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## Assessing the impact of e-learning systems on learners: a survey study in the KSA

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### Abstract

With the rapid growth of the use of e-learning systems around the globe, assessing the success and impact of such systems is becoming increasingly important. This paper presents findings from a study of the impact of e-learning systems on university students in the Kingdom of Saudi Arabia. It is asserted that gauging the impact of e-learning systems on learners is central to the development of suitable and effective e-learning systems. Students from two different universities in the KSA were surveyed to capture their perceptions regarding their current e-learning systems. The assessment framework is based on the IS Success/Impact Measurement framework, which has been successfully applied to similar studies on e-Learning, e-Health, and e-Government. This paper reports on the impacts that the e-learning systems have had on student participants' performance with regard to the depth of learning, customization of learning pace, student productivity, and student satisfaction. The conclusion of the study is that the use of e-learning systems shows a positive impact on student learning. This paper provides information that will be of interest to e-learning system designers and developers.

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### 1. Introduction

Ever since the concept of schools and classes was adopted by communities to facilitate education, the tradition of face-to-face interaction has prevailed. A classroom with one or more teachers and students, with both groups meeting physically and synchronously in real time, has been the common practice. However, with the advent of computer technology and the Internet, the traditional setup of learning is evolving into a form mostly referred to as "e-learning." E-learning is the term given to a kind of instruction and learning system in which the students and the teacher, or whoever is involved in the interchange of information, do not meet physically, but rather are separated by time, distance, or both. This separation is bridged with the help of communication technology, including the Internet and emergent educational technologies. E-learning may or may not be in real time. A more formal definition of e-learning is "the delivery of a learning, training or education program by electronic means. E-learning involves the use of a computer or electronic device—in some way to provide training, educational or learning material" (M. M. Maneschijn, 2005, p. 1).

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This paper reports on an assessment of the impact on students' learning of e-learning systems used in two universities in the Kingdom of Saudi Arabia (KSA). The framework used for this study is the IS Success/Impact Measurement framework pioneered by DeLone and McLean (1992) and later extended by Gable, Sedera, and Chan (2008). Based on the adaptation of this framework to the e-learning area, the assessment criteria include depth of learning, pace of learning, student productivity, and student satisfaction. The significance of this work is that it provides a new form of system evaluation based on empirically derived evidence, which will guide the next phase of evolutionary development.

Saudi Arabia was chosen as the site for this research because it is one of the fastest-growing countries in the world in terms of e-learning (CITC, 2010) and it has unique educational opportunities based on its particular cultural operating environment. Moreover, CITC data show explosive growth in the number of Internet users in the KSA, from a mere 200,000 in 2000 to 4.8 million in 2006. The number of students enrolled in institutions of higher education has also increased significantly in recent years (CITC, 2010). As a result, many of these institutions have turned to e-learning systems as a means to broaden and enhance student access to their courses and subjects (Al Saif, 2005).

Reflecting this trend, a growing number of studies have been conducted on e-learning in KSA. Many of these studies have focused on identifying the key factors that differentiate online education from face-to-face learning, analysing the in-principle advantages and disadvantages of online courses or developing strategies to achieve a suitable online learning environment (Alshehri, 2005). To date, however, little attention has been paid to the issue of assessing the existing e-learning environments that have been set up in the country. Indeed, relatively little research has been done regarding the evaluation of e-Learning systems in general (Aceto, et al., 2007; Wang, Wang, & Shee, 2007). Responding to this gap in the literature, this paper relates the results of a qualitative study on the impact of e-learning systems on student experiences of learning in two different Saudi universities. The next section of this paper provides a review of the literature related to e-learning and specifically to e-learning systems in Saudi Arabia, as well as to the IS Measurement Model (Gable, Sedera, & Chan, 2008). This is followed by a description of the methodology adopted for this study and then an analysis and discussion of the data are provided. Finally, the paper concludes by summarising the outcomes of the study and their implications for the impact of e-learning system on learners in the Saudi context.

## **2. Consideration of the IS-Impact Measurement model**

An e-learning system is one of the many types of Information System (IS) (Wang et al., 2007). In the context of e-learning and e-learning systems, there have been a number of studies on the effectiveness of web-based learning compared to traditional classroom learning (Zhang & Nunamaker, 2003). However, there has been little research carried out on the evaluation of e-learning systems themselves (Aceto et al., 2007) or their effectiveness (Wang et al., 2007).

In order to assess the effectiveness of e-learning systems in use in two universities in the KSA, the IS-Impact Measurement model (DeLone & McLean, 1992) was selected because it takes into account the success of educational systems by measuring multiple dimensions of the information system (Cao & Elias, 2009). Importantly, the IS-Impact Measurement model does not involve any financial considerations of information system success, an aspect which makes it a more reliable model for application to the educational arena (Cao & Elias, 2009). In addition, dimensional theory (Gable, et al., 2008) was used to uncover the issues that would be used to measure the IS success/impact. Furthermore, Gable et al. (Gable, et al., 2008) stated that this model should cover the maximum environment that may affect the quality of using any system like the e-learning system. We have reviewed a number of models that are relevant to using the techniques and technology in e-learning, such as DeLone and McLean's (1992) IS Success model, Balanced Scorecard (Kaplan & Norton 1996), and Sedera and Chan's IS-Impact model (2008), to find the most appropriate model for this research. We found that the DeLone and McLean IS Success model is the most cited model in IS research (B. Myers, Kappelman, & Victor, 1997).

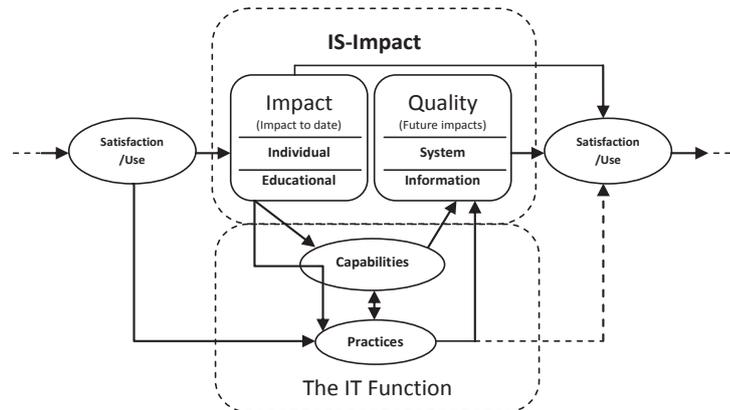


Figure 1. Modifying the IS Measurement model (Alkhalaf, Nguyen, & Drew, 2010; Gable, et al., 2008)

Most of the models have been concerned with the measurement of companies, institutions, and financial profits in measuring the IS Impact (Gable, Sedera, & Chan, 2003). However, this paper focuses on measuring the impact of e-learning system on individuals. The latest model developed by researchers is the IS Impact model, which is also a measurement model for IS evaluation (Gable, et al., 2003; Gable, et al., 2008). This model is the most useful for measuring e-learning systems because it comprises 41 measures that include 6 dimensions: System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact (Cao & Elias, 2009; Gable, et al., 2008). According to Gable et al. (2008) and Rabaa'i and Gable (2009), user satisfaction and IS use are a result of the success (before and after), rather than a contributing factor to success. Moreover, both system quality and information quality affect use and user satisfaction (Wang, et al., 2007). In addition, Gable, Sedera, and Chan (2008) believe that the Use construct in the IS-Impact Measurement model is unsuitable for measuring IS success. They stated that "user satisfaction has been measured indirectly through Information Quality, System Quality and other variables in prior studies" (Gable, et al., 2008). Thus, we are left with only 36 measures from 4 dimensions. A review of previous studies in IS fields, e-learning systems, IS success, end-user computing satisfaction, system use, and other areas related to IS measurement and evaluation (e.g., (Bonk, 2002; El Mansour & Mupinga, 2007; Gable, et al., 2003; Gable, et al., 2008; Hooper, 1992; Latchman, Salzmman, Thottapilly, & Bouzekri, 1998; S. Liaw & Huang, 2007; M. Maneschijn, 2005; Naidu, 2006; Okamoto, 2003; Rabaa'i & Gable, 2009, 2010; Reuben, 1988; Suthers, Vatrappu, Joseph, Dwyer, & Medina, 2006; Tomsic & Suthers, 2006; Wang, 2003; Wang & Liao, 2007; Wang & Tang, 2004; Wang, Tang, & Tang, 2001; Wang, et al., 2007; Zembylas & Vrasidas, 2007) was carried out in order to find the most suitable variables for measuring the success of e-learning systems. Section 3 discusses how these models, generally applied to institutions, can be modified to measure impacts on individuals.

### 3. Measuring individual impact

According to Gable, Sedera, and Chan (2008, p. 289), "The 'individual impact' is a measure of the extent to which (the IS) has influenced the capabilities and effectiveness, on behalf of the organization, of key-users" (p. 289). Based on the IS-Impact Measurement model, the variables for the construct of "individual impact" areas shown in Table 1:

Table 1. Individual Impact (II) items

Items	Sources
II1 - I have learnt a lot through the experience of using the e-learning system	(Gable, et al., 2008, p. 390)
II2 - The e-learning system enhances my awareness of the requirements of educational processes	(Gable, et al., 2008, p. 390)
II3 - Using the e-learning system will increase my productivity	(Gable, et al., 2008, p. 390)
II4 - I am satisfied with the experience of using the e-learning system	(Wang, et al., 2007, p. 1799)
II5 - Most users have a positive attitude towards or evaluation of e-learning system functionality	(Wang, et al., 2007, p. 1798)

Accordingly, the hypothesis for this construct is that the use of e-learning system has a positive impact on the individual.

#### 4. Methods

This study adopts a positivist paradigm of research. According to M. D. Myers (1997) and Walsham (1995), the positivist school concerns when researchers achieve substantive information and discover facts in a way that could be replicated by other researchers. Objectivity can be maintained through the use of scientific methodologies and mainly logical rules, calculations, and assumptions that are used to test theories and to obtain independent and unbiased results (M. D. Myers, 1997). This study uses a positivist approach because it seeks to test a theory and uses a hypothesis to achieve a model for a high-quality e-learning system. The hypothesis arose through the application of the IS-Impact Measurement model.

The analysis was carried out through quantitative study of the data, which were collected through a questionnaire. The survey questionnaire was distributed to e-learning students in both Qassim University and King Abdulaziz University in order to evaluate the current e-learning system that is already used in these universities. The questionnaire was designed based on the IS measurement model (Gable, et al., 2008). It includes 37 questions and measures 4 dimensions: System Quality, Information Quality, Individual Impact, and Educational Impact. As mentioned earlier, this paper focuses on the individual impact, which consists of 5 measures, or variables. The questionnaire was presented to 800 students and 560 were returned, but 32 of these were excluded as they were deemed incomplete. Therefore, 528 questionnaires, 328 from male participants and 200 from females, were included in the analysis.

#### 5. Findings

Statistical analysis of 528 questionnaires was carried out with the Statistical Package for Social Sciences (SPSS). As mentioned above, only those survey questions that measure the impact of e-learning systems on individuals are included. We analyse the frequency and percentage of responses for each of the 5 variables, their Chi-square value and their level of significance.

Table 2: Relative numerical distribution and basic standards, including the Chi-square values of variables related to influencing the individual (Individual Impact)

Item	Strongly agree		Agree		Neutral		Disagree		Strongly disagree		Mean	SD	$\chi^2$	Relative weight	Order
	N	%	N	%	N	%	N	%	N	%					
1	143	26.5	205	40.6	117	23.2	30	5.94	19	3.76	3.8	1.018	236.9 <sup>**</sup>	76	3
2	144	28.5	220	43.6	103	20.4	27	5.35	11	2.18	3.91	.945	292.9 <sup>**</sup>	78.2	1
3	157	31.1	199	39.4	92	18.2	43	8.51	14	2.77	3.88	1.034	235.2 <sup>**</sup>	77.6	2
4	132	26.3	169	33.7	87	17.4	81	16.2	32	6.39	3.57	1.217	109.2 <sup>**</sup>	71.4	4
5	77	15.5	202	40.6	138	27.7	62	12.4	19	3.82	3.51	1.019	204.6 <sup>**</sup>	70.2	5

\* denotes significance at 0.01 or 10%

\*\* denotes significance at 0.05 or 5%

Items: 1: I have learnt a lot through the experience of using the e-learning system; 2: The e-learning system enhances my awareness of the requirements of educational processes; 3: Using the e-learning system increases my productivity; 4: I am satisfied with the experience of using the e-learning system; 5: Most users have a positive attitude towards or evaluation of e-learning system functionality.

In calculating the Chi-square Goodness of Fit Test from Table 2, which shows the values for each item that is related to individual responses regarding the first dimension of the questionnaire, which is Individual Impact, we see that the Chi-square for each item is higher than the critical value of 0.05 and the probability level of 7.78 for significance with 4 degrees of freedom indicates that for each item there is a significant difference between expected and actual values for the dimension Individual Impact. This means that these results are no statistical coincidence.

The survey results clearly indicate that the most important response among the variables within Individual Impact is item number 2: "the system enhances my awareness of the requirements of educational processes." The majority of students have a positive view of the functionality of the e-learning system, with mean scores between 3.51 and

3.91 out of 5, and the importance of the relative range is 70.2–78.2%, with all variables near 70% and with standard deviation ranging from 0.945 to 1.217.

With regard to item number 1, the results demonstrate that the majority of students feel that they have learnt a great deal through the use of the e-learning system, but with different levels of agreement. While 40% of the students agree that they have learnt a lot, 26% state that they strongly agree. Thus, it appears that the use of e-learning systems has had a positive impact on their education. Their conviction suggests that e-learning plays an effective role in the development of educational processes. These findings are in line with several previous studies. For instance, Williams and Jacobs (2004) stated that student learning through blogs or similar collaboration tools is more effective than from teachers or textbooks.

The results further indicate that most of the students (72%) either agree or strongly agree that e-learning systems enhance their awareness of the requirements of educational processes. This result reflects some of the previous findings in the literature, such as Ehlers (Ehlers, 2011), who found that a certain educational environment is needed for development and learning processes.

Moreover, the majority (71%) of the surveyed students either agree or strongly agree that using e-learning systems increases their productivity. A reason behind this may be related to the adoption of modern e-learning systems that enable students to get all the required information in the educational process easily and quickly.

The results also confirmed that 60% of the participants are either satisfied or very satisfied with their experiences using e-learning systems. However, about 23% of the students either disagree or strongly disagree regarding their satisfaction with the experience of using the e-learning system, so more improvements in the applied e-learning system are needed to enhance students' satisfaction and meet their requirements. The widespread availability of modern technology in organisations, as implemented through an e-learning system at Qassim University, has improved the student experience. Furthermore, the University has attempted to close the gap between students and administration through this new technology. In addition, the findings show that 40.6% of the students agree that they have a positive view towards the functionality of the e-learning system and 15.5% strongly agree. These results are similar to Liaw, Huang, and Chen's (2007, p. 1066) finding that in e-learning system users "have very positive perceptions toward using e-learning as a teaching assisted tool" (p. 1066).

## 6. Conclusion

This paper reports on an assessment of the impacts of an e-learning system on individual students in Saudi Arabia. The measurement framework was based on the IS Success/Impact Measurement framework pioneered by DeLone and McLean (1992) and extended by Gable, Sedera, and Chan (2008). This paper indicates that the use of e-learning system positively affects the individual impact. Importantly, the findings supported a number of results reported in previous literature regarding the impact of e-learning systems on individuals. The analysis of the results shows that using e-learning systems has increased students' ability to interpret information accurately. Furthermore, the e-learning system has increased students' understanding of the information and relevant activities in their departments. It also helps provide basic information, which, in turn, helps students take important decisions effectively and accurately, thus increasing the overall productivity of the process of teaching and learning. Finally, this paper highlighted the IS Success/Impact model as the most useful for measuring the impact of e-learning system on individuals.

## References

- Aceto, S., Delrio, C., Dondi, C., Fischer, T., Kastis, N., Klein, R., et al. (2007). e-Learning for Innovation: Executive Summary of the Helios Yearly Report 2007. Brussels: MENON Network EEIG.
- Al Saif, A. A. (2005). The motivating and inhibiting factors affecting the use of web-based instruction at the University of Qassim in Saudi Arabia. Unpublished 3168482, Wayne State University, United States Michigan.
- Alkhalaf, S., Nguyen, A., & Drew, S. (2010, 26-28, November). Assessing eLearning Systems in the Kingdom of Saudi Arabia's Higher Education Sector: An exploratory analysis. Paper presented at the 2010 International Conference on Intelligent Network and Computing (ICINC 2010), Kuala Lumpur, Malaysia.

- Alshehri, A. (2005). Assessing faculty attitudes toward the significant factors for facilitating the implementation of online courses at the Institute of Public Administration in Saudi Arabia. Mississippi State University
- Bonk, C. (2002). Collaborative tools for e-learning. *Chief Learning Officer*, 30, 41.
- Cao, Lan & Elias, Nur Fazidah (2009) Validating the IS-Impact model : two exploratory case studies in China and Malaysia. InBapna, Ravi & Sambamurthy , V (Eds.) *Proceedings of the Pacific Asia Conference on Information Systems 2009*, Association for Information Systems (AIS), Hotel Novotel, Hyderabad, India, pp. 1-14.
- CITC. (2010, 2011). Communication and Information Technology Commission 2009, from <http://www.citc.gov.sa/citcportal/Homepage/tabid/106/cmospid/%7B611C6EDD-85C5-4800-A0DA-A997A624D0D0%7D/Default.aspx>
- Dalziel, J. (2003). Implementing learning design: The learning activity management system (LAMS). *Proceedings of the ASCILITE 2003 conference*, Adelaide..
- DeLone, W., & McLean, E. (1992). Information systems success: The quest for the dependent variable. *Information systems research*, 3(1), 60–95.
- Ehlers, U. D. (2011). Quality in e-learning from a learner's perspective. *EURODL*, 9.
- El Mansour, B., & Mupinga, D. (2007). Students'positive and negative experiences in hybrid and online classes. *College Student Journal*, 41(1), 242.
- Gable G, Sedera D And Chan T (2003) Enterprise systems success: a measurement model. In *Proceedings of the Twenty-Fourth International Conference on Information Systems (MARCH S, MASSEY A and DEGROSS JI, Eds)*, p. 576, Association for Information Systems, Seattle, Washington, US.
- Gable, G., Sedera, D., & Chan, T. (2008). Re-conceptualizing information system success : the IS-Impact Measurement Model. *Journal of the Association for Information Systems*, 9(7), 377-408.
- Hooper, S. (1992). Cooperative Learning and Computer-Based Instruction. *Educational Technology Research and Development*, 40 (3).
- Latchman, H., Salzmann, C., Thottapilly, S., & Bouzekri, H. (1998). Hybrid asynchronous and synchronous learning networks in distance education. Paper presented at the International Conference on Engineering Education, ICEE'98, Rio de Janeiro, Brazil.
- Liaw, S.-S., Huang, H.-M., & Chen, G.-D. (2007). Surveying instructor and learner attitudes toward e-learning. [doi: 10.1016/j.compedu.2006.01.001]. *Computers & Education*, 49(4), 1066-1080.
- Liaw, S., & Huang, H. (2007). Developing a Collaborative e-Learning System Based on Users' Perceptions. *Lecture Notes in Computer Science*, v 4402, 751.
- Maneschijn, M. (2005). *The e-learning dome: A comprehensive e-learning environment development model*. (Unpublished Master's thesis). University of South Africa, South Africa.
- Myers, B., Kappelman, L., & Victor, R. (1997). Prybutok, A comprehensive model for assessing the quality and productivity of the information systems function: toward a theory for information systems assessment. *Information Resources Management Journal*, 10(1), 6-25.
- Myers, M. D. (1997). Qualitative Research in Information Systems. [Article]. *MIS quarterly*, 21(2), 241-242.
- Naidu, S. (2006). *E-learning: A guidebook of principles, procedures and practices*. 2nd Revised Edition. New Delhi, India: Commonwealth Educational Media Center for Asia (CEMCA), and the Commonwealth of Learning.
- Okamoto, T. (2003). E-collaborative learning technologies and e-pedagogy. *Proceedings of the 3rd IEEE International Conference on Advanced*
- Rabaa'i, Ahmad A. & Gable, Guy G. (2009) Extending the IS-Impact Model into the higher education sector. In *ICICS2009 : 7th International Conference on Information and Communications Systems*, 7-10 Dec., 2009, Macau. Reuben, B. (1988). *Communication and human behaviour*: USA:Macmillan Publishing Company.
- Reuben, B. (1988). *Communication and human behaviour*.USA: Macmillan Publishing Company.
- Suthers, D., Vatrappu, R., Joseph, S., Dwyer, N & Medina, R. (2006). Representational Effects in Asynchronous Collaboration: A Research Paradigm and Initial Analysis. In *Proceedings of the 39th Hawai'i International Conference on the System Sciences (HICSS-39)*, January 4-7, 2005, Kauai, Hawai'i (CD-ROM), Institute of Electrical and Electronics Engineers, Inc. (IEEE)

- Tomsic, A., & Suthers, D. (2006). Discussion tool effects on collaborative learning and social network structure. *Educational Technology & Society*, 9(4), 63-77.
- Walsham, G. (1995). The emergence of interpretivism in IS research. *Information systems research*, 6(4), 376–394.
- Wang, Y. (2003). Assessment of learner satisfaction with asynchronous electronic learning systems. *Information & Management*, 41(1), 75-86.
- Wang, Y., & Liao, Y. (2007). The conceptualization and measurement of m-commerce user satisfaction. *Computers in Human Behavior*, 23(1), 381-398.
- Wang, Y., & Tang, T. (2004). Assessing customer perceptions of Web site service quality in digital marketing environments *Advanced Topics in End User Computing* (Vol. 3, pp. 16-35): IGI Global.
- Wang, Y., Tang, T., & Tang, J. (2001). An instrument for measuring customer satisfaction toward web sites that market digital products and services. *Electronic Commerce Research*, 2(3), 89-102.
- Wang, Y., Tang, T., & Tang, J. (2001). An instrument for measuring customer satisfaction toward web sites that market digital products and services. *Electronic Commerce Research*, 2(3), 89–102.
- Wang, Y., Wang, H., & Shee, D. (2007). Measuring e-learning systems success in an organizational context: Scale development and validation. *Computers in Human Behavior*, 23(4), 1792-1808.
- Williams, J. B., & Jacobs, J. S. (2004). Exploring the use of blogs as learning spaces in the higher education sector. *Australasian Journal of Educational Technology*, 20(2), 232-247.
- Zembylas, M., & Vrasidas, C. (2007). Listening for silence in text-based, online encounters. *Distance Education*, 28(1), 5-24.
- Zhang, D., & Nunamaker, J. (2003). Powering e-learning in the new millennium: An overview of e-learning and enabling technology. *Information Systems Frontiers*, 5(2), 207–218.