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

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Abstract

This study investigates factors that predict the successful adoption and implementation of e-learning technologies in producing knowledge. Two hundred and twelve members of the faculty in a small Liberal Arts college in the Midwest were targeted. Several layers of analysis were performed to test the effects of academic backgrounds and other demographic variables on 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.

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

1. INTRODUCTION

"E-learning" is a new buzzword in many learning environments at all educational levels. Although many have attempted 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 information technologies and other online resources. This definition suggests that adopting e-learning requires revolutionizing the delivery methods, changing our priorities, and investing in areas that encourage incorporating technologically oriented innovations. Investing in e-learning, as Jones and O'Shea (2004) have suggested, is often a top-down decision process based on a rational cost-benefit calculation; 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 depends on the technology's ability to shift the faculty-student functionality and productivity.

The emphasis on e-learning has produced a great deal of sociological and pedagogical concerns for the new pedagogy's functionality. These concerns relate to the end users' perceptions of the technology as an effective teaching-learning tool; the pedagogical concerns also reflect e-leaning's effectiveness as it stands out by itself (Ahmed, 2009). The fear is that technology has a tendency to create an uneven development of the Internet use—the "digital divide" (Guillen & Suarez, 2005; Smith, 2003).[i] Thus, the conditions that foster adopting e-learning in classrooms are significant factors that may be conducive to the end users' characteristics as contributing to the use of the technology in classrooms. For this reason, this study explores the challenges of 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.[ii] This situation in higher education is intriguing. In reality, the mystery surrounding computers stems from the "fear of the unknown" because computers were known as a device used by intelligent people. Viewing the issue from this perspective, the origin of this fear stems from

one's awareness of one's inability to use technology. Therefore, confidence in one's ability and knowledge of e-learning technologies become important and 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. Given this, it should be noted that incorporating e-learning in classroom requires one to connect this knowledge to a variety of pedagogical tools (e.g., collaborative learning, connectivity, etc.) demanded by e-leaning. These demands, Wang (2002) noted, include a shift of paradigm from "the sage on the stage" information generator to "the guide on the side" coach. Thus, adopting e-learning require addressing the challenges that it poses by eventually focusing on whether this an effective tool. Hence the current study explores the factors affecting a faculty decisions to take a new look at teaching and learning, and decide if they need to revamp their methods of delivery.

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" model of teaching-learning, as compared with the traditional classroom format or the "hybrid" modules. The second category concentrates on 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. Also, 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). However, research on the stakeholders' perception scrutinized the upper management's perceptions, or the Board's interests in investing in e-learning technologies (Marouf & Rehman, 2007). When the concerns were either investing in technology or in learning, the pedagogical designers kept an eye on the learner and accentuated the user-friendly aspects of e-learning technologies. Investment efforts placed the end users' needs and interests at the center of the e-learning universe (Norman, 2002), but missed the focus on the faculty. Thus, the literature is silent on the pragmatic and pedagogical concerns of the "educator" about e-learning.

On the other hand, research on the effectiveness of e-learning have 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. Ahmed's (2009) research (while putting an interesting spin in the notion of e-learning) also revealed 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), 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).

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 teaching 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/or 3) simply feeling productive.

Given the above, the faculty decision to adopt e-learning is 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. The literature suggests that these and the appropriateness of technology are important human capital factors that determine the success of such decisions.

3. THEORETICAL FRAMEWORK

The above review delineates several key, but separate, specificities that dominated research on e-learning. E-learning does not seem to be specific to either industry or academy, despite the differences in their conceptual definitions. Both environments have adopted the technology with similar intentions: e-learning is the magic wand in teaching and learning. Thus, a common question in both environments is: What factors predict a successful adoption of e-learning technologies in the production of knowledge? Other related questions are: What promotes or hinders the success of this newfound pedagogy? Which characteristics play elemental roles in predicting the tendencies to adopt the technology, which in turn is assumed to enhance effective teaching-learning?

Current research has provided inconclusive answers to these questions. This study proposes a theory of e-learning that attempts to address these question by proposing a model that simultaneously investigates the end users, their characteristics (e.g., motivation, perception, attention and emotions coupled with knowledge, cognitive and teaching styles, intellectual capabilities, and perceptions), and the technical issues that determine the decision to adopt e-learning. Borrowing from Peterson (1995), the proposed model also includes other important factors such as the end users' perception of information technology, their willingness to adopt, and their competence as the key factors in adopting e-learning in teaching.

The proposed model assumes that the decision to adopt e-learning, and its effectiveness, depends on the end user's perception that such technologies can be useful (i.e., "efficient" and "productive") teaching-learning tools. Instructors are effective in an e-learning environment if the technology is readily available for use. Anything to the contrary may inadvertently affect one's perceptions about the usefulness of e-learning technologies. 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 instrument; both of which are characterized by factors such as usefulness of e-learning in preparing for a class and the delivery methods.

This model also 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 cognitive state (i.e., perceived functionality and usefulness of e-learning as effective pedagogical tool). This assertion stems from the assumption that the pedagogical effectiveness of e-learning is a function of perceived usefulness. In this regard, one's academic credentials and professional experiences is aligned with the way the subject matter is effectively delivered. Here, technology is treated as the framework, 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, X_4= Decision to Adopt e-learning, and X_5= Effectiveness. Hence the structural equation for the working model is:

$$\boldsymbol{X_5 = P_{51}X_1 + P_{52}X_2 + P_{53}X_3 + P_{54}X_4 + \sum_{J=1}^{4} e}$$

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

4. METHODS

An aspect of the decision to adopt e-learning is the emphasis on the role of the demographic variables. 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 summarized 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

Five 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; 4) the faculty tendency to adopt e-learning technologies and resources; and, 5) classroom effectiveness or outcomes of adopting e-learning technologies. 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. Three items also reflected measures of "effectiveness". All items were ordinal in measure.

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," "adoption," and "effectiveness" scales. Chronbach's *α* ensured internal consistency and reliability. Chronbach's *α* for academic background was .75; it was .70 for perception and confidence, respectively. The value of *α* for effectiveness was .82, and .64 for the tendency to adopt technology in classrooms (the recommended *α* is .70 or greater). Also, other demographic variables (such as age and sex) acted as control variables to detect the differences between categories, and their effects on the decision to adopt e-learning.

Limitations

The low *α* 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 preliminary 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, tendency to adopt e-learning, and effectiveness) in this study.

These findings indicate that facets of academic backgrounds are not correlated with the 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. Conversely, neither one's years of teaching experiences nor the academic rank correlated with his/her confidence in being able to incorporate e-learning. Furthermore, implementing e-technologies in classrooms 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. All variables of academic backgrounds, except for rank, did not produce any statistically significant correlation with adopting e-learning. Additional item-by-item analyses also suggested no statistically significant correlation between academic background and effectiveness (data not shown); likewise, the additive "academic background" scale did not show any statistically significant correlations with perception, confidence, adoption, and effectiveness. 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 ($r = .23$, $p = .01$); confidence and adopting ($r = 31$, $p = .001$); perception and effectiveness ($r = .41$, $p < .000$); competence and effectiveness ($r = .18$, $P = .05$); and adopting and effectiveness ($r = .21$, $p = .05$). The exception in this model is "perception," which did not show a statistically significant correlation with adopting e-learning ($r = .14$, $p = .07$).

The empirical data shown in Figure 2 is consistent with the hypothesized path model, except for the effects of the academic background variables. However, a path analysis was conducted to ensure proper fit, and to ascertain the possible causal relationships among the variables. 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 perceptions has on adopting e-learning (β = .07). Another diminished link is the effects of a faculty's confidence in his/her ability to utilize e-learning and effective teaching/learning (β = .06). 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 (β = .21). This is also consistent with the original model. Although one's perception of the usefulness of e-learning technologies did not seem to have an effect on the decision to adopt (β = .07), it appeared to be a statistically significant determinant of effectiveness (β = .18). Thus, the revised model suggests that the largest determinant of effective classroom teaching/learning to be "adopting and implementing" e-learning technologies while assigning classroom activities (β = .42).

Table 2. Standard Regression Coefficients

Variables	1	2	3	4	5
1. Academics	#				
2. Confidence	.12	#			
3. Perception	-.09	.20*	#		
4. Adopting	.09	.09	.07	#	
5. Effectiveness	.03	.06	.18*	.41*	#

** Correlation is significant at p < 0.001 level (2-tailed).
* Correlation is significant at p ≤ 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 5 pairs of the correlates of e-learning (i.e., competence and adopting, competence and effectiveness, perception and adopting, adopting and effectiveness, and adopting and effectiveness) in the revised model.

Table 3. Reproduced Correlations For the Revised Model

Variables	1	2	3	4	5
1. Academics	#				
2. Confidence	.12	#			
3. Perception	-.01	.24	#		
4. Adopting	.12	.34	.14	#	
5. Effectiveness	.05	.35	.44	.34	#

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 where researchers (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.

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 to maintain 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, it is the expectation of the stakeholder that e-learning technologies streamline the work process by increasing the potential for availability and accessibility. Perhaps, future research is needed to verify whether the faculty shares this view. The administrators' confidence in e-learning technologies' abilities in terms of effective and productive teaching tools may be high (Laurilard, 2006), but Hephaestus is a limping god whose 21st century technological offspring is resisted by others in favor of the traditional classroom teaching behavior.

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 as measures of one's effectiveness 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.

A negative view on e-learning technologies and their usefulness and effectiveness may appear as an impediment in an e-learning environment, but an exclusive focus on factors associated with the academic environment excludes an attention to other exogenous factors such 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. For example, some researchers (e.g., Anderson, Vornhagen, & Campbell, 1998; Jones and O'Shea, 2004) have suggested that to create the preference to adopt e-learning is doable by communicating its appeal to the faculty in terms of the "usefulness of technology" in delivering and managing information and other teaching related items. These types of endeavors have aimed at increasing e-learning popularity in colleges and universities, but it is not clear whether they have successfully affected the faculty perceptions of e-learning.

Although these latter factors were not included in the hypothesized model in 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 sum, 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-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

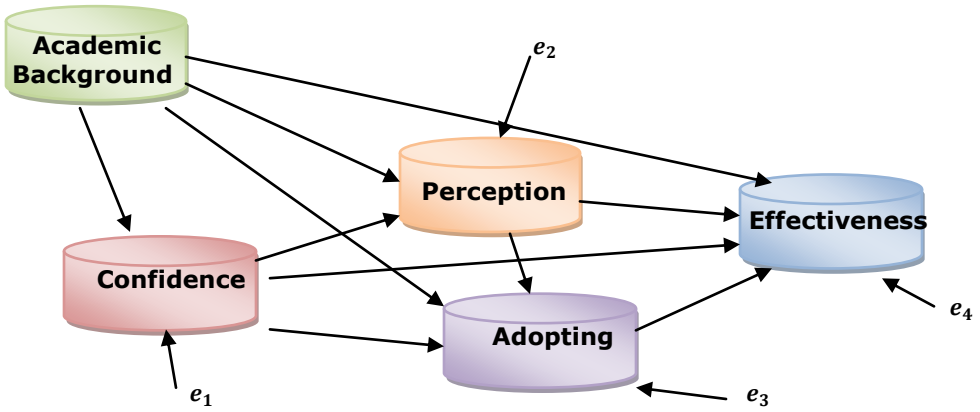

Figure 1: Hypothetical Model

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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)

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APPENDIX C

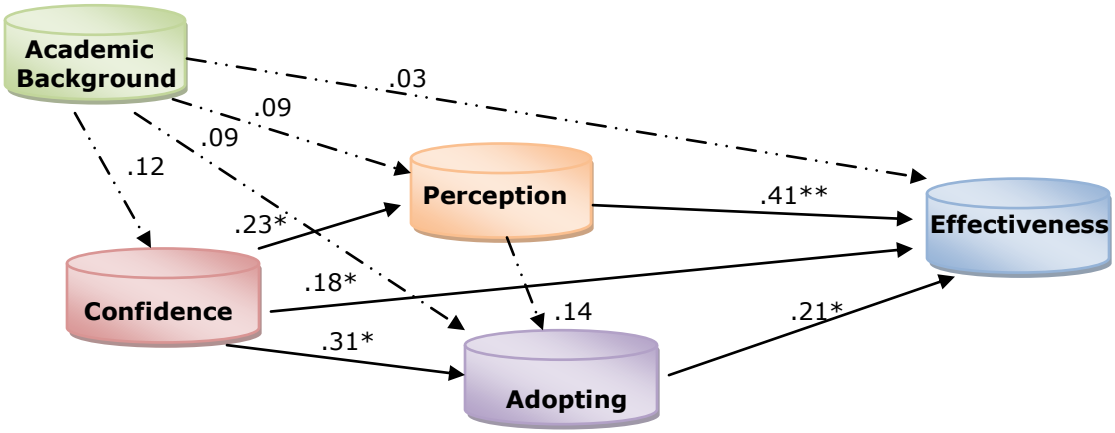

Figure 2. Path Model with Bivariate Statistics (Spearman Rho)

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

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APPENDIX D

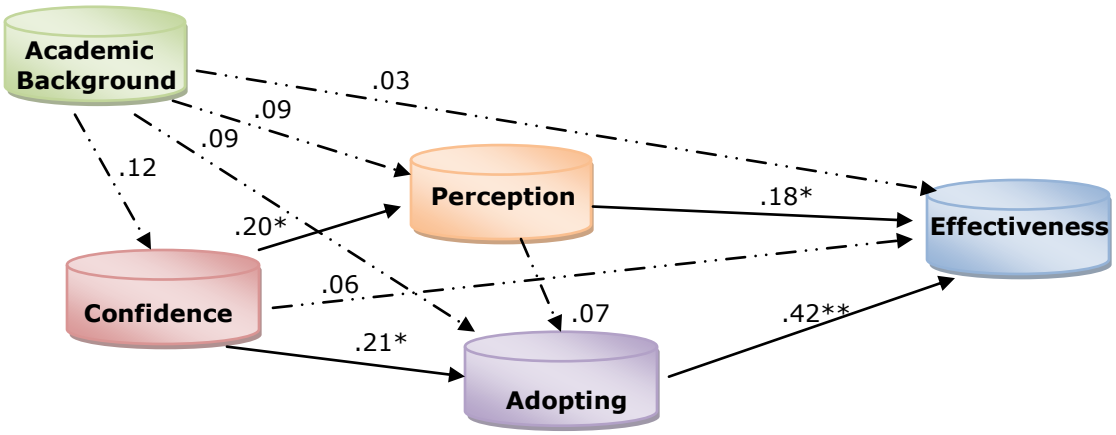

Figure 3. Modified Path Model with Standard Regression Coefficients

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