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THE RELATIONSHIP AMONG COMPUTER ATTITUDES, COMPUTER SELF-EFFICACY, AND COMPUTER USAGE: AN EMPIRICAL STUDY OF UNIVERSITY STUDENTS

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Abstract

This study presents an integrated model of computer self-efficacy (CSE) with empirical findings about university students' computing behavior across a variety of disciplines at a large university. The study empirically investigates the relationship among students' attitudes toward computers, CSE and computer usage across six academic disciplines in a university environment.

The findings suggest that a student's positive attitude toward computers has a significant positive effect on the student's CSE, while a student's negative attitude and intimidation by computers has a significant negative effect on CSE. In addition, a student's positive attitude has a significant positive effect on the student's computer usage, while a student's intimidation by computers has a significant negative effect on computer usage. From the findings of the study, professors, college deans, and the academic community would benefit from knowing the factors that affect a student's computer usage as computers are an integral part of the learning experience in most fields of study.

Keywords: Attitudes toward computers, computer self-efficacy and computer usage

Introduction

Organizations across all business sectors demand that their employees have computing skills. Therefore, university students must gain computer proficiency in order to maintain a competitive position in the job market. Although different academic disciplines have different levels of computer skill requirements from their students, universities do provide students with an opportunity to enhance their computing skills during their course of study.

As a result of using information technology (IT), firms can better understand their customers and enhance their business strategies. The need to have employees with computing skills has put pressure on business managers to integrate this requirement into their business planning. One of the most effective ways to accomplish this task is to hire college graduates with computer skills.

This study provides evidence suggesting that several factors are related to a student's computer software usage in an academic environment. A recent study illustrates that both attitudes toward computers and computer self-efficacy (CSE) have an effect on computer usage across professional organizations (Compeau & Higgins, 1995a, 1995b).

Understanding the relationship among students' attitudes toward computers, CSE and computer usage can provide a key consideration in a university's endeavor to foster computer skills. Very limited research has been conducted on students' attitudes towards computers and CSE in academic settings. Through the use of a survey, this study investigates students' attitudes toward computers, CSE, and computer usage among students enrolled in six colleges at a large university.

Theoretical Framework and Proposed Model

The basis for this study was three established theories, and one previous CSE study. They were Fishbein and Ajen's (1975) theory of reasoned action, Bandura's (1986) self-efficacy of social cognitive theory (SCT), and Compeau and Higgins' (1995a, 1995b)

CSE study which was developed from Bandura's SCT. Compeau and Higgins (1995a, 1995b) suggested in their CSE study that SCT postulates an ongoing reciprocal interaction among cognitive factors, environment and behavior.

First, Fishbein and Ajen (1975) indicated that a person's behavior (e.g., computer usage) is best predicted by intentions (e.g., outcome expectations), that are jointly determined by the person's attitude and subjective norm concerning the behavior. Second, Bandura (1986) defined self-efficacy as an individual's judgment of his or her capabilities to organize and execute courses of action to attain designated types of performance. Bandura also argued that individuals judging themselves as capable to perform certain tasks or activities will be more likely to attempt and successfully execute the tasks. Third, Compeau and Higgins (1995a, 1995b) suggested that CSE refers to a judgement of an individual's capacity to use computers. Furthermore, they argue that individuals with a higher computer-self efficacy could accomplish more difficult computing tasks than those with lower CSE.

This study examined students' attitudes toward computers, CSE, and the extent of computer usage of senior year students enrolled in six academic disciplines at a large university. The factors examined are positive attitude (PosAtt) and negative attitude (NegAtt) toward computers, intimidation by computers (Intimid) and computer self-efficacy (SCE). These factors were used in previous CSE studies (Murphy, Coover & Owen, 1989; Harrison & Rainer, 1992; Compeau & Higgins, 1995a, 1995b; Compeau, Higgins, & Huff, 1999). Figure 1 depicts the model for this investigation. Based on the theoretical background and the proposed model, the following are hypothesized:

Hypothesis 1: A student's positive attitude toward computers has a positive impact on the student's computer self-efficacy.

Hypothesis 2: A student's positive attitude toward computers has a positive effect on the student's computer usage.

Hypothesis 3: A student's negative attitude toward computers has a negative impact on the student's computer self-efficacy.

Hypothesis 4: A student's negative attitude toward computers has a negative effect on the student's computer usage.

Hypothesis 5: The higher a student's intimidation by computers, the more likely there is a negative impact on the student's computer self-efficacy.

Hypothesis 6: The higher a student's intimidation by computers, the more likely there is a negative effect on the student's computer usage.

Hypothesis 7: A student's degree of computer self-efficacy has a direct impact on the student's computer usage.

Research Methodology

Questionnaire

The questionnaire for this study was developed using existing, validated scales. Positive attitude, negative attitude, and intimidation by computers was measured using the Computer Attitude Scale (CAS) (Nickell & Pinto, 1986; Harrison & Rainer, 1992). Computer self-efficacy was measured using a scale developed by Compeau and Higgins (1995a, 1995b). Computer usage was measured by calculating the mean for the extent of usage for 11 software applications (e.g., word processing, e-mail).

Data Collection

The data were collected from 456 senior students of six different colleges within the same university. Of this sample, 46.8% were female and 53.2% were male, 56 were from the school of architecture, 145 from the college of business, 93 from the college of education, 48 from the college of engineering, 64 from the college of liberal arts, and 50 from the college of forestry and wildlife. The average age of the participants was 22.6, ranging from 19 to 43 years old.

At the onset of the study, meetings were conducted with the dean of each school or discipline. Upon approval from individual professors, the questionnaire was administered to students in senior level courses. The actual questionnaire took approximately 10 to 15 minutes for each student to complete. 456 responses were collected, but 30 of them were unusable in this study.

Data Analysis

The measure characteristics of the constructs were assessed to determine the reliability based on internal consistency for each scale by calculating Cronbach's Alpha. The range of alpha values for all the scales used in this study was between 0.80 and 0.91. All alphas are above the cutoff value suggested by Nunnally (1978) of 0.70 for hypothesized measures of a construct. Table 1 reports the alphas and descriptive statistics for the factors.

Table 1, Cronbach's Alpha and Descriptive Statistics for the Four Factors in the Study

Factor	Mean	Std Dev	Cronb. α	Correlation Coefficient			
				1	2	3	4
CSE	6.89	1.76	.91	1.000			
NegAtt	2.89	.95	.85	-.140**	1.000		
Intimid	2.23	1.12	.87	-.361***	.301**	1.000	
PosAtt	4.92	.64	.80	.228***	-.255***	-.195***	1.000

*p < .05 **p < .01 ***p < .001

A convergent validity test was conducted to determine whether all the indicators comprising a scale converge or load together on a single factor. In general, if the factor loadings are statistically significant, convergent validity exists. To assess this validity, statistical significance was computed using the one-tailed t-statistic test. In this model, all the factor loadings are significant (t > 1.96) indicating that convergent validity exists.

In the confirmatory factor analysis phase, using EQS structural equation modeling (SEM) software, the hypotheses were tested by examining path coefficients for the factors and the observed variable.

Research Results

EQS was used to determine the relationship among three attitudes toward computers, computer self-efficacy, and the extent of computer software usage. The results of the analysis indicate that the model is supported. Figure 1 summarizes the findings from the data analysis.

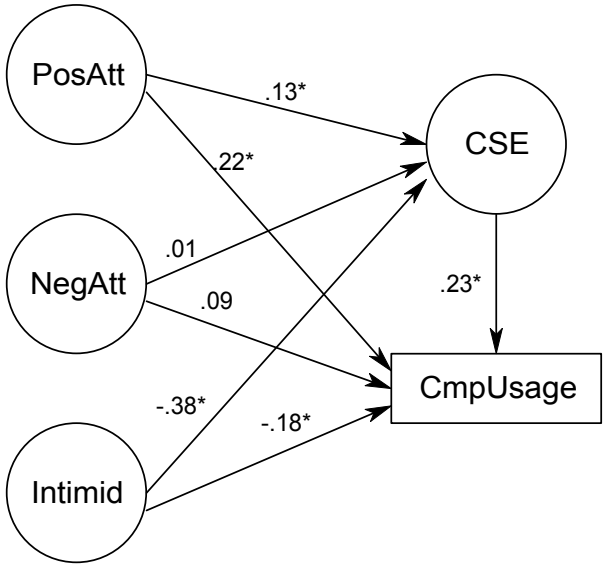

Figure 1. Model with Standardized Loadings

χ^2 = 827.30 AGFI = .81 * p < .05
df = 293 CFI = .89
χ^2/df = 2.82 RMSEA = .07

There is not one generally accepted measure of overall model goodness of fit, or even a set of optimal tests. Thus, we need to rely on the use of multiple fit criteria. The first is the χ^2 statistic which tests the proposed model against a fully saturated model--meaning all variables are correlated (Hartwick and Barki, 1994). A small χ^2 value indicates a good fit. The problem with the χ^2 statistic is that it is sensitive to sample size. In large samples, the χ^2 statistic is almost always significant. A better measure using the χ^2 statistic is to divide χ^2 by its degrees of freedom. This ratio should be as small as possible. In this study, the ratio of χ^2 to degrees of freedom is 2.82 which is below the threshold of 3 commonly found in IS literature (Chin & Todd, 1995).

The second test statistic is the value of the Adjusted Goodness-of-Fit Index (AGFI). In this study, AGFI is 0.81, which is an acceptable value for the good fit for all sample sizes (Segars & Grover, 1993). The third measure of goodness of fit is the Comparative Fit Index (CFI). The CFI has been found to fit well at all sample sizes, and is thought to provide a more stable estimate than some of the other fit indices (Bentler, 1990; Hartwick and Barki, 1994). The CFI value of the model is a 0.89 which is close to the threshold fit of a 0.90 (Bentler, 1990). Finally, the root mean square error of approximation (RMSEA) measures the discrepancy in the population between the observed and estimated covariance matrices per degree of freedom. RMSEA is not affected by sample size (Garver and Mentzer,

1999). The RMSEA value of 0.07 in the model falls within the acceptable range of 0.08 or less (Hair, Anderson, Tatham and Black, 1995).

Discussion

This study integrated the theoretical perspectives and empirical findings on computer self-efficacy as proposed and tested a structural equation model examining the students' attitude toward computers, computer self-efficacy and the extent of computer software usage. The results indicate moderate support for the model variables and provide interesting insight into how students' attitudes toward computers, computer self-efficacy, and the extent of computer software usage are impacted by each other.

First, a student's positive attitude toward computers has a significant positive effect on computer self-efficacy as proposed in Hypothesis 1. The model shows a student's positive attitude toward computers has a positive significant effect on the student's computer usage as proposed in Hypothesis 2.

Second, a student's negative attitude toward computers does not have a significant effect on the student's computer self-efficacy nor computer usage as proposed in Hypotheses 3 and 4. Thus, neither Hypotheses 3 nor 4 was supported.

Third, a student's intimidation by computers has a significant negative effect on the student's computer self-efficacy and computer usage as proposed in Hypotheses 5 and 6. Thus, both hypotheses are supported.

Finally, a student's computer self-efficacy has a significant positive effect on the student's computer usage as proposed in Hypothesis 7.

Limitations of the Study

There are a number of limitations to this study including:

The findings on the relationships among computer attitudes, computer self-efficacy and computer usage were based on limited number of college students at a university over a limited time period. However, there is evidence that addressed variables could be related to these three variables in order to help explain students' computing behavior. It might provide more insights if the study includes a discussion of differences between the subject groups, e.g., students vs. business managers, freshman vs. senior students, or business major vs. education major students. A comparison between two universities could provide additional insights for the study. Computer self-efficacy differences by gender would be another research question that could be examined in future studies.

Conclusion and Directions for Future Study

While a few conclusions can be drawn from this study, there are other factors that may provide just as much insight into students' attitudes toward computers and CSE. For instance, it would be useful to examine a threefold relationship among students' academic performance expectations (i.e., GPA), their computer self-efficacy and the extent of computer software usage.

Future research is recommended to validate and promulgate this study. First, longitudinal studies are required to improve generalizeability of the study. Second, a set of new survey items is required for students' CSE in an academic environment in order to reflect the reality of a rapidly changing IT environment. Since this study relied on existing questionnaires designed in the 1980's and 1990's for business environment settings, making interpretation of causality was somewhat problematic. Third, another major limitation of the study is the number of academic disciplines involved in the study. With more disciplines in a sample, the model of this study could improve overall goodness of fit. Two previous studies on the goodness of fit suggest that the GFI and AGFI are significantly affected by the sample size (Marsh and Bella, 1988; Mulaik et al, 1989).

This study presents significant progress toward explaining the relationship among students' attitudes toward computers, CSE and their computer usage in a university environment. The findings are encouraging in light of the fact that there is significant evidence supporting the study in other types of organizations. Thus, professors, college deans, and the academic community should be able to utilize the results of this study to enhance academic curriculum relevant to computing skills for their students. Improving computing skills should lead to more effective use of information technology. In addition, the students possessing more ability should become more competitive in the job market as they graduate.

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