

# **Toward Successful E-Learning Implementation in Developing Countries: A Proposed Model for Predicting and Enhancing Higher Education Instructors' Participation**

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## **Abstract**

The rapid development and widespread of Internet and communication technologies have materially altered many characteristics and concepts of the learning environment. E-learning emerged as an imperative paradigm of modern education unrestricted by time or place, offering new possibilities to higher education institutions for providing flexible and cost-effective remote or distance learning environment, thus many universities put it in their programs. In developing countries e-learning can compensate the weakness of traditional education methods. While a considerable amount of research has been conducted on e-learning, little has tested it from the perspective of instructors, as a determinant or prerequisite for any successful implementation. Thus this research paper attempts to fill this gap in the current body of literature, specifically in our local context, by empirically examining and validating the critical factors that have the most significant influence on instructor's participation in e-learning process. In contrast to previous works in this area, the current empirical study extended the research scope by combining the most critical factors identified in literature and applied them in the local context, therefore researcher's proposed model contained variables that have not been integrated into one framework, to examination simultaneously for validation and relationship. A richer research methodology is used in this empirical study combining quantitative and qualitative methods. Based on its findings the study has made a number of important managerial and academic implications.

**Keywords:** Developing countries, E-learning, Higher-education, Learning environment, University instructors.

## **1. Introduction**

The rapid development and widespread of Internet and communication technologies have materially altered many characteristics and concepts of the learning environment. Nowadays, the traditional teaching in universities' classrooms becomes no longer sufficient for our students. E-learning (electronically delivered learning) emerged as an imperative paradigm of modern education unrestricted by time or place, offering new possibilities to higher education institutions for providing flexible and cost-effective remote or distance learning environment,

thus many universities put it in their programs, depending mainly on the Internet as a delivery medium (e.g. Chen & Tseng, 2012; Ahmed, 2010; Keramati et al., 2011; Bhuasiri et al., 2012).

Universities in developing countries face unique challenges compared to developed countries and suffer from congested classrooms, e-learning can compensate the weakness of their traditional education methods and enables higher-education instructors to transfer their knowledge for a relatively large number of students without limitation of space, time or facilities (e.g. Bhuasiri et al., 2012; Maldonado at al., 2011).

Addressing these challenges require examining the participation of higher-education instructors as an essential determinant or prerequisite for any successful e-learning implementation. Strong support can be found for this argument by other researchers (e.g. Chen & Tseng, 2012; Teo, 2011; Teo, 2011) concluded that Universities' instructors will be reluctant to invest time and effort in e-learning if they do not perceive it as a useful higher-education system.

Therefore there would seem to be some merit for more studies to empirically examine factors influencing the participation of higher-education instructors in e-learning systems at unstudied developing countries to achieve improvement in learning outcomes. The current research is an attempt at this direction.

## **2. Research Problem, Objectives and Plan**

Although studies in e-learning are increasing in number, related models offered in the academic literature concerning its applications in universities are mainly conceptual, while few empirical researches have tested it from the perspective of instructors, as an essential determinant for any successful implementation (Chen & Tseng, 2012; Chen & Huang, 2011; Bhausiri et al., 2012).

Another key limitation of the existing e-learning literature to date concerns their focus exclusively on developed countries, with a greater predisposition toward the Internet, while the worldwide growth of e-learning has shown the need to extend this research to other unstudied developing countries (e.g. Ahmed, 2010; Maldonado at al., 2011). Therefore, this research attempts to fill this gap in the current body of literature by developing and validating an empirical-based model for systematically predicting the various critical factors influencing instructors' intention to participate in e-learning systems, as well as suggesting recommendations to enhance this participation for more learning outcomes.

In sum, the present investigation contributes to literature and practice through achieving the following objectives: (1) provide deeper understanding about role of e-learning in improving higher education process and providing more learning outcomes specifically in developing countries, (2) examine the potential factors that have the most significant influence on instructor's intention to participate in e-learning systems as an essential determinant for any successful implementation, and assess the relative importance of each of these factors, (3)

develop and validate a mathematical model that can systematically predict and enhance the probability of their participation.

With these objectives in view, the current paper has been organized as follows: the literature and relevant studies were reviewed and analyzed. Then a research model was proposed and hypotheses were formulated to be tested in the study. This was followed by an explanation of the procedures used to obtain data, measurement, and validation processes, as well as the testing of the hypotheses stated. Finally, based on paper's findings a series of conclusions with managerial implications and final thoughts that emphasize the great interest in the topic under analysis were presented; and then certain limitations and future lines of research with regard to this issue were highlighted.

### **3. Literature Review**

Relevant literature, which provided the conceptual foundation for this paper and past research were extensively reviewed and integrated sequentially, including a wide range of recently published works, in order to develop more effectively the study hypotheses and the research model. Through this process it was noted that E-learning has been conceptualized and defined in multiple ways in literature. However, today many authors use the terms e-learning, online learning and web-based learning interchangeably, and that approach will be taken in the current study. Taking the learner perspective for instance Hassanzadeh et al. (2012) defined e-learning as a learning technology that uses web browsers as a tool for interaction with learners and other systems. Similarly Abdleaziz et al. (2011) viewed e-learning as a type of distance learning in which educational material is delivered electronically to a remote learner via the Internet or intranet.

Other research stream adopted the process perspective; this school of thought defined e-learning as using the network technologies to create, foster, deliver and facilitate learning, anytime and anywhere (Duan et al., 2010), or simply it refers to the education delivered through information and communications technologies to support individual and organizational goals (Maldonado et al., 2011). Here e-learning is perceived as a key enabler to knowledge transfer within the higher education sector, which considered the central theme of the system (Owens & Price, 2010; Sridharan et al., 2010).

For the current study purpose, we operationally defined e-learning in high-education institutions as a type of distance learning that uses the Internet technology to interact with remote learners and deliver educational material electronically to support students and universities goals and enhance knowledge transfer.

In this connection, it is worthwhile to mention that there are different technologies that high-education instructor can use as a tool for e-learning, such as Internet, intranet, extranet, satellite, broadcast, audio/video tape, interactive TV, CD-ROM and many others. But with the increasing development of internet, concept of e-learning has been completed and generally

refers to cases where learning is done through the internet (Hassanzadeh et al., 2012; Brown & Charlier, 2012).

E-learning as a new paradigm shifts higher-education from instructor-centered to learner-centered and enhance the quality of teaching and learning. Through the Internet, e-learning allows digitized educational materials to be quickly and efficiently delivered to higher-education students. The self-paced aspect of e-learning gives students a chance to access educational materials any time, any place and choose tools appropriate to their different needs. It also allows students to customize the organization of their personal learning course (Jeong et al., 2012; Bhuasiri et al., 2012). Universities can achieve numerous benefits from implementing e-learning programs, including personalized instruction, content standardization, accountability, on-demand availability, reduced cycle time, increased convenience for students, improved tracking capabilities, and reduced cost.

Also, e-learning systems provide a configurable infrastructure that integrates learning material, books, and services into a single solution to effectively and economically create and deliver educational content. As a result, it has become an important alternative to traditional classroom and growing at fast rate among higher-education institutions (Bhuasiri et al., 2012; Abdelaziz et al., 2011; Duan et al., 2010; Brown & Charlier, 2012). From the instructors view point, e-learning systems allow tutoring to be done at anytime and materials can be updated at once, (Chen & Tseng, 2012; HU & Hui, 2012; Kermati et al., 2011; Brown & Charlier, 2012).

On the other hand, existing e-learning systems pose a serious challenging to instructors, specifically in developing countries. Higher-education instructors in developing countries are relatively accustomed to traditional teaching approaches; as a consequence, creating educational technology awareness and changing instructors' intentions and behavior to use it are required for the success of e-learning implementation (Bhuasiri et al., 2012, Wu et al., 2010; Jeong et al., 2012).

Analyzing a wide range of the available published studies dealt with e-learning adoption led to identification of some constructs that may be associated with instructors' intention to participate in e-learning. These constructs are drawn from e-learning literature, information technology literature and the theory of acceptance technology to effectively meet research objectives and help in better refining the research problem. Given that different studies identified different factors. For example, Chen & Testing (2012), examined four main variables: instructor' experience with the Internet, instructor' experience with computer, perceived usefulness (the extent to which instructor believes that using e-learning would enhance his or her efficiency), and perceived complexity (the extent to which instructor finds that e-learning is difficult to use). They reported that the first three factors have a significant positive association with e-learning adoption, while the perceived complexity of e-learning is negatively related to this adoption. Compared with this negative effect, some authors (e.g. Rugnon & Garcia, 2010) used the term perceived ease of use instead of perceived complexity, and accordingly they referred to the positive correlation between this variable and e-learning adoption.

On the other hand, Duan et al. (2010) and Zhang et al. (2010) proposed three different perceptual factors, perceived compatibility (the extent to which instructor believes that e-learning is compatible with existing values and experience), perceived trial-ability (the extent to which instructor believes that there are chances for e-learning to be tested before applying it) and perceived visibility (the level of which the results of e-learning are visible). In this respect, they concluded that these variables have a significant positive influence on user intention to use e-learning.

In addition to previously mentioned variables, insights from a serious of in-depth interviews in the preliminary stage of our study revealed some organizational factors which have not been previously addressed in other works, but considered important in influencing instructors' intention to participate in e-learning in developing countries. These factors are the university culture and university size. It seems probable that if university is relatively large and has a supportive culture toward e-learning systems, higher-education instructors will be more likely to use e-learning. Focusing on developing countries such as Egypt is relevant because previous research employed data from developed countries.

#### 4. Developing the Research Model and Hypotheses

Drawing upon the theoretical background discussed earlier and based on the feedback arising out of our preliminary study, the research model was developed and graphically presented in figure 1 to guide this investigation. The structure paths of the model represent the directions of the hypothesized relationship.

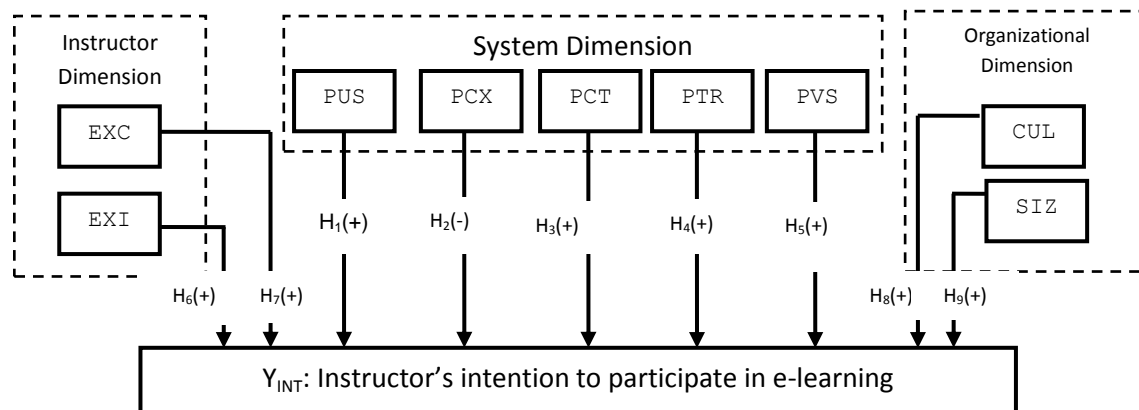


Figure 1: The Research Model

Where:

- PUS= Perceived ease of use
- PCX= Perceived complexity
- PCT= Perceived compatibility
- PTR= Perceived trail-ability
- PVS= Perceived visibility
- EXI= Experience with Internet
- EXC= Experience with computer

CUL= University Culture

SIZ= University Size

YINT= Instructor' intention to participate in e-learning systems

In contrast to previous works and existing models in this area, the current empirical study extended the research scope by combining the most critical factors identified in relevant literature and attempted to apply them in the local context. Therefore our proposed model contained variables that have not been integrated into one framework subject, to examination simultaneously for validation and relationship.

As presented in the figure, the study categorized nine constructs into three main dimensions, based on their relevant nature, as independent variables, to be examined simultaneously in our proposed model: (a) System related dimension includes perceived usefulness (PUS), perceived complexity (PCX), perceived compatibility (PCT), perceived trial-ability (PTR) and perceived visibility (PVS), (b) Instructor related dimension include instructor' experience with the Internet (EXI) and instructor' experience with computer (EXC), (c) organizational related dimension include university culture (CUL) and university size (SIZ). Accordingly, hypotheses for testing their relationships are formulated as follows:

- H<sub>1</sub>: Perceived usefulness positively influences the instructor' intention to participate in e-learning system
- H<sub>2</sub>: Perceived complexity negatively influences the instructor' intention to participate in e-learning system
- H<sub>3</sub>: Perceived compatibility positively influences the instructor' intention to participate in e-learning system
- H<sub>4</sub>: Perceived trail-ability positively influences the instructor' intention to participate in e-learning system
- H<sub>5</sub>: Perceived visibility positively influences the instructor' intention to participate in e-learning system
- H<sub>6</sub>: Experience with Internet positively influences the instructor' intention to participate in e-learning system
- H<sub>7</sub>: Experience with computer positively influences the instructor' intention to participate in e-learning system
- H<sub>8</sub>: Supportive university culture positively influences the instructor' intention to participate in e-learning system
- H<sub>9</sub>: University size positively influences the instructor' intention to participate in e-learning system

Symbolically, the prediction multiple regression equation of the model (EQ1) can be presented as follows, to predict the probability of high-education instructor's intention to participate in e-learning systems (the criterion variable: YINT), served as regress, given known values from a set of predictor variables (PUS, PCX, PTR, PVS, EXI, EXC, CUL and SIZ), used as regressors.

EQ1:

$$Y_{INT} = a + b_{PUS} PUS - b_{PCX} PCX + b_{PCT} PCT + b_{PTR} PTR + b_{PVS} PVS + b_{EXI} EXI + b_{EXC} EXC + b_{CUL} CUL + b_{SIZ} SIZ$$

Where:

PUS= Perceived ease of use

PCX= Perceived complexity

PCT= Perceived compatibility

PTR= Perceived trail-ability

PVS= Perceived visibility

EXI= Experience with Internet

EXC= Experience with computer

CUL= University Culture

SIZ= University Size

$Y_{INT}$ = Instructor' intention to participate in e-learning systems

## **5. Research Methodology**

A richer research methodology is used in this empirical study combining quantitative and qualitative methods to validate the research model and empirically test the hypothesized relationships among its variables. Thus, the research process involved multi-stage procedures as follows:

### *5.1 Preliminary Qualitative Study*

In this stage, a series of in-depth interviews were held to get deeper understanding of the phenomenon under investigation, and establish the criteria and relationship constructs relevant to our empirical study. Issues arising from this stage were used as a basis for the next quantitative study.

### *5.2 Preliminary Qualitative Study*

The quantitative stage in the form of personally-administrated questionnaire survey was conducted over three-month period to collect empirical data. The target population was the higher-education instructors who are teaching to post-graduate students in Egyptian government and public universities. To increase generalizations of the results the participants were spread across six major universities in Egypt (three government universities and three private universities). A comprehensive list of respondents was assembled from the six universities' websites and served as a sampling frame for this study to enhance the validity of the survey results. Simple random sampling was carried out in order to gain as many representative samples as possible.

### *5.3 Instrument and Validity*

To develop our instrument a number of prior relevant studies and corresponding scales were reviewed to ensure that a comprehensive list of measures was included and the major aspects of the topic were adequately covered. Multi-items measures were generated for each construct and assessed for the reliability and content validity. A 7-point multi-item Likert scales ranging from 1 as strongly disagree to 7 strongly agree was used for measuring all influential constructs

(except university size). The questionnaire was originally developed in English, and subsequently translated into Arabic language. Also, a back translation was carried out by another translator to ensure the accuracy of the translation. The questionnaire was then pre-tested among 25 respondents. This step was followed by a pilot test. Based on pre-test and pilot test feedback, modifications had been made to improve readability and appropriateness. The revised questionnaire was again pre-tested and the final version was found worked well and the instrument has confirmed content validity.

#### *5.4 Research Design and Reliability*

The research design for this study involved a cross-sectional survey methodology, which was conducted between March and May, 2012. Among a total of 600 questionnaires that were randomly distributed, 281 valid responses were received and used in data analysis, after removing invalid answers, yielding a usable response rate of 58.20 percent for the overall survey. The sample consisted of 174 male respondents (48.50%) and 84 female respondents (40.21%). Despite the relatively low response rate, which thought to be expected, as the survey was conducted during the spring academic semester, the fact that the respondents were as much representative of the population as possible, led to their contribution being regarded as providing information applicable to the larger population. The reliability of instruments was assessed using Cronbach's alpha coefficient test. The test showed an acceptable degree of internal consistency reflecting a strong reliability, all alpha values over 0.8 (alpha > 0.8).

### **6. Data Analysis and Model Testing**

The empirical data collected by the survey was analyzed and tested using statistical software packages (SPSS). Multiple regression analysis with its associated statistical inference tests (F test and t-test on b), were applied.

#### *6.1 Multicollinearity Test*

To determine whether any multicollinearity effects existed, total correlation matrix of the research model was reviewed in-depth, and the results showed that there was no significant evidence of multicollinearity problem among regressors. The results of testing each of the nine hypotheses are given below:

#### *6.2 The results of Hypotheses testing*

The summary output of the multiple regression analysis, in table 1, led to accept the above mentioned hypotheses, while the statistical significance test supported this acceptance.



Table 1: Summary output of the multiple regression analysis

Coefficients <sup>a</sup>	Symbols	Values
<i>Regression Statistics</i>		
Multiple correlation coefficient	Multiple R	0.943285633
Coefficient of multiple determination	R <sup>2</sup>	0.889787786
Adjusted R Square	Adjusted R <sup>2</sup>	0.886257857
Standard Error	SEE	0.725335549
Observations	N	291
<i>ANOVA <sup>b</sup></i>		
Regression	SS <sub>reg</sub>	1193.55094
Residual	SS <sub>res</sub>	147.837376
Total	SS <sub>total</sub>	1341.38832
F-test overall model	F	252.069629861732*
Degrees of freedom	df <sub>1</sub> , df <sub>2</sub>	9, 281

<sup>a</sup> Criterion variable:  $Y_{INT}$

b. Predictors: (constant), PUS, PCX, PCT, PTR, PVS, EXI, EXC, CUL and SIZ

\*Significant at ( $p < 0.0000$  level)

A strong, significant and meaningful correlation is found between citizen' intention to use public e-services and the above mentioned independent variables (Multiple correlation coefficient: Multiple R=0.943285633). The F statistic value (F=252.069629861732 at  $p < 0.000000$  level) is statistically significant indicating that the results of the model could hardly have occurred by chance. Thus, the goodness-of-fit of the model is satisfactory. The coefficient of determination, multiple R-square showed that these predictor factors explained the major proportion (88.97 %) of the variability observed among instructors' intention (R<sup>2</sup>=0.886257857), which reinforce our confidence in the hypotheses testing results and provides support for the above mentioned association.

Furthermore, the adjusted R<sup>2</sup> of the model, which is a more conservative estimate of variance by considering error variance, is 0.886257857. This reinforces our confidence that the overall explanatory power of the research model considered high and quite capable of explaining the observed variance among the sample. For easily comparing and assessing the relative impact of each predictor variable on the criterion variable standardized beta coefficients and t-test values were summarized in table 2.

Table 2: Variables included in the research model equation

Factors	Regression Coefficients		Beta Coefficients		<i>t-test</i>	
	Sym bol	Value	Sym bol	Valu e	Value	Sig.
PUS	$b_{PUS}$	0.27520 1658	$B_{PUS}$	0.26 4	7.117431 449	0.000000 000
PCX	$b_{PCX}$	- 0.09749 712	$B_{PCX}$	- 0.09 3	- 3.869038 79	0.000000 000
PCT	$b_{PCT}$	0.00294 9334	$B_{PCT}$	0.00 2	0.089538 65	0.928717 623
PTR	$b_{PTR}$	0.10185 7132	$B_{PTR}$	0.06 2	2.724952 87	0.006834 506
PVS	$b_{PVS}$	0.14699 5963	$B_{PVS}$	0.09 1	2.519907 621	0.000000 000
EXI	$b_{EXI}$	0.23912 2884	$B_{EXI}$	0.26 6	5.500677 457	0.003894 786
EXC	$b_{EXC}$	0.06436 8675	$B_{EXC}$	0.06 5	2.910711 32	0.000000 000
CUL	$b_{CUL}$	0.52875 6442	$B_{CUL}$	0.30 4	7.252186 714	0.000156 89
SIZ	$b_{SIZ}$	0.17636 3268	$B_{SIZ}$	0.13 6	3.799074 834	0.000178 05
<i>Intercept</i>	<i>a</i>	0.62938 8769				
<i>df</i>	<i>n-k-1</i>	281				

Based on the results shown in the table, it can be stated that within 9 independent variables, included in EQ1, only five predictor variables are considered to have a critical significant impact on the criterion variable  $Y_{INT}$ , namely CUL, EXI, PUS, SIZ and PCX. More specifically, the university culture (Beta  $CUL = 0.304$ ,  $p < 0.000000$ ) had the highest effect on instructors' intention, followed by experience with Internet (Beta  $EXI = 0.266$   $p < 0.000000$ ), perceived usefulness (Beta  $PUS = 0.264$   $p < 0.000000$ ), university size (Beta  $SIZ = 0.136$ ,  $p < 0.000000$ ) and perceived complexity (Beta  $PCX = -0.093$   $p < 0.000000$ ).

These findings are in partially agreement with previous work, as there were some similarities with those provided by Chen & Tesng (2012). They found that the perceived usefulness followed by perceived ease of use were the most important determinants of teachers' acceptance to use e-learning systems at junior schools in Taiwan. Using the values of the regression coefficients presented in table 2, the future intention of higher-education instructors

to participate in e-learning systems can be predicted, in this study, by the following final equation (EQ2):

$$Y_{INT} = 0.63 + 0.27 PUS - 0.09 PCX + 0.003 PCT + 0.10 PTR + 0.15 PVS + 0.24 EXI + 0.06 EXC + 0.53 CUL + 0.18 SIZ$$

### 6. 3 Normal probability analysis

As the classical regression model was used in our analysis, a P-P plot of regression standardized residual for assessing the assumption of normality was conducted. The plot, in figure 2, showed that the quantile pairs fell nearly on a straight line. Thus, it can be stated that the data used in this research are approximately normally distributed.

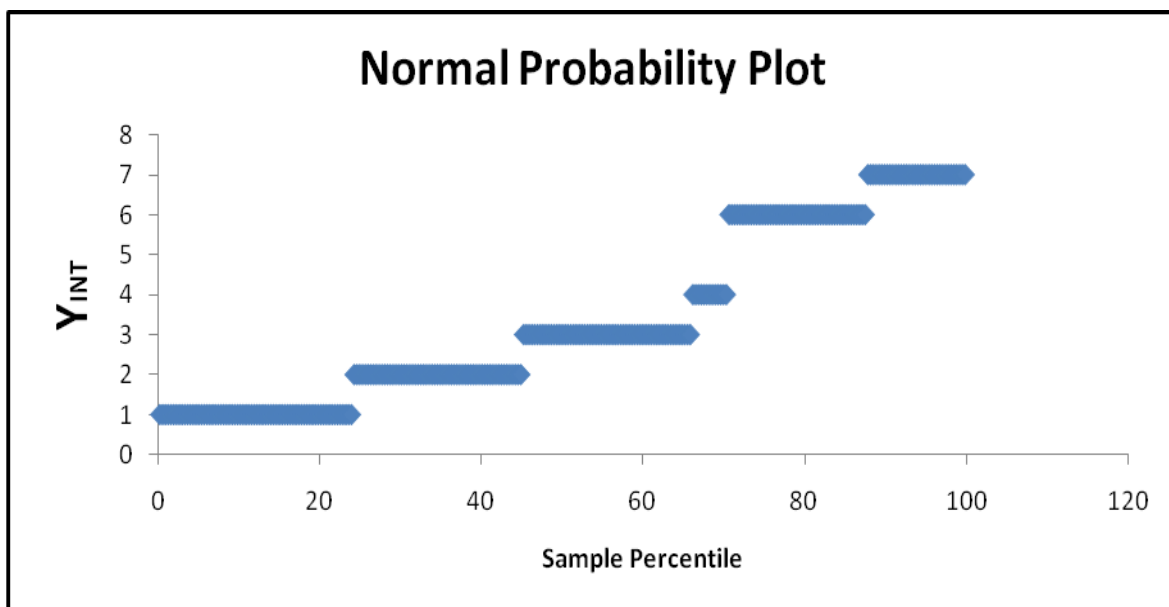


Figure 2: Normal P-P plot of regression standardized residual

## 7. Conclusion and Implications

This paper has taken a further significant step in contributing to both theory and practice of e-learning, specifically in developing countries and to help address some gaps in the current body of literature, through expanding the research in this area by developing a comprehensive empirically-based model that quantitatively assessed and predict the critical key factors that have the most significant influence on higher-education instructors' intention to participate in e-learning systems, as an essential determinant for any successful implementation, which have never been integrated before into one framework, to examination simultaneously for validation and relationship.

More specifically, this study has made a number of important practical implementations and theoretical contributions. In term of practical implications, the results presented in this paper

can help higher-education institutions in developing countries to apply successful e-learning applications. Based on the results, in order that e-learning could be implemented successfully, universities in these countries should formulate strategies addressing critical factors that are essential in enhancing instructors' intention to participate in e-learning systems, such as: (a) Creating a supportive culture toward e-learning environment, (b) provide incentives to motivate instructors, (c) provide related Internet and computer training, (d) continuing to establish more flexible and easy-use e-learning applications and finally (e) increase awareness about the importance of e-learning as a useful medium to achieve instructors and universities educational goals, as higher-education instructors in developing countries do not likely see the importance of e-learning as instructors in developed countries, where e-learning systems are mature.

From an academic and research standpoint, this study provides empirical evidences and validation for the existing specialized literature concerning e-learning. The findings of the empirical study provide support for the research model and for the hypotheses regarding the directional linkage among its variables. The high overall explanatory power of our model indicated that this model is capable of explaining high proportion of variance observed in e-learning behavioral intention. Furthermore, this research attempted to integrate and encompass the most frequently cited factors in the literature, and applied them in the local context in order to best examine the phenomenon. Therefore, the proposed model contained variables that have not been tested simultaneously in previous works.

## **8. Limitations and Further Research**

Although this paper is differentiated from other previous work and expanded the research scope, as in any study, there are a few limitations that should be considered when interpreting the results and implications. First, the research model was validated using empirical data gathered from Egypt and therefore the findings may be specific to the culture in this developing country. Since the study is cross-sectional in design, a further examination of our argument using a longitudinal study is recommended in the future to investigate our model in different time periods.

Apart from the above, we must point out that although the majority of the hypothesized relationships were validated, and significant, and the proposed model yielded a relatively high level of coefficient of multiple determination, multiple R-square ( $R^2$ ), there is still need to find additional variables, which may not be considered in our research model, to improve our ability to predict the future instructors' intention. However, there are other opportunities to build on this study in future research. Suggested areas include reexamining the proposed model in other countries with different cultures, and make comparisons, to see whether it can be applied. Also it would be valuable that future research use other theoretical bases or different methodologies and sample to derive predictions of higher -education instructors' intention.

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