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AN EMPIRICAL EXAMINATION OF ELECTRONIC TRAINING IN DEVELOPING COUNTRIES FROM INNOVATION PERSPECTIVE USING MIXED METHODS RESEARCH

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Abstract

The concept of electronic training (e-training) has developed substantially and emerges as a new alternative training tool that enables companies to transfer knowledge and skills in a more interactive environment efficiently. However, limited empirical works examined factors influencing employees' intention to use e-training as a prerequisite for any successful implementation. The current research aimed to address this gap by (1) examining these factors empirically, (2) developing a model combining multiple sets of critical factors which are significant in predicting employees' intention to use e-training as well as (3) examining the mediatory impact of this intention on the effectiveness of transferring employability skills. The study expands the research scope by integrating the critical factors, identified in prior research, into one framework to examination simultaneously for validation and relationship. This empirical study employed a mixed-methods research design for enhancing the integrity of the research finding. Structural equation modeling (SEM) was applied to test the hypothesized relationships of the proposed model simultaneously, through a series of separate multiple regression equations estimated simultaneously. Before conducting this analysis, statistical tests for multicollinearity, normality, and linearity were carried out to ensure the data used in the empirical data met the requirements of multiple regression analysis.

Keywords: Job-related Skills, Employees' intention, e-Training, Innovation Perspective, Traditional training

INTRODUCTION

In today knowledge society, organizations and employees should be able to update their knowledge and skills as a strategic resource for continuously enhancing performance and productivity, achieving quality improvement and gaining competitive advantage in order to cope with rate of change and survive in the contemporary business environment (e.g. Mahdi et al., 2019; Aragón et al., 2014; Sarmento, 2010; García et al., 2014; Hu, 2014; Marcano et al., 2019).

During the recent years, the concept of electronic training (or e-training) has developed substantially, and emerges as a new alternative training tool that enables companies to efficiently transfer knowledge and employability skills in a more flexible and interactive environment without limitation of space, time or facilities, reduce a company's training costs, increase trainees' convenience and makes it easier to combine work and training in workplace compared with traditional face-to-face training (e.g. Busquets & Arguellers, 2014; Bhuasiri et al., 2012; Kim et al., 2011; Jia et al., 2011; Floyde et al., 2013).

From innovation perspective, e-training viewed as non-linear innovation processes carried out in organization networks, in contrast to the linear approach that characterized traditional training processes, which focus mainly on training manuals and classroom setting (Rampersad, 2010; Plewa et al., 2012; Kim & Kizildag, 2011). Thus e-training does more than simply transfer training materials to the Internet it creates new and innovative way to deliver work instructions and a broad range of training solutions through a distributed environment.

Moreover, it provides affordable new training opportunities that were not available before and thus represents innovation in training (e.g. Busquets & Arguellers, 2014; Duan et al., 2010, Gupta et al., 2012).Therefore, there would seem to be some merit for more studies to empirically examine this phenomenon that remains under-examined, specifically in most developing countries (e.g. Dai et al., 2014) such as Egypt and the current research paper is an attempt at this direction.

Research Problem, Objectives and Plan

Despite the presumed positive effect of e-training on all levels of organizational outcomes, only few publications addressed this phenomenon (Gennari, 2013; Hameed et al., 2012) and among these publications limited empirical works examined the driving factors influencing employee' intention to use e-training programs as an essential determinant or prerequisite for any successful implementation (e.g. Talukder, 2012; Busquets & Arguellers, 2014; Arts et al., 2011; Flight et al., 2011; Looguma et al., 2012; Noppers et al., 2014), given that measuring these factors remains a challenge for many firms, because most of time it have to track intangible assets (Ivanov & Avasilcăi, 2014).

Accordingly, this research paper aims address the gap in extant body of literature, and contributes to both theory and practice as well as respond to calls for research on e-training, by examining empirically employees' intention to use e-training programs, developing and validating an analytical comprehensive model combining multiple sets of key influence factors, found in literature, which are significant in predicting their intention and quantificationally assess the relative importance of these factors.

In addition, the current study seeks to test the mediatory impact of this intention on the perceived effectiveness of transferring employability skills in order to examine the phenomenon under investigation from broader perspective.

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 empirical 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 practical and academic 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.

LITERATURE REVIEW

Relevant literature, which provided the conceptual foundation and theoretical background for this paper, and past research were extensively reviewed in order to develop more effectively the study hypotheses and the proposed model. Through this process it was noted that transfer of employability skills using e-training has been conceptualized and defined as the extent to which employees apply job related skills and knowledge to a job situation, gained from training programs provided to them via the Internet and wireless technologies (e.g. Bhatti et al., 2013; Park & Wentling, 2007, Plewa et al., 2012; Dalveren, 2014).

In literature, innovation is typically defined as successful implementation of creative ideas within an organization (Rocca & Snehota, 2014; Valk et al., 2011) and considered an integral activity that involves the whole firm (Roman et al., 2011). However, a variance of meanings and definitions have been given to the concept of e-training, the current paper operationally adopted the concept that define e-training as training initiatives that takes place anytime a trainee uses electronic means and network technologies for gathering information acquired without the physical presence of an instructor on location, and can be synchronous (i.e. an internet conference in which geographically separated instructors and trainees congregate in an online class-room) or asynchronous, (i.e. self-paced training modules with pre-recorded presentations of the instructional content) (Kim et al., 2011).

Unlike previous works with similar objectives, the current empirical study expands the research scope by integrating the most critical constructs identified in innovation literature into one framework subject to examination simultaneously for validation and relationship. Without breaking the consistency of the five primary factors suggested by Rogers (2003) original model as key influencer of innovation adoption: perceived relative advantage, complexity, compatibility, trial-ability and observability, the present research addressed two additional constructs, perceived risk or uncertainty (Arts et al., 2011) and customizability (Flight et al., 2011).

These constructs can be operationally defined as follows (Flight et al., 2011; Duan et al., 2010; Arts et al., 2011; Wu et al., 2012): Relative advantage refers to the degree to which an innovation is perceived as being better than the current application. Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. Complexity reflects the degree to which an innovation is perceived as relatively difficult to understand and use. Trial-ability is the extent to which people believe that there are chances for the innovation to be experienced before deciding whether to adopt it or not. Observability is the degree to which the results of an innovation are visible to others. Perceived risk refers to the extent to which the functional and/or financial consequences of

purchasing and using an innovation cannot be established. Customizability reflects the ability to modify the application features in order to maximize received benefits.

Developing Hypotheses and Research Model

Drawing upon the theoretical background discussed earlier and comprehensive review of literature on e-training, e-learning and innovation adoption, as well as insights from a serious of in-depth interviews in the preliminary stage of our study the following hypotheses that guide the investigation were formulated for testing their relationships.

H_1: Perceived relative advantage (PRA) is positively related to the intention to use e-training programs

H_2: Perceived compatibility (PCT) is positively related to the intention to use e-training

H_3: Perceived complexity (PCL) is negatively related to the intention to use e-training

H_4: Perceived trail-ability (PTR) is positively related to the intention to use e-training

H_5: Perceived observability (POB) is positively related to the intention to use e-training

H_6: Perceived customizability (PCU) is positively related to the intention to use e-training

H_7: Perceived risk (PRK) is negatively related to the intention to use e-training

H_8: Intention to use e-training (INT) mediates the relationship between adoption antecedent predictors and the perceived effectiveness of transferring employability skills (EFF) via e-training programs

Accordingly, the proposed research model presented in figure 1 comprised from seven constructs (PRA, PCT, PCL, PTR, POB, PCU and PRK) as independent variables, one mediating variable (INT) and one dependent variable (EFF). Symbolically, the initial prediction multiple regression equation of the proposed model (EQ1) can be presented as follows, to predict the probability of INT served as regress, given known values from the seven predictor variables used as regressors.

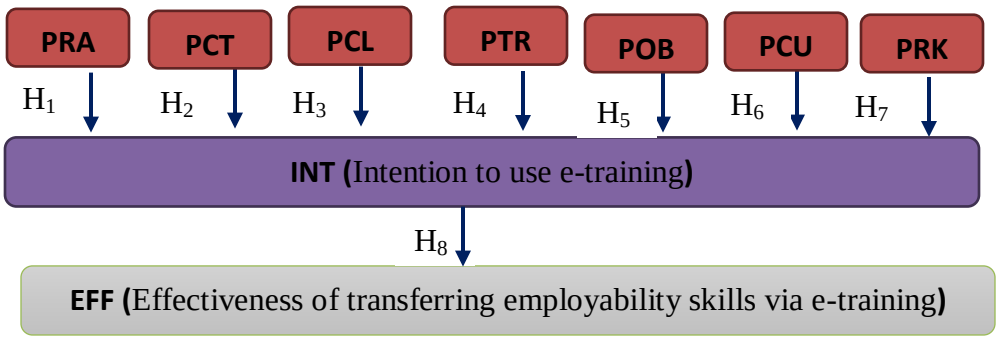

Figure 1: The research Model

$$INT = a + b_{PRA}\,PRA + b_{PCT}\,PCT - b_{PCL}\,PCL + b_{PTR}\,PTR + b_{POB}\,POB + b_{PCU}\,PCU - b_{PRK}\,PRK \quad (EQ1)$$

RESEARCH METHODOLOGY

This empirical study employed a mixed-methods research design, combining elements of quantitative and qualitative methodologies for enhancing the integrity of the research finding. Structural equation modeling (SEM) was applied to test simultaneously the hypothesized relationships of the proposed model, through a series of separate multiple regression equations estimated simultaneously (e.g. Taguchi, 2018; Lee, 2018; Clark, 2019). Before conducting this analysis, statistical tests for multicollinearity, normality, and linearity were carried out to ensure the data used in the empirical data met the requirements of multiple regression analysis. Thus, the research process involved multi-stage procedures as follows.

a-Qualitative Study

Preliminary qualitative study data were collected by means of focus group, complemented by a series of in-depth face-to-face interviews, to get deeper understanding of the phenomenon under consideration, supports hypotheses development and establishes the criteria and relationship constructs relevant to our empirical study. Issues arising from this stage were used as a basis for the subsequent quantitative study.

b-Quantitative Study

The quantitative research design in the form of questionnaire survey involved a cross-sectional methodology and permitted the use of many statistical tools. The survey was conducted over three-month period to collect the empirical data. The sample was drawn from full-time employees working at Egyptian business firms embedded in e-training, and a list of companies in Egypt (at http://companylist.org/Egypt/) served as a sampling frame for this study.

To increase generalizations of the results the participants were spread across the two major business cities in Egypt (Cairo and Alexandria) using simple random sampling technique to gain as many representative samples as possible.

Among a total of 500 questionnaires that were randomly distributed, 287 valid responses were obtained and used in data analysis, after removing invalid answers, yielding a usable response rate of 57.40 percent for the overall survey. The study used criteria for considering responses invalid, such as missing values, rated every question at the same scores, or giving two answers when one answer is required. The respondents did not need assistance in completing the questionnaires as the information on the cover letter, and instructions on how to fill the questionnaire were explicit.

Instrument, Validity and Reliability

Before the survey, this current research took steps to ensure reliability and validity. The scales used for measurement process were adapted from well-established survey items of previous works and modified to suit the purpose of the current study. Research variables were measured by multiple items, using A 5-point Likert scale ranging from “strongly disagree =1” to “strongly agree =5”. The questionnaire was 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.

Cronbach’s alpha coefficient test was used to evaluate the internal consistency reliability. The reliability analysis results of the present paper showed that the value of Cronbach’s alpha of every construct is greater than 0.8 (ranging from 0.81 to 0.94), therefore, the reliability of constructs is acceptable. Also, exploratory factor analysis was used to evaluate the construct validity and the results demonstrate acceptable standard.

ANALYSIS, MODEL TESTING AND RESULTS

The empirical data collected by the survey was analyzed and tested using statistical software packages (SPSS). Analysis, as presented in table 1, included descriptive statistics and linear correlation matrices to examine the relationship among independent, dependent and mediating variables, which provided preliminary empirical evidence of valid hypotheses testing, before performing the regression analysis.

Table 1: Descriptive statistics and correlation matrices

V.	*Mean*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1-PRA	3.9094	1.19971	1								
2-PCT	3.8954	1.17202	0.31	1							
3-PCL	3.1219	1.42986	-0.49	-0.41	1						
4-PTR	3.7700	1.21589	0.47	0.38	-0.50	1					
5-POB	3.8466	1.14850	0.36	0.37	-0.50	0.48	1				
6-PCU	4.3275	1.17254	0.28	0.46	-0.45	0.44	0.38	1			
7-PRK	3.0696	1.36208	-0.33	-0.42	-0.39	-0.41	-0.41	-0.36	1		
8-INT	2.8606	1.42459	0.68**	0.58*	-0.87**	0.57*	0.60**	0.66**	-0.77**	1	
9-EFF	2.5714	1.25197	0.47*	0.56*	-0.68**	0.48*	0.51*	0.54*	-0.58*	0.77**	1

n= 287, (a) Tested by Pearson coefficients r

**Correlation is significant at 0.000 levels (2-tailed) *Correlation is significant at 0.001 levels (2-tailed)

Due to the presence of many predictors in the study, multiple regression models (full model and stepwise forward conditional model) were built to test for the joint and independent influence of the predictors on the criterion variable, assess meditational hypothesis and modeling relationships.

Multicollinearity Test

During data analysis, the current research examined tolerance and the variance inflation factor (VIF) to assess multicollinearity among the independent variables included in the proposed regression model. The values revealed no severe multicollinearity problem among the regressors, which suggested that predictors were tolerated in the criterion variable.

The results of Hypotheses testing

The summary output of the multiple regression analysis (full model) introduced in table 2 and correlation analyses in table 1 led to accept the above mentioned hypotheses, while the statistical significance test supported this acceptance and confirmed the hypothesized relationships.

A strong, significant and meaningful correlation is found between criterion variable INT and the above mentioned predictor variables (*Multiple R=0.910264136827132*).

Table 2: Summary output of the multiple linear regression analysis

Coefficients a	Symbols	Values
Model Summary		
Multiple correlation coefficient	Multiple R	0.910264136827132
Coefficient of multiple determination	R^2	0.828580798793644
Adjusted R Square	Adjusted R^2	0.824279958620007
Standard Error	SEE	0.597173764185509
Observations	N	287
ANOVA b		
Regression	SS_{reg}	480.929082315829
Residual	SS_{res}	99.4960047921858
Total	SS_{total}	580.425087108015
F-test overall model	F	192.655566201409*
Degrees of freedom	df1, df2	7, 279

a. Criterion variable: INT b. Predictors: (constant), PRA, PCT, PCL, PTR, POB, PCU, PRK

*p<0.00000000 levels of significant

Multiple linear regression analysis and Interpretation

The value of F- ratio (*F (7,279) =192.655566201409 at p<0.000000*) is statistically significant indicating that the results of the model could hardly have occurred by chance. Thus, the goodness-of-fit of the model considered satisfactory. The coefficient of determination, multiple R-square suggested that the proposed model is valid, the predictor factors of the model explained the major proportion (82.85 %) of the variability observed among the criterion variable INT (R^2*=0.828580798793644*), which reinforce our confidence in the hypotheses testing results and provides support for the above mentioned association.

Furthermore, the adjusted R^2 of the model, which is a more conservative estimate of variance by considering error variance, is 0.824279958620007. 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 presented in table 3.

As it can be seen from the table, out of the 9 variables considered in the model, only 3 of them (namely PCL, PRK and PRA) were found to have a critical significant impact on the criterion variable INT with p-value less than 0.001.

More specifically, the perceived complexity had the highest effect on employees' intention (with negative association (*Beta PCL =-0.576, t=15.1838355, p<0.000000*) followed by perceived risk (*Beta PRK =-0.346, t=10.0127845, p<0. 000000*) then perceived relative advantage (*Beta PRA = 0.117, t=3.44364278, p<0. 0006*). These finding is consistent with correlation analysis results summarized in table 1, variable PCL has the highest correlation value to INT (*r=-0.87, P<0.00000*).

Table 3: Standardized and non-standardized coefficients of variables included in the full model equation

Variables [a]	Non-standardized Regression Coefficients		standardized Beta Coefficients		t-test	
	Symbol	Value	Symbol	Value	Value	Sig.
PRA	b_{PRA}	0.139047338	BPRA	0.117	3.44364278	0.000662058
PCT	b_{PCT}	0.100279971	BPCT	0.083	1.32713437	0.185549277
PCL	b_{PCL}	-0.573685897	BPCL	-0.576	-15.183835	0.000000000
PTR	b_{PTR}	0.003656753	BPTR	0.003	0.05725256	0.954385013
POB	b_{POB}	0.057467403	BPOB	0.046	0.96808264	0.333841537

PCU	b_{PCU}	0.048545172	BPCU	0.040	1.32422172	0.186513214
PRK	b_{PRK}	-0.361453145	BPRK	-0.346	-10.012784	0.000000000
Intercept	a	1.6088468378				

Table 3...

a. Criterion variable: INT

Accuracy of the outputs of the structural equation model

Structural equation modeling (SEM) was used for the estimation of multiple relationships incorporated into an integrated model at the same analysis. The results of indices values for comparative fit index (CFI), the goodness of fit index (GFI), and normed fit index (NFI) were above 0.90. Root mean square error of approximation (RMSEA) below 0.08. These values were in the acceptable range, indicating a satisfactory fit, and signified the acceptability of the model. On the other hand, Table 4 shows the path coefficients, their t-values, and significance levels.

Table 4 Structural Model Result and Summary of Hypotheses Testing

Hypotheses	Structural Paths	**β** Coefficients	Results
H_1	PRA → INT	0.117*	Supported
H_2	PCT → INT	0.083	Not supported
H_3	PCL → INT	0.576	Supported
H_4	PTR → INT	0.003	Not supported
H_5	POB → INT	0.046	Not supported
H_6	PCU → INT	0.040	Not supported
H_7	PRK → INT	-0.346*	Supported

**p<0.00000000 levels of significant*

The graphic presentation in figure 2 clearly illustrates the findings discussed above. The values of the non-standardized regression coefficients in table 3 were utilized for mathematically predicting the employees' intention to use e-training in future by the following multiple regression equation (EQ2).

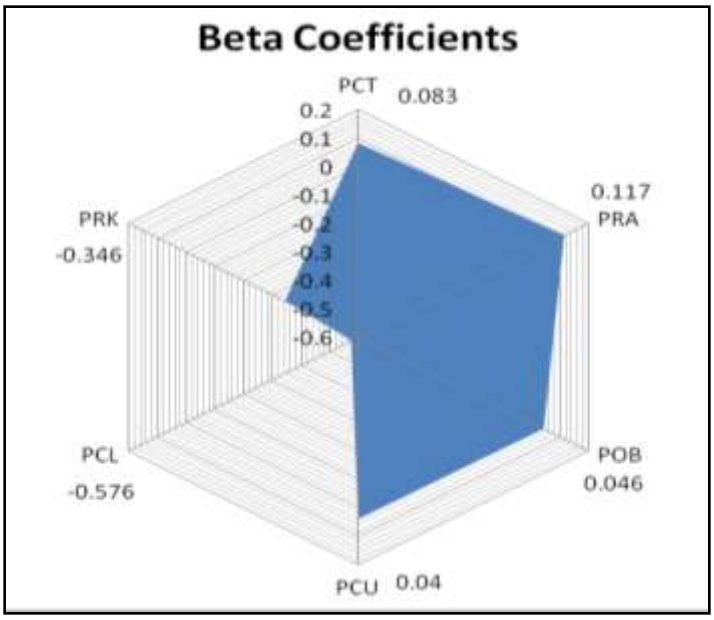

Figure 2: Spider diagram representing beta coefficients

$$INT = 1.61 + 0.14\ PRA + 0.10\ PCT - 0.57\ PCL + 0.004\ PTR + 0.05\ POB + 0.04\ PCU - 0.36\ PRK \quad (EQ2)$$

For deeper analysis, the multiple regression analysis was repeated again using stepwise regression approach by conditional model to provide further evidence regarding the preceding findings and incorporates the pure impact of a smaller subset of variables that account for most of the variation in the criterion variable. The analysis outcomes are summarized in table 6.

Table 5: The output summary of stepwise regression analysis (forward conditional model)

Model	R	R^2	Adjusted R^2	SSres	SS_{total}	df	F	Sig.
1	0.868	0.754	0.753	437.658	580.425	1, 285	873.680*	0.00000
2	0.903	0.816	0.815	473.560	580.425	2, 284	629.255*	0.00000
3	0.909	0.826	0.824	479.193	580.425	3, 283	446.538*	0.00000

Model 1: Variables entered: PCL

Model 2: Variables entered: PCL, PRK

Model 3: Variables entered: PCL, PRK, PRA

Criterion Variable: Yapp

a Criterion variable: INT

* p < 0.00000000 levels of significant

Table 6: Standardized and non-standardized coefficients of variables included in the stepwise equation

Variables [a]	Non-standardized Regression Coefficients		standardized Beta Coefficients		t-test	
	Symbol	Value	Symbol	Value	Value	Sig.
PRA	b_{PRA}	0.134	BPRA	0.113	3.968	0.000
PCL	b_{PCL}	-0.575	BPCL	-0.577	-15.594	0.000
PRK	b_{PRK}	-0.360	BPRK	-0.344	-10.070	0.000
Intercept	a	1.646				

a Criterion variable: INT

As noted here, not all variables in EQ2 loaded in stepwise regression models, as the stepwise technique determined which of the initial seven constructs should be included as significant predictors in the final equation. Only the 3 predictor factors (PCL, PRK, PRA) succeeded to enter the model equation and explained 82.6 percent of the total variation in criterion variable INT (R^2 *for model 3 =0.826*). Nevertheless, tracing the order in which the variables have been entered reconfirmed that PCL has the greatest influence on INT. Predictor PCL alone explained 75.3 percent of such total variation (R^2 *for model 1= 0.754*).

Accordingly, the 3 regression coefficients values presented in table 5 were used to estimate the final predictive equation (EQ3), as below:

$$INT = 11.64 + 0.13\ PRA - 0.57\ PCL - 0.36\ PRK \text{ ----------} (EQ3)$$

Normal probability analysis

A P-P plot of regression standardized residual for assessing the assumption of normality was conducted, to see if the error term ϵ is actually normally distributed (e.g. Schmidt, 2018). The plot, in figure 3, showed that the data met the assumptions of normality, quantile pairs fell nearly on a straight line and quite close to the 45-degree line. Thus, it can be concluded that the data used in this research are approximately normally distributed and the fitted model is appropriate.

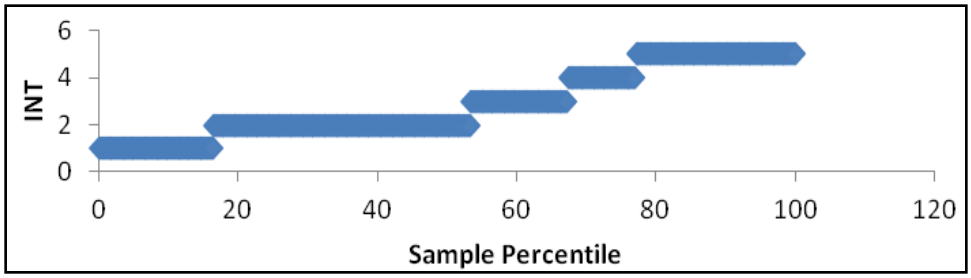

Figure 3: Normal P-P plot of regression standardized residual

CONCLUSION AND IMPLICATIONS

This paper has addressed several pressing issues regarding e-training in organizations and taken a further significant step in contributing to both theory and practice of e-training, as well as help to fill some gaps in the current body of literature. Given that employee training plays a significant role in improving employee performance in terms of offering better quality services and, hence, helping an organization obtain a competitive advantage (Dhar, 2015)

More specifically, this study has made a number of important practical implementations and theoretical contributions. In term of practical implications, the results presented in and information acquired from this paper can help practitioners and companies to develop more customized successful e-training programs and effectively transfer employability skills based on what their employees want and expect, overcoming the discrepancies exist between what employees expect and want and what management perceives they expect.

The empirical findings of the study showed that companies need to design e-training programs that motivate employees to use it as an innovative training tool, by formulating strategies addressing critical factors that are essential in enhancing employees' intention to use e-training.

For instance, designing e-training courses to be easier to understand and use for minimize their perceived complexity, clearly establishing the consequences of using e-training, which positively can decrease employees perceived risk, and creating awareness that e-training can bring incremental value compared to currently available training course, thus represent more relative advantage to employees. As the present study confirmed that complexity and perceived risk had the highest effect on employees' intention to use e-training.

Meanwhile, the results of this study indicated that intention to use e-training highly mediates the positive relationship between the effectiveness of transferring employability skills via training programs and the adoption rate of these program, which is practical for management.

From an academic and research standpoint, this study provides empirical evidences and validation for the existing specialized literature concerning e-training. The study proposed a mathematical model for predicting the potential impact of factors influencing intention to use e-training. Also 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-training behavioral intention.

It is also critical to note that the sample of this study was collected from many different business companies embedded in e-training programs, thus the sample possibly considered highly representative.

Another interesting finding of this study was that the 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, which have never been integrated before into one framework subject, to examination for validation and relationship. Therefore, the proposed model contained variables that have not been tested simultaneously in previous works.

LIMITATIONS AND FUTURE RESEARCH

Despite the theoretical contributions and practical implications, the current study has some limitations that indicate directions for future research. First, the research model was validated using empirical data gathered from Egypt and therefore the findings may be affected by the culture in this developing country. Further research could be extended to a wider range of geographical settings to explore the differences between various cultures and economic contexts. Second, 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.

Further, 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 value of multiple correlation coefficient, the obtained value of multiple R-square (R2), implies that other additional variables, which may not be considered in our research model, can be addressed to enhance the model ability for prediction.

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. It would be valuable that future research uses other theoretical bases or different methodologies and sample to derive different predictions. Also, future research can analyze the relative advantage of those companies which invest in e-training as opposed to those who invest in traditional face-to-face training.

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