Antecedents of Adopting e-Learning: Toward a Model of Academic e-Learning Acceptance

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Abstract

This study investigates factors that predict the successful adoption and implementation of e-learning technologies in college level courses. The study employed "availability sample," to collect data via face-to-face interviews with academic professionals in a small liberal arts and sciences college in the Midwest. Two hundred and twelve members of the faculty were targeted, of whom 129 (60%) completed the interviews. Several layers of analysis were performed to test the effects of academic backgrounds and other demographic variables on the perceptions about and the tendencies to adopt e-learning. It was found that the academic background variables did not yield significant correlations with perception about, and the decision to adopt, e-learning. The data showed that the primary interest in the correlates of the decisions to adopt e-learning is the faculty's self confidence in using the technology and online resources.

Keywords: e-learning, information technology, teaching model, faculty perceptions, decision to adopt

1. INTRODUCTION

"E-learning" has been commonplace in many learning environments at all educational levels. There have been many attempts to provide a concise definition of the term (e.g., Guri-Rosenbilt, 2005; Selim Ahmed, 2010), it simply signifies any type of teaching-learning module that involves computer technology and online resources. The tendency toward e-learning necessitated investing in this area, which has been a top-down decisions, as Jones and O'Shea (2004) have suggested. However, the decision to integrate and adopt e-learning in the classroom seems to be predominantly a matter of the individual faculty's choice, and in most instances seems to depend on the technology's ability to shift the faculty-student productivity.

The emphasis on e-learning also has created a great deal of sociological and pedagogical concerns for this new pedagogy's functionality, among which the end users' perceptions of the technology as an effective teaching-learning tool and e-leaning's effectiveness as it stands out by itself (Ahmed, 2009) seem to be paramount. The fear is that technology has a tendency to create an uneven development of the Internet use—namely, the "digital divide" (Guillen & Suarez, 2005; Smith, 2003). Has this been the case, then the conditions that foster adopting e-learning in classrooms are significant factors that may be conducive to the end users' characteristics. Hence, this study investigates the challenges of adopting e-learning in relations to the end users' characteristics, and the antecedents that affect the decision to integrate or adopt e-learning in teaching.

A common myth about the reluctance to incorporate technology in classrooms is "the air of mystery" that surrounds computers. In reality, the mystery stems from the "fear of the unknown;" computers were known as a device used by intelligent people. Viewing the issue from this angle, the origin of this fear lies seemingly in one's awareness of one's inability to use technology. Therefore, confidence in one's

ability and knowledge of e-learning technologies become critical factors in deciding to adopt e-learning. Because technical skills are parts of the professional development nowadays, it remains to be seen if engaging with the task is a matter of making a connection between self-efficacy and perceived abilities in engaging with the task. This demands a shift from pedagogy to androgogy: a shift of paradigm from "the sage on the stage" information generator to "the guide on the side" coach (Wang, 2002). Thus, adopting e-learning require a new look at the challenges of the delivery system and whether the currently in-placed methods need to be revamped.

2. LITERATURE REVIEW

Although research on e-learning is diverse, it can be classified into three broad, but distinct categories. The first category includes research focused on the development of pedagogical e-learning modules and designs (e.g., Behar, 2011). This genre looked at the effectiveness of a "purely online" teaching-learning model, as compared with the traditional classroom format or the "hybrid" modules. The second category covers evaluating the learners' satisfaction and experiences with e-learning (e.g., Saade, He, & Kira, 2007). The third type, which is also a focus on perceptions, entails research that investigated the stakeholders (i.e., the upper managers and/or the Board) and their willingness to invest in this technology (e.g., Brown, 2003; Rogers, 2003).

Research on "perceptions" predominantly investigated the students, staff, or the stakeholders. The preponderance of research in this category is conducted overseas (e.g., Agbatogum, 2001; Liaw, Huang, & Chen, 2006; Panda & Mishra, 2007)—especially in developing countries where there is a great deal of hope and expectations, but uncertainty about including technology in teaching and learning (Behar, 2011; Newton, 2003; Haywood, Anderson, Doyle, Day, Haywood, & McLeod, 2000).

Research on the stakeholders' perception scrutinizes the upper management's perceptions, or the Board's interests in investing in e-learning technologies (Marouf & Rehman, 2007). Whether the concerns are either investing in technology or in learning, the pedagogical designers keep an eye on the learner and the accentuated user-friendly aspects of e-learning technologies. Investment efforts focus heavily on the consumers' (students') needs and interests (Norman, 2002), but ignore the faculty. This is evident in the literature, which is silent on the pragmatic and pedagogical concerns of the "educator" about e-learning.

The literature is also silent on whether e-learning is a high priority for the faculty. The popularity of research on the students' needs, and the stakeholders, has undermined research on the faculty perceptions and their decision to adopt e-learning. The focused on the students reflects predominantly a sample of courses that required laboratory experiences and one-on-one instructions (e.g., Yazon et al., 2002). Drawing viable and applicable inferences from such research to the Liberal Arts disciplines and Humanities is suspect because of the varying approaches in the latter disciplines. On the other hand, a few who studied the faculty and their decision to adopt technology focused on the situational variables such as the appeal to adopt e-learning (Liu, Hodgson, & Lord, 2010).

It is commonsense to assume that the teaching environment dictates the development of a customized pedagogical model. A seasoned faculty teaches differently in different teaching environments. The success and workability of an e-learning environment, therefore, depends partially on the momentum created by the faculty in terms of their perceived capabilities, preferences, and productivity. Kuo and Ye (2010) provided evidence to verify that the decision to adopt e-learning is attributable to structural factors such as, length of work experiences and levels of authority. Their research, however, did not specify whether the faculty's rationale to adopt e-learning rests on: 1) its usefulness in performing the required tasks, 2) its ability to crystallize the achievement of the intended pedagogical goals and being productive, or 3) simply because it is a fad.

Although not the intent of the current study, but research on the effectiveness of e-learning also has yielded contradictory findings. For example, MacKeog and Fox (2009) found an ambivalent correlation between e-learning modules and their effectiveness in learning and knowledge generation, while Wong's and Huang's (2011) review of several empirical studies supported the positive and effective outcomes of e-learning. Selim Ahmed's (2009) research puts an interesting spin in the notion of e-learning by revealing a series of potential drawbacks in pure e-learning. He contended that e-learning is more effective in hybrid learning environments. Citing other studies (such as Yazon, Mayer-Smith, & Redfield, 2002), Selim Ahmad (2009) saw the root cause of the failure of pure e-learning in the

lack of face-to-face contact with the instructor and classmates.

The contradictory findings in research on e-learning are not isolated. For example, Dillenbourgh (2002) and Brewer and Klein (2006) reached similar conclusions. They have recommended the need for maintaining contact with fellow students regardless of the employed learning model. Although these recommendations are advocating the need for a mentor or a monitor even in a pure e-learning environment, research findings in this area do not specify whether the contact person should be the faculty, a peer mentor, tutor, or a teaching assistant. Thus, these recommendations surmise that it is very unlikely for e-learning to completely replace face-to-face classroom teaching-learning models (Oh, 2003).

Therefore, the faculty decision to adopt e-learning can be affected by set of factors ranging from their acceptance of technology to their skill level. The skill level is often viewed in terms of "technical skills". For example, a number of researchers (e.g., Haywood et al., 2000; Newton, 2003; Roca, Church, & Martinez, 2006; Tsai, 2011) have suggested that learning how to integrate heterogeneous e-learning systems is also a measure of the faculty's skill in creating and training an effective pedagogy. There may be pressure from the administrators to adopt, as MacKeog and Fox (2009) have argued, but as the literature suggests, adopting e-learning rests on the adopter's comfort level with his or her perceived abilities—the prediction that he or she has learned enough to be comfortable with that stage of technology. Arguably, the pressure from the top may hinder the motivation to adopt e-learning, as Engelbrecht, (2005) observed, if the basic faculty behavior and characteristics (i.e., skills, preparedness, perceptions, willingness and preference to employ e-learning) are absent. As the literature suggests, these and the appropriateness of technology are important human capitals that determine the success of the decision to adopt.

3. THEORETICAL FRAMEWORK

The above review delineates several key, but separate, specificities that dominates research on e-learning. E-learning does not seem to be specific to either industry or academy, despite the differences in their conceptual definitions and approaches. It would appear that the academic environment in higher education is swayed toward adopting the business model in education. Both environments have adopted the technology with similar intentions: e-learning is the magic wand in teaching and learning. Thus, they share in common a question: What factors predict a successful adoption of e-learning technologies in the production of knowledge? Another related question is: Which characteristics play elemental roles in predicting the tendencies to adopt the technology, which in turn are assumed to enhance effective teaching-learning?

Although the literature provides inconclusive answers to these questions, one may contend that the common denominators in adopting e-learning to be motivation, attention, and emotions regarding e-learning. Although these are important psychological factors in decision-making, borrowing from Peterson (1995), this study address these question by investigating the end users, their characteristics (e.g., Intellectual capabilities, knowledge, and perceptions), and the technical issues that determine the decision process. Included in this theoretical model is also the faculty's willingness to adopt, and their competence, which are two other key factors in adopting e-learning in teaching.

The proposed theoretical model assumes that the decision to adopt e-learning depends on the end user's perception that such technologies can be useful (i.e., "efficient," "effective," and "productive") teaching-learning tools. In other words, instructors are effective in an e-learning environment if the technology can be used as a facilitating tool. Thus, the source for deciding to adopt e-learning is a social psychological one that reflects the user's perceived functionality and efficacy of this module; both of which can be translated into factors such as usefulness of e-learning in preparing for a class and the delivery methods.

In summation, the proposed theoretical model in this study attributes the success of e-learning to other structural variables such as self-awareness (i.e., knowledge of the technology, skills, and the comfort level with one's ability to navigate the system), and the end user's socio-cognitive state (i.e., perceived functionality and usefulness of e-learning as effective delivery tools). Thus, the pedagogical effectiveness of e-learning is a function of its perceived usefulness, the end user's academic credentials and professional experiences. Here, e-learning is treated as the framework (tool), not the content; its extent is limited only to its relevance to, and implications for, educational training and development. Figure 1 (Appendix A) summarizes the theoretical

model and its conceptual framework in this study. This model assumes a standard format (using z-score coefficient) where X_1= Academic Background, X_2 = Confidence, X_3= Perceptions about e-learning, and X_4= Decision to Adopt e-learning. Hence the structural equation for the working model is:

$$X_4 = P_{41}X_1 + P_{42}X_2 + X_{43} + \sum_{J=1}^{3} \in$$

Where *P* presents the direct causal effect coefficient (i.e., path coefficient), and $\in$ reflects the *error* terms or the residual effects of the combination of any other factors not predicted in the model.

4. METHODS

Race and gender occupy a preeminent place in research on the digital divide. However, the attention to the work experiences and levels of authority has been constrained to the (business) organizational environment. A focus on the demographic factors in studying the decision to adopt e-learning in the academic environment must merit similar consideration. These latter factors can be measured in terms of tenure situation, academic ranks, or levels of authority and seniority.

Variables and Measures

Four different additive scales were created to measure factors studied in this research. These scales measured: 1) the end users' (i.e., the faculty) academic backgrounds; 2) their perceptions of the usefulness of e-learning technologies; 3) their confidence in their abilities (or competence) in using e-learning technologies and resources; and, 4) the faculty tendency to adopt e-learning technologies and resources. Four items (i.e., educational degrees, years of service, academic rank, and tenure status) measured "academic backgrounds". Another set of three items quantified the faculty "perceptions" about technology. Three items generated data on one's confidence in his/her technological "skills and competence". Two items assessed the tendency to "adopt and implement" technology-based resources in classrooms.

Content validity was assessed by piloting the questionnaire at a regional professional conference, and by modifying the questions several times. The first layers of analysis included an examination of the reliabilities of the "academic background," "perception," "confidence," and "adoption" scales. Chronbach's *a* ensured internal consistency and reliability. Chronbach's *a* for academic background was .75; it was .70 for perception and confidence, respectively. The value of *a* for the tendency to adopt technology in classrooms was .64 (the recommended *a* is .70 or greater). Also, other demographic variables (such as age and sex) acted as control variables; they helped detect the differences between categories, and their effects on the decision to adopt e-learning.

Limitations

The low *a* value for the measures of "adopting technology" is a cause for concern. One concern with reliability was whether the diversity in the training culture among the faculty was a deterrent factor in the construction of this scale. Another concern was whether the respondents' teaching background and their years of service had affected reliability. However, after conducting a split-half analysis, the F ration between the two groups in each item of this scale was statistically significant ($p < .000$).

Sample and Data

The theoretical population in this study is the faculty teaching in liberal arts colleges and university. This study targeted all members of the faculty in a small (close to 250 faculty and 6,500 student body) Liberal Arts college in the Midwest. The actual population represents a wide variety of academic background, ranks, sex, and work experiences. Out of 212 names contacted, 129 (60%) completed the surveys. The sample included 56.6% males; a majority of 73.2 % completed their doctoral degree; and, the average years of teaching experiences was 15 years. Although only 30% surveyed were tenured, 52.8% were on tenure track, and the rest had other types of employment statuses. The sample included diverse representation of the academic ranks: only 18.9% surveyed were instructors or had other similar ranks, 33.9% were assistant professors, 19.7% were associate professors, and 27.6 percent were full professors. The question regarding the age of the participants asked the actual age. With a mean of 40-49 years of age, this faculty body is fairly young.

5. ANALYSIS AND FINDINGS

The second layer of analysis investigated the bivariate relationships between the variables in the hypothetical model (see Appendix B, Table

1). The Spearman Rho was used because of the ordinal nature of the variables and the scales examined in this study. The tests of the relationships between the variables of academic background scale (i.e., years of service, academic rank, tenure status, and academic degree) revealed no significant correlations with the endogenous variables (i.e., confidence, perceptions, and the tendency to adopt e-learning) in this study.

The preliminary findings suggest that facets of academic backgrounds are not significantly correlated with a faculty's perceptions on the usefulness of e-learning technologies (data not shown). However, the degree of confidence in one's knowledge of how to implement e-learning technologies is closely associated with one's tenure status and academic degree. Further analyses indicate that neither years of teaching experiences nor the academic rank significantly correlated with one's confidence in being able to incorporate e-learning in classroom teaching. Implementing e-technologies in classrooms, however, showed a statistically significant correlation with the faculty's academic rank: junior faculty members (at the rank of assistant professor and below) were more inclined toward adopting e-learning technologies in classrooms. In sum, all variables of academic backgrounds, except for rank, did not produce any statistically significant correlation with adopting e-learning. Likewise, the additive "academic background" scale did not show any statistically significant correlations with perception, confidence, and adoption. It remains to be seen whether there is a difference in tendency to adopt e-learning between computer science and engineering faculty and other instructors. Future research can be more attentive to this question.

The next layer of analysis focused on the bivariate relationships among the variables in the hypothesized model (see Appendix C, Figure 2). The data in Figure 2 shows strong and statistically significant correlations among different possible pairs of variables in the model—i.e., perception and confidence ($r = .23$, $p = .01$); and, confidence and adopting ($r = 31$, $p = .001$). The slight exception in this model is the correlation between "perception" and "adopting e-learning" scales, which did not show a statistically significant correlation ($r = .14$, $p = .05$).

Although the empirical data shown in Figure 2 is consistent with the hypothesized path model, except for the effects of the academic background variables, a path analysis was conducted to ensure proper fit, and to ascertain the possible causal relationships among the antecedents of adopting e-learning. This layer of analysis included testing several possible regression equations that ensured proper mapping of the missing and additional links in the model; it also tested the correspondence between the hypothesized model and the empirical data. Figure 3 (Appendix D) portrays the revised model according to the empirical data. The revised model specification is more complicated than the linear structural equation for the hypothetical model. The assumptions for testing this model are: 1) the residual terms are not associated with the independent variables; 2) the variables are measured without errors as verified by the Chronbach's reliability test; and, 3) the relationship between the independent and dependent variables is linear (Mertler & Vannatta, 2002).

The significant standard regression coefficients (Table 2; and, in Figure 3) demonstrate that the results of the bivariate analysis—i.e., no significant effect by academic backgrounds—to be consistent with the original model. The standard regression correlations for the revised model also seem consistent with the initial bivariate correlation, except for the effects that "perception" has on adopting e-learning ($\beta = .07$). According to the data in Figure 3, the primary interest in the correlates of the decisions to adopt e-learning is the faculty's self confidence in knowing how to use the technology ($\beta = .21$). This is also consistent with the original model.

Table 2. Standard Regression Coefficients

Variables	1	2	3	4
1. Academics	#			
2. Confidence	.12	#		
3. Perception	-.09	.20*	#	
4. Adopting	.09	.21**	.07	#

** Correlation is significant at $p < 0.001$ level (2-tailed)

* Correlation is significant at $p \leq 0.05$ level (2-tailed)

Since the original model did not fit the empirical data, we can assume that some degree of variance in adopting e-learning and its effectiveness may be due to the unexplained portion of the exogenous variables (i.e., academic background, confidence, and perceptions about e-learning. As a result, another layer of analysis obtained the

reproduced correlations based on path decomposition (or tracing) of all possible combinations of causal relationships among the variables (Table 3). The path analysis determined stronger correlations in three pairs of the correlates of adopting e-learning (i.e., confidence and adopting, confidence and perception, and perception and adopting) in the revised model.

Table 3. Reproduced Correlations For the Revised Model

Variables	1	2	3	4
1. Academics	#			
2. Confidence	.12	#		
3. Perception	-.01	.24	#	
4. Adopting	.12	.34	.14	#

6. CONCLUSIONS AND POLICY RECOMMENDATIONS

Research on e-learning is helpful in understanding its effectiveness or usefulness as compared with the traditional lecture courses. While it is impossible to present a unified e-learning theory, we can pinpoint some of the factors that positively affect this type of learning environment. As the literature suggests, e-learning received many positive marks in business organizational settings (e.g., Wong and Huang, 2011). However, the verification that an academic environment can replicate a business organizational teaching-learning model is highly disputed in the literature.

The theoretical focus on recognizing the faculty's functionality, experiences and skills, their confidence in knowing how to implement e-learning technologies, their perception of the usefulness of e-learning technologies as effective teaching/learning tools, and teaching/learning outcomes yielded inconclusive results in this study. However, the findings suggest that the academic staff's confidence in their ability to incorporate e-learning is a key factor in utilizing the technology and therefore effectively reaching the desired pedagogical outcomes. However, it can be extrapolated from the findings that the faculty's acceptance of the usefulness of such technologies is not a deciding factor for adopting e-learning. As MacKeog and Fox (2009) have argued, it is conceivable that the faculty has grown used to the traditional academic freedom that encourages them to be selective in their teaching practices.

Managing teaching requires the educators to recognize the advantages and disadvantages of one method over another. In the past, the pedagogical functionality and the faculty-student connectivity were more likely to be confined to the classroom periods and/or to the office hours. But, the stakeholders in higher education now believe that functionality and productivity means to help the faculty to "easily access their most critical university-related messages anytime, anywhere" (Huddlestone, 2011, p. 54). Viewed from this angle, the stakeholders expect that e-learning technologies should streamline the work process by increasing the potential for availability and accessibility. The administrators' confidence in e-learning technologies as effective and productive teaching tools may be high (Laurilard, 2006), but Hephaestus is a limping god whose 21st century technological offspring is resisted by many who favor of the traditional classroom teaching behavior. Future research is needed to verify whether the faculty shares this view from the top.

A negative view on adopting e-learning or the end user's confidence may be impediments in a learning environment because such an exclusive focus deters attention from other exogenous factors such as the available technical support systems and incentives (e.g., stipends, teaching load reduction, etc.). This raises a pivotal trepidation in teaching when e-learning's usefulness is questioned. Thus, finding ways of magnifying the usefulness of e-learning and how to create an appeal to that segment of the educators who resist e-learning consume much energy. Among these, as some researchers (e.g., Anderson, Vornhagen, & Campbell, 1998; Jones and O'Shea, 2004) have suggested, is to create the preference to adopt e-learning by communicating its appeal to the faculty in terms of its "usefulness" in delivering and managing information and other teaching related items. This type of endeavor has aimed at increasing e-learning popularity in colleges and universities, but it is not clear whether they have successfully affected the faculty perceptions.

Although the factors mentioned in this section were not included in the hypothesized model of this study, further analysis of the effects of the available technical supports and their efficiency rendered no significant effect on the decision to adopt e-learning. The impact of the incentives on increasing a favorable view of e-learning was envisioned after the data was collected for this study. Perhaps, future studies should focus on improving the model by focusing on impacts of

the available incentives on the use of e-learning and its growth on a college campus.

In conclusion, the incessant growth in information technology and the demand for professional development in education necessitated positioning academic professionals with new knowledge, skills, and personal attributes comparable to those desired in the business world. The need for supporting and incorporating e-learning in pedagogy stems from the assumption that it is a form of investment to stay in the race (Anderson, Brown, Fiona, Sampson, & Mentis, 2006; Blake, 2009). However, this is an investment that is looked upon suspiciously for its inconclusive outcomes.

7. ENDNOTES

1. The U.S. Senate and the former President Bill Clinton agreed on approving national Digital Empowerment Act that focused on funding for school technology (U.S. Senate, 2000). But, the situation is uncertain around the globe. For example, most of the concerns in scholarly circles seem to have been redirected towards how the population in developing countries are fairing in the Internet haves-and-have nots matrix. This is not to disregard the importance of race (Atwell, 2001) and gender (Volman and Van Eck, 2001) in maintaining the status quo in education despite the increased computer and Internet usage both in schools and at homes.

2. For example, see Rizza's (2008) study of pre-service teachers.

3. These factors relate to what Ritzer (2004) might have labeled them as "the McDonaldization of education".

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APPENDIX A

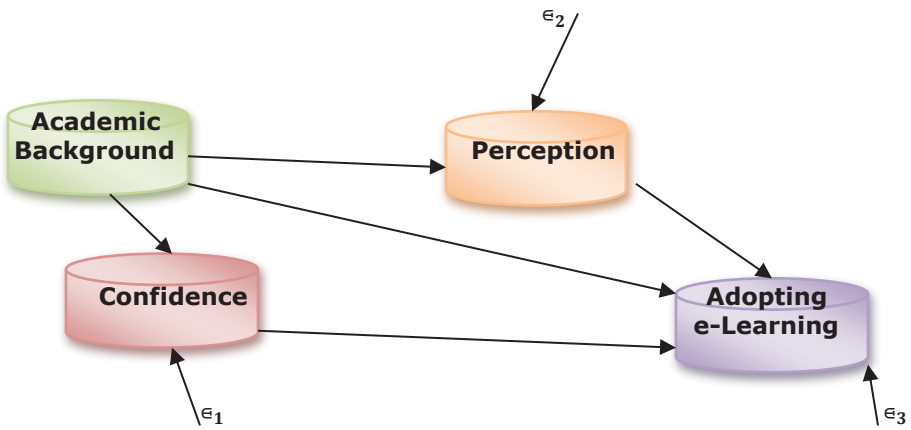

Figure 1: The Hypothetical Model

APPENDIX B

Table 1. Descriptive Statistics and Bivariate Correlation Values

Variables	Mean	SD	1	2	3	4	5	6	7
1. Academics	2.16	1.06	#						
2. Confidence	2.18	1.21	.12	#					
3. Perception	2.12	0.93	-.01	.23*	#				
4. Adopting	1.88	.86	.09	.31**	.14*	#			
5. Effectiveness	2.69	1.17	.03	.18*	.41**	.21*	#		
6. Gender	1.42	0.49	.05	.28**	-.01	-.05	-.04	#	
7. Age	3.30	1.03	-.45**	.18*	-.02	-.01	-.05	.03	#

** Correlation is significant at $p < 0.001$ level (2-tailed)
* Correlation is significant at $p \leq 0.05$ level (2-tailed)

APPENDIX C

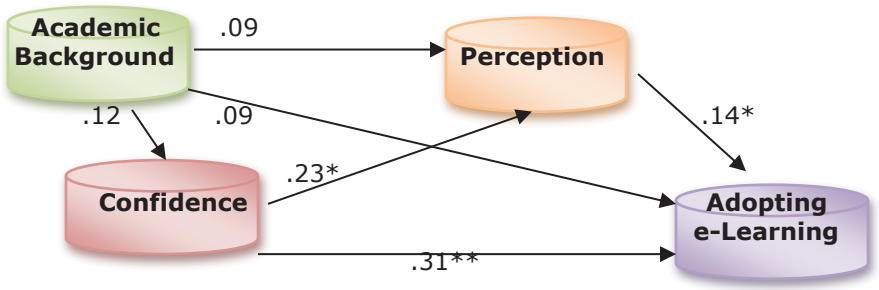

Figure 2. Path Model with Bivariate Statistics (Spearman Rho)

** Correlation is significant at p < 0.001 level (2-tailed)
* Correlation is significant at p ≤ 0.05 level (2-tailed)

APPENDIX D

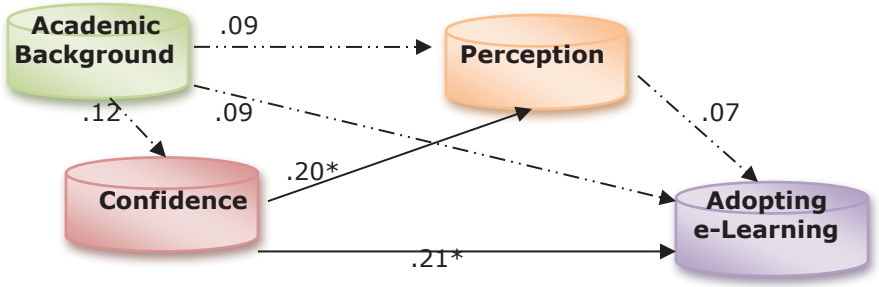

Figure 3. Modified Path Model with Standard Regression Coefficients

** Correlation is significant at p < 0.001 level (2-tailed)
* Correlation is significant at p ≤ 0.05 level (2-tailed)