.795
ELU	0.909	0.777

Table 7. Correlation matrix of e-learning CSFs

Factor	ISE	PSB	IAIT	IATS	ELU
ISE	***0.878****				
PSB	0.493	***0.831****			
IAIT	0.390	0.248	***0.857****		
IATS	0.360	0.308	0.511	***0.892****	
ELU	0.509	0.581	0.185	0.278	***0.881****

** Square root of the average extracted variance*

evaluated before any adoption attempt is made by universities and instructors. The adoption of e-learning technology is a complex process of establishing and developing an integrated information technology system. This study, in line with the literature, identified and measured four critical factors that assist universities and instructors to adopt e-learning technologies. Critical factors which were identified and measured from instructor perceptions, included: instructor self efficacy, student perceived benefits, instructor attitude towards information technology, and instructor attitude towards technical support. The four factors impact the decision to adopt e-learning technology in higher education institutions.

A sample of 606 instructors was used to identify and measure the proposed e-learning factors. The instructors perceived the four factors as critical success factors in e-learning. The surveyed instructors indicated that technical support to e-learning tools and technologies is the most critical factor. Surprisingly 35% and 34% of the participants viewed instructor attitude towards information technology and perceived student benefits as the least important factors of successful e-learning. The instructors indicated that when a higher education institution attempts to adopt e-learning based courses the following factors should be critically considered:

- Instructors should have sufficient computing skills and enthusiasm.
- Construction of an effective information technology infrastructure in order to facilitate fast Web access, email, course management system, and other e-learning services.
- Establishment of reliable and responsive e-learning support services.
- Development of orientation programs to both students and instructors.
- Easy and fast Internet access

All indicators of the instructor self efficacy factor were important and significant measures. Generally, instructors felt comfortable using e-learning in teaching if they get sufficient training. Some instructors found it easy to get e-learning tools do what they wanted to do. Instructors perceived valuable student benefits such as better quality of coursework activities and better in-class interactivity.

The instructor attitude towards the information technologies used in e-learning was an important factor of e-learning success. Important items used in measuring this factor included reliability of the information technology infrastructure, Internet access and speed, course management system, and student information system. The instructor attitude towards the technical support of e-learning tool was viewed as critical success factor. Technical support factor was measured by how the helpdesk is responsive and effective. Instructors indicated that they would teach e-learning based courses in future assuring their positive attitude and support to e-learning technology and tools.

This study explored the instructors' perceptions in identifying and measuring e-learning critical factors within higher education schools. Further study can expand on this research to develop a causal research model that includes all the 5 constructs (ISE, PSB, IAIT, IATS, and ELU). The objective of the causal research model would be to study the effects of the first 4 factors on e-learning acceptance as indicated by ELU. The proposed research model can generate causal relationships among the 5 factors.

REFERENCES

Alavi, M. (1994). Computer-Mediated Collaborative Learning: An Empirical Evaluation. *MIS Quarterly, 18*(2), 159-175.

Angeli, C. (2005). Transforming a teacher education method course through technology: effects on preservice teachers' technology competency. *Computers & Education, 45*(4), 383-398.

Beyth-Marom, R., Chajut, E., Roccas, S., & Sagiv, L. (2003). Internet-assisted versus traditional distance learning environments: factors affecting students' preferences. *Computers & Education, 41*(1), 65-76.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Dveleopment of a measure and initial test. *MIS Quarterly, 19*, 189-211.

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variable and measureent error. *Journal of Marketing Research, 18*, 39-50.

Hair, J., Anderson, R., Tatham, R., & Black, W. (1998). Multivariate data analysis. In (5 ed.): Prentice Hall.

Hu, P. J., Clark, T., & Ma, W. (2003). Examining technology acceptance by school teachers: a longitudinal study. *Information & Management, 41*, 227-241.

Kollias, V., Mamalougos, N., Vamvakoussi, X., Lakkala, M., & Vosniadou, S. (2005). Teachers' attitudes to and beliefs about web-based Collaborative Learning Environments in the context of an international implementation. *Computers & Education, 45*(3), 295-315.

Lee, M. K. O., Cheung, C. M. K., & Chen, Z. (2005). Acceptance of Internet-based learning medium: the role of extrinsic and intrinsic motivation. *Information & Management, 42*(8), 1095-1104.

Liaw, S.-S., Huang, H.-M., & Chen, G.-D. (2006). Surveying instructor and learner attitudes towards e-learning. *Computers & Education, Inpress*.

Selim, H. M. (2003). An empirical investigation of student acceptance of course websites. *Computers & Education, 40*(4), 343-360.

Selim, H. M. (2004). *E-learning critical success factors: An exploratory investigation of student perceptions.* Paper presented at the 2005 IRMA International Conference, New Orleans, Louisiana, USA.

Selim, H. M. (2005). Videoconferencing-Mediated Instruction: Success Model. *Journal of Distance Education Technologies, 3*(1), 62-80.

Selim, H. M. (2006). Critical success factors for e-learning acceptance: confirmatory factor models. *Computers & Education, Forthcoming*.

Shih, T., Antoni, G., Arndt, T., Asirvatham, A., Chang, C., Chee, Y., et al. (2003). A survey of distance education challenges and technologies. *International Journal of Distance Education Technologies, 1*(1), 1-21.

Urdan, T. A., & Weggen, C. C. (2000). *Corporate e-learning: Exploring a new frontier*: WRHAMBRECHT+CO.

Wang, Y. (2003). Assessment of learner satisfaction with asynchtonous electronic learning systems. *Information & Management, In Press, uncorrected proof*.

APPENDIX

E-learning Acceptance Instrument

Instructor Self Efficacy (ISE)

ISE1	I would feel comfortable using e-learning in teaching if I get training support from the university.
ISE2	I can learn how to implement e-learning in my teaching by myself.
ISE3	I find it easy to get e-learning methods to do what I want to do.
ISE4	I have become dependent on e-learning methods in both teaching and learning.
ISE5	I can handle technologies such as, course websites, PCs, and computer projectors effectively.
ISE6	I am getting the training I need to be able to use e-learning in my teaching from the university.

Perceived Student Benefits (PSB)

PSB 1	Utilization of e-learning has enabled students to submit better quality coursework activities
PSB 2	Students have come to rely on e-learning in performing their coursework
PSB 3	All in all I think that e-learning is extremely useful to the students
PSB 4	E-learning has improved student interactivity in class
PSB 5	Students need more orientation in order to utilize e-learning affectively.
PSB 6	Students are prepared to handle e-learning activities in the class

Instructor Attitude towards IT (IAIT)

IAIT 1	Easy on-campus Internet access
IAIT 2	Internet browsing speed is satisfactory
IAIT 3	I can count on the computer network to be “up” and running
IAIT 4	I can get student information from the student information system easily
IAIT 5	I can use any on campus PC using the same authentication
IAIT 6	Overall, the university information technology infrastructure is efficient
IAIT 7	It is easy to learn how to use the computer systems I need

Instructor Attitude towards Technical Support (IATS)

IATS1	I can get technical support from technicians easily
IATS2	The information technology people I deal with understand the day-to-day objectives of my teaching and learning needs
IATS3	The IT support teams takes real interest in helping me solve my teaching and learning problems
IATS4	When I make a request for service or assistance, support team normally responds to my request in timely manner
IATS5	I am satisfied with the level of e-learning technical support planning at my university

E-learning Usage/Acceptance (ELU)

ELU1	I intend to teach courses that use e-learning methods.
ELU2	E-learning is an effective method of teaching and learning.
ELU3	Using e-learning methods fir well into the way I teach.
ELU4	All in all I think that e-learning is an important tool for my university.
ELU5	I personally benefited from the existence of e-learning activities and tools in my university.
ELU6	Using e-learning methods would make my teaching more efficient and effective.