Business Student Computer Self-Efficacy: Ten Years Later

Rex Karsten
Department of Management
University of Northern Iowa
Cedar Falls, IA 50614 USA
rex.karsten@uni.edu

Dennis Schmidt
Department of Accounting
University of Northern Iowa
Cedar Falls, IA 50614 USA
dennis.schmidt@uni.edu

ABSTRACT

This study analyzes computer self-efficacy for two independent samples of students enrolled in an introduction to information systems course in 1996 and 2006. We administered two validated and frequently employed measures of general computer self-efficacy to each group of students and collected demographic and computer-use data. Our findings demonstrate that the 2006 students reported significantly more computer experience, used computers much more frequently, and took significantly more core courses that require computer use than their 1996 counterparts. This experience, however, did not translate into significantly higher computer self-efficacy scores, and female students in both groups had significantly lower scores than male students. Even more surprising, after controlling for gender, class level, computer experience, and frequency of computer use, we observed that computer self-efficacy was significantly lower for the 2006 students than the 1996 students. This article discusses the implications of these findings for information systems educators.

Keywords: Computer Self-efficacy; Computer Experience; Computer Use; Gender.

1. INTRODUCTION

Students entering college today can logically be expected to have more computing experience than students of years past. They are also more likely to use computers in home, educational, and workplace settings than their counterparts of a decade ago. The growth of the Internet and wireless networking technologies has also changed how, and accordingly how often, students use computers. Computers and computing devices (e.g., cell phones, PDAs) have become primary communication tools for students of all ages and are as likely to be purchased as a telecommunications device as a problem-solving tool. For example, students today make extensive use of e-mail, instant messaging, text messaging, social networking sites, and web browsing. The popularity of web sites that support downloading, viewing, and posting video and audio applications and recordings provides additional anecdotal evidence of students' immersion in, and dependence on, computing and telecommunications technologies. In sum, computing has become increasingly pervasive, with information technology and information processing integrated into the everyday activities of today's students.

It is reasonable to ask if greater experience with, and use of, information technologies make post-secondary students today more able and inclined to use computer technologies than were their counterparts a decade or more ago. This is an ongoing concern. For many years, educators have been concerned about the nature and impact of the computing skills and experience students bring to college (e.g., Havelka, 2003; Kim and Keith, 1994; Karsten and Roth, 1998a; Palaigeorgiou, Siozos, and Konstantakis, 2006). As stated by Palaigeorgiou, Siozos, and Konstantakis (2006, p. 459), "…students' prior computer experience is a major unknown factor in professors' development of Information Systems and other computer-related academic departments." Consequently, most business schools require student completion of introductory information technology courses intended to ensure that all have received similar and sufficient exposure to essential computer skills and fundamental computer concepts (Creighton et al., 2006; Smith, 2004).

Our experience as information systems educators has provided anecdotal evidence that this approach remains appropriate. The purpose of the current study, however, is to investigate formally how student computer experience and frequency of computer use have changed over a ten-year period and how such changes may have affected the students' competence and confidence in the skills typically taught in introduction to information systems courses. As described below, we employed two popular measures of computer self-efficacy (CSE) that researchers have frequently used to assess student perceptions of their computer capabilities. Computer self-efficacy is a well-researched construct that has provided valuable insights into the computing capabilities of individuals inside and outside the classroom (e.g., Karsten and Roth, 1998a; Marakas, Johnson, and Clay, 2007; Smith, 2004).

A review of the literature suggests that the current study differs from prior research in at least two important ways. First, we collected data from two independent samples of students enrolled in a typical introduction to information systems course ten years apart. To our knowledge, this study is unique in that regard. Second, the use of two measures of computer self-efficacy that are generic enough to stand the test of time (Stephens, 2006) allowed us to make meaningful comparisons between the two samples. In the following sections, we describe the computer self-efficacy construct and measures employed. We then present the hypotheses, research method, and results. This article concludes with a discussion of the study's findings and the implications for information systems educators.

2. COMPUTER SELF-EFFICACY

Computer self-efficacy is derived from the general concept of self-efficacy (Bandura, 1986, 1997) and is defined as "…a judgment of one's ability to use a computer" (Compeau and Higgins, 1995, p. 192). Computer self-efficacy has been identified as a key determinant of computer-related ability and the use of computers (Hasan, 2003). Individuals high in computer self-efficacy are more likely to choose and participate in computer-related activities, expect success in these activities, persist and employ effective coping behaviors when encountering difficulty, and exhibit higher levels of performance than individuals low in computer self-efficacy (Compeau, Higgins, and Huff, 1999). In sum, computer self-efficacy appears to capture the competence and confidence information systems educators hope to instill in their students (Karsten and Roth, 1998a).

Individuals gain computer self-efficacy information from a variety of sources (Bandura 1997): their own performance accomplishments (e.g., personal success and failure using computers), observing the successes and failures of others (e.g., friends, classmates), verbal persuasion (e.g., encouragement and support that reinforces the belief they can become computer competent), and emotional states (e.g., confidence or anxiety when faced with computer-dependent tasks). More years of experience and more frequent computer use should offer more opportunities to gather computer self-efficacy information. However, it is important to note that computer self-efficacy is a domain-specific, dynamic construct that changes over time as people acquire new information and experiences (Gist and Mitchell, 1992). The nature of that change depends upon the relevancy of new information and experiences to the computing skills of interest. In other words, it is the kind of computer experience, and not computer experience per se, that influences self-efficacy perceptions (Karsten and Roth, 1998a). Interested readers are encouraged to review Marakas, Yi, and Johnson (1998) and Marakas, Johnson, and Clay (2007) for in-depth examinations of the computer self-efficacy construct.

2.1 TCSE vs. GCSE

Marakas, Yi, and Johnson (1998) differentiated between task-specific measures of computer self-efficacy (TCSE) and general computer self-efficacy (GCSE). TCSE refers to "…an individual's perception of efficacy in performing specific computer-related tasks within the domain of general computing" (Marakas, Yi, and Johnson, 1998, p. 128). More simply put, Hasan (2006) describes it as a judgment of efficacy in performing a defined computing task using a specific computer application. Examples of TCSE would include measures of word processing, spreadsheet, and database efficacy.

On the other hand, Marakas, Yi, and Johnson (1998, p. 129) define general computer self-efficacy (GCSE) as "…an individual's judgment of efficacy across multiple computer application domains." The authors suggest that GCSE can be thought of as a collection of specific TCSEs accrued over time, and that its long-term value may be "…as a predictor of future levels of general performance within the diverse domain of computer related tasks" (p. 129). Hasan (2006) describes GCSE as the perception of ability to use a computer in general, without regard to a particular computing task, application, or environment. Marakas, Yi, and Johnson (1998) state that GCSE conforms more closely to the definition of computer self-efficacy that researchers have tested in the information systems literature. We employed two measures of GCSE in the current study.

2.2 Two Measures of GCSE

The two scales employed in this study were developed independently by Murphy, Coover, and Owen (1989) and Compeau and Higgins (1995). The scales have been two of the most frequently used and widely respected measures in computer self-efficacy studies (Marakas, Yi, and Johnson, 1998; Marakas, Johnson, and Clay, 2007). Both are measures of GCSE. While both scales attempt to capture the same construct, visual inspection of their respective items suggests obvious differences in approach to GCSE assessment.

Murphy, Coover, and Owen (1989) measure GCSE via a 32-item scale of an individual's perceptions of his or her ability to accomplish specific tasks and activities involved in operating a computer (see Appendix A, and referred to here as MGCSE). Subjects indicate their confidence on a 5-point scale (1 = strongly disagree, 5 = strongly agree). The MGCSE scale is a "widely respected and adopted measure of CSE" (Marakas, Johnson, and Clay, 2007, p. 22).

Over the years, researchers have regularly used the original and modified versions of the MGCSE scale to assess the perceived computer capabilities of students enrolled in introductory information systems courses (e.g., Durndell, Haag, and Laithwaite, 2000; Karsten and Roth, 1998a; McIlroy, Sadler, and Boojawon, 2007; Smith, 2005) and to determine the type of training necessary to improve computing proficiency (Stephens, 2006). In a recent study, Stephens (2006) found the MGCSE scale to be highly correlated (r = .93) with the Business Computer Self-Efficacy (BCSE) scale developed by Stephens and Shotick (2002). The BCSE scale includes a wide variety of computer literacy skills.

It should be noted that Marakas, Johnson, and Clay (2007) express concern that when existing measures like the Murphy, Coover, and Owen (1989) scale are used, they are often dramatically altered to make them more relevant to changes in the computing environment, or that items are simply dropped without adding new items that reflect those changes. For example, the original Murphy, Coover, and Owen (1989) scale—developed prior to the common use of local networks—included three items that measured skills related to logging onto, logging off, and working on a mainframe computer. Some researchers have determined that these skills are no longer relevant and have dropped these items from the MGCSE scale (Stephens, 2006). Fortunately, this change was already evident in 1996, and we replaced the mainframe items with three items measuring skills related to logging onto, logging off, and working on a computer network. Consequently, the modified MGCSE measure administered in this study in 1996 and again in 2006 addresses the concern voiced by Marakas, Johnson, and Clay (2007) and allows for meaningful comparisons over time.

Compeau and Higgins (1995) assess computer self-efficacy via a 10-item scale that assesses an individual's perceptions of his or her ability to use a new software package under a variety of conditions (see Appendix B, and referred to here as CHGCSE). For each condition, subjects first indicate whether they would be able to complete an assignment using the software package. For each "yes" condition, subjects next indicate their confidence on a 10-point scale (1 = not at all confident, 10 = totally confident). Though the scale focuses on application use, it does not specify a particular application (e.g., spreadsheet or database). Therefore, the CHGCSE scale is a measure of general computer self-efficacy as well. The CHGCSE scale has been "…arguably the single most adopted and reused measure of the construct" (Marakas, Johnson, and Clay, 2007, p. 19). Like the MGCSE scale, researchers have used the CHGCSE scale in whole or part to assess the perceived computing capabilities of students enrolled in information systems courses (e.g., Shih, 2006; Hasan, 2003; Hasan and Ali, 2006; Thatcher and Perrewe, 2002).

In sum, self-efficacy researchers developed the MGCSE scale nearly 20 years ago and the CHGCSE scale more than a decade ago. Though the measures have some limitations, we believe they continue to ask questions about general computing capabilities that remain relevant today for the assessment and comparison of computer experience, confidence, and competence.

3. HYPOTHESES AND RESEARCH METHOD

We expected to observe significant increases in computer experience, frequency of computer use, and number of courses requiring computer use between the 1996 and 2006 subjects. Computer self-efficacy theory, however, posits that it is the kind of experience, not the amount, that affects individuals' self-efficacy (Karsten and Roth, 1998a). Despite the increasingly technological immersion of today's students, we were concerned that more computer experience and use may not be translating into increased computer self-efficacy.

Prior research has also investigated gender differences in computer self-efficacy. Some studies have observed females exhibiting lower computer self-efficacy than males (Hsu and Huang, 2006; Shotick and Stephens, 2006; Smith, 2005), while others have demonstrated no difference (Havelka, 2003; Karsten and Roth, 1998b) and have suggested the differences have disappeared as a result of increased computer use by males and females (Rainer, Laosethakul, and Astone, 2003). Because of the inconsistent findings over time, we tested for gender differences in this study. Based on CSE theory and our research interests, we tested the following hypotheses:

H1: Computer-use attributes are significantly higher for the 2006 subjects than the 1996 subjects.

H2: There is no difference in computer self-efficacy between female and male subjects.

H3: There is no difference in computer self-efficacy between the 1996 and 2006 subjects.

We were fortunate in this study that one of the authors—an instructor of an introduction to information systems course for many years—administered the MGCSE and CHGCSE scales to his students back in 1996. This gave him the opportunity to re-assess students in the same course in an identical fashion ten years later. This instructor has found that the application and analysis of the scales provide valuable insight into his students' preparation and motivation in the introductory information systems course context.

The subjects in each group consisted of students in three sections of the same introduction to information systems course at a medium-size state university in the Midwestern portion of the United States. The course is required for all business majors, and nearly everyone in the course was a business major. The 1996 group consisted of 119 subjects, while the 2006 group had 114 subjects. For each group of students, the instructor administered the two scales in the first week of class, before the students were exposed to any course content. Prior to administration, the instructor told the students that participation was voluntary, responses would remain confidential, and the results would only be used to emphasize those computer skills with which students felt least confident. To reduce order effect, half the subjects saw the MGCSE scale first, while the other half saw the CHGCSE scale first. The survey instruments for each year also collected demographic and computer-use data about the students. We tested the hypotheses using independent-samples T tests and hierarchical regression analysis (Cohen and Cohen, 1983).

4. RESULTS

We employed two widely used and well-validated measures of general computer self-efficacy in this study. Our results indicate that the MGCSE and CHGCSE scales exhibited both convergent validity and reliability. The two scales were significantly correlated with each other for both years (r = .72 and .45 in 1996 and 2006, respectively; $p < .001$), which demonstrates that they are most likely measuring the same construct. In addition, the scales exhibited very high internal consistency reliability each year. Cronbach's alpha coefficients ranged from .92 to .97.

Table 1 displays the mean scores for the 1996 and 2006 groups for the variables of interest to this study. The two groups shared very similar demographic characteristics. There were no significant differences in age (approximately 21 years old), class (approximately 88% in each group were sophomores and juniors), and gender composition (approximately 60% male and 40% female). As expected, though, the groups did differ substantially in their computer-use attributes. The 2006 students reported significantly higher values than their 1996 counterparts, thus supporting hypothesis one. Study participants in 2006 averaged 8.7 years of computer experience compared to 5.0 years for the 1996 group. The samples also differed dramatically in reported frequency of computer use, with 84% of the students in the 2006 group indicating they used a computer at least once a day compared to only 30% for the 1996 participants. In addition, the 2006 group reported taking significantly more college courses requiring computer use (mean = 4.4) compared to the 1996 participants (mean = 2.7). Despite these significant differences in computer-use attributes, the two groups did not differ significantly on their mean scores for either the MGCSE scale (1996 = 3.66, 2006 = 3.79, p = .11) or the CHGSE scale (1996 = 6.12, 2006 = 6.28, p = .43).

Variable	1996[a]	2006[b]	*t*	Sig.
Age	21.22	20.75	1.13	.26
Class[c]	2.78	2.72	0.66	.51
Gender[d]	0.63	0.59	0.66	.51
Years of Computer Experience	4.95	8.68	-9.36	.00
Frequency of Computer Use[e]	4.59	5.89	-8.07	.00
Courses Requiring Computer Use	2.69	4.39	-3.42	.00
MGCSE[f]	3.66	3.79	-1.62	.11
CHGCSE[g]	6.12	6.28	-0.80	.43

[a] n = 119 [b] n = 114 [c] Freshman = 1, Graduate = 5
[d] Female = 0, Male = 1 [e] Never = 1; Monthly = 2; >Monthly = 3; Weekly = 4; >Weekly = 5; Daily = 6; >Daily = 7 [f] Strongly Disagree = 1, Strongly Agree = 5
[g] Cannot Do = 0; Not at All Confident = 1, Totally Confident = 10

Table 1 – Differences in Group Means

Although the simple comparisons of means for the MGCSE and CHCSE scales support hypothesis three, we wanted to test for group (and gender) differences in computer self-efficacy after controlling for other factors that may affect students' computer self-efficacy. To do this, we used a two-step hierarchical regression model (Cohen and Cohen, 1983). Before describing this model, however, we note two things. First, neither the age variable nor the courses requiring computer use variable was significantly correlated with either self-efficacy scale, so we excluded them from the regression analyses. The results of this study do not change if these two variables are included in the analyses. Second, the frequency of computer use variable is categorical, not continuous. We ran the regression models treating this variable as continuous and separately treating it as a set of six dummy variables. The results were substantially identical, so for ease of table display and interpretability, we present the results of this variable treating it as continuous.

Variable	β	S.E.	*t*	Sig.
Step 1:				
Constant	3.03	.20	14.81	.000
EXPERIENCE	.03	.01	2.33	.021
FREQUENCY	.16	.03	5.59	.000
CLASS	-.16	.05	-3.14	.002
GENDER	.23	.07	3.19	.002
R^2 = .26; Adj. R^2 = .25; F = 20.42 (p = .000)				
Step 2:				
Constant	2.97	.20	14.72	.000
EXPERIENCE	.04	.01	3.36	.001
FREQUENCY	.18	.03	6.31	.000
CLASS	-.18	.05	-3.47	.001
GENDER	.22	.07	3.13	.002
GROUP	**-.25**	**.08**	**-3.00**	**.003**
R^2 = .29; Adj. R^2 = .28; F = 18.72 (p = .000) Incremental R^2 = .03; F = 9.02 (p = .003)				

Table 2 – Hierarchical Regression Analysis (Dependent Variable = MGCSE Scale Score)

Variable	β	S.E.	*t*	Sig.
Step 1:				
Constant	4.28	.58	7.38	.000
EXPERIENCE	.05	.03	1.56	.121
FREQUENCY	.31	.08	3.90	.000
CLASS	-.18	.15	-1.22	.223
GENDER	.71	.20	3.52	.001
R^2 = .16; Adj. R^2 = .15; F = 10.78 (p = .000)				
Step 2:				
Constant	4.14	.58	7.19	.000
EXPERIENCE	.08	.03	2.45	.015
FREQUENCY	.38	.08	4.52	.000
CLASS	-.22	.15	-1.47	.143
GENDER	.69	.20	3.47	.001
GROUP	**-.61**	**.24**	**-2.56**	**.011**
R^2 = .18; Adj. R^2 = .17; F = 10.15 (p = .000) Incremental R^2 = .02; F = 6.56 (p = .011)				

Table 3 – Hierarchical Regression Analysis (Dependent Variable = CHGCSE Scale Score)

Table 2 reports the results of the two-step hierarchical regression analysis with the MGCSE scale as the dependent variable, while Table 3 displays the results for the CHGCSE scale. In each model, the variables representing years of computer experience, frequency of computer use, class level, and gender enter at step 1. The group variable enters at step 2.

The results reported in Tables 2 and 3 are quite interesting. For both GCSE scales, the coefficients of the years of computer experience and frequency of computer use variables are significantly positive, indicating that these factors do influence computer self-efficacy. The coefficient for the class variable is negative for both scales and is significant for the MGCSE scale. This indicates that the higher the students' class level, the lower their computer self-efficacy. This finding may be attributable to the fact that students with low confidence in their computing abilities may postpone taking the introduction to information systems course until late in their academic careers.

The results regarding gender differences do not support hypothesis two. These findings are disturbing and should be of concern to information systems educators. For both scales—after controlling for the other variables in the model—males demonstrate significantly higher computer self-efficacy scores than females. We did some additional multiple regression analyses to investigate whether this relationship was constant over time and found that males had significantly higher scores than females for each scale for both the 1996 and 2006 samples. We discuss the implications of these findings later in the article.

The results for the group variable (coded: 1996 = 0, 2006 = 1) are most surprising, and do not support hypothesis three. For both scales, the coefficient for the group variable is negative and significant. The incremental increase in explanatory power when this variable enters the models in step 2 is also significant. What these findings demonstrate is that when we hold computer experience, frequency of computer use, class level, and gender constant between the groups, students in the 2006 group exhibit significantly lower self-efficacy scores than students in the 1996 group. This result has major implications to information systems educators, as discussed in the next section.

5. DISCUSSION AND CONCLUSIONS

As educators who interact with students inside and outside the classroom on a regular basis it was no real surprise to find that students in 2006 differed dramatically and significantly from their 1996 counterparts in years of computer experience and frequency of computer use. For example, more than 80% of the 2006 respondents reported daily computer use compared to less than one-third of those surveyed in 1996. Today's students obviously make frequent use of computing technologies such as e-mail, instant messaging, text messaging, social networking, web browsing, and more.

On the other hand, it was somewhat unexpected to find that these significant and substantial increases in computer experience and use did not translate into significantly higher levels of GCSE on either measure for the 2006 students. As discussed previously, this might be understandable if the scale items measured computer activities that are not as relevant in 2006 as they were a decade earlier. However, the scales remain popular and generic enough measures of GCSE to be reasonably timeless (Stephens, 2006). The CHGCSE scale is one of the most frequently used measures in computer self-efficacy research (Marakas, Johnson, and Clay, 2007). The MGCSE scale in original or modified form is also in frequent and recent use, and it is important to note again that we modified the MGCSE measure *prior* to the 1996 survey to replace the three obviously dated mainframe items with more appropriate computer network items. A recent study also supports the continued relevancy of the MGCSE measure. Stephens (2006) found a very high correlation (r = .93) between the MGCSE scale and the Business Computer Self-Efficacy (BCSE) scale developed by Stephens and Shotick (2002). In sum, we believe that the lack of an increase in self-efficacy between the 1996 and 2006 groups is not a measurement issue. Rather, it is an indication that ever-increasing levels of computer experience characteristic of today's students still do not provide the kind of information and experiences that develop and enhance the computer self-efficacy necessary for success in college (Karsten and Roth, 1998a).

We offer several explanations for the results. First, we suspect that students use computers much more frequently to communicate with others than to perform the kinds of information processing and problem-solving tasks required in introductory information systems courses. Social networking, e-mailing, text messaging, and instant messaging result in extensive computer use that requires the repetitive use of a limited range of skills, primarily entering text. Consequently, dramatic increases in time spent using a computer may not supply experiences necessary to enhance the diverse skills that fall within the domain of general computer self-efficacy. Second, though students indicate the number of classes that require computer use has significantly increased, the computer skills required in some of the classes may be narrow (e.g., Word, PowerPoint), or not consistently required, reinforced, or integrated across classes. If a semester or more passes between classes requiring spreadsheet use, for example, perceptions of self-efficacy within that domain will most likely decrease (Bandura, 1997). Finally, as educators, we may sometimes fail to help make the connection between the skills and experiences students may not realize they have and the skills we expect. For instance, we have had success teaching about file types, file size, and secondary storage issues using examples of file type compatibility, the size of song files, and the storage capacity of iPods and similar devices. We have also demonstrated how to use special operators and terms to make search engine queries more accurate—we find few students have not used "Google" in the past—as a springboard to introducing more traditional database queries. Making such connections more obvious may help students better assess their ability to use a computer successfully in the classroom context. Making connections between existing and expected computer skills may be especially helpful in raising the computer self-efficacy perceptions of female students, who the literature suggests may not always receive the same amount of encouragement for technical proficiency as male students (Shotick and Stephens, 2006).

Based on our findings and observations, we offer several recommendations. First, we encourage IS educators to evaluate periodically the computer self-efficacy of students entering introduction to information systems classes. Annual evaluation, for example, may provide valuable insight into student perceptions of their personal computer capabilities, and may help educators avoid making tempting, but potentially unwarranted, assumptions about the computing prowess of incoming students. In addition, the measures can be administered during or at the end of the semester to demonstrate improvement and supplement the class outcome information provided by traditional, objective measures of performance (Karsten and Roth 1998a; 1998b). Though self-efficacy measures are limited in that they are subjective self-reports, the computer self-efficacy construct captures important dimensions of computer competence and confidence. Specifically, students high in CSE are more likely to exhibit a willingness to choose and participate in computer-related activities, expect greater success in such activities, and demonstrate more persistence or effective coping when faced with computer-related difficulties than are individuals low in CSE (Compeau and Higgins, 1995; Gist, Schwoerer, and Rosen, 1989; Karsten and Roth, 1998a; Murphy, Coover and Owen, 1989). The generalizability of our research is limited to students enrolled in an introduction to information systems in a medium-size, Midwestern university. However, we suggest these characteristics define desirable outcomes for all students in similar education training contexts anywhere.

We also encourage IS educators and researchers to develop and refine measures of computer self-efficacy at both the general and task-specific level of analysis. While the measures of GCSE employed in this and other recent research continue to provide rewarding insight, the evolutionary changes in the domain of computing at the general and task-specific levels of computer self-efficacy call for the careful construction and refinement of new measures (Bandura, 2001; Marakas, Johnson, and Clay, 2007).

Finally, we join in the call for the development of finer measures of prior computer experience that are able to detect the distinctive characteristics of students' prior computer usage. Current measures of computer experience and use seem too coarse to reveal the nature and impact of the prior computer experience students bring to college (Palaigeorgiou, Siozos, and Konstantakis, 2006). Better measures of prior computer experience and use should in turn lead to more accurate measures of computer self-efficacy (Hasan, 2003).

In conclusion, our study indicates that while much has changed in the realm of computing, much has remained the same. What seems clear is that just as it was a decade ago, it remains unwise to make assumptions about the computer capabilities male and female students bring to college. We encourage educators and researchers to continue the unbiased assessment and investigation of the relationships among gender, computer experience, and computer self-efficacy.

6. REFERENCES

Bandura, A. (1986), Social Foundations of Thought and Action, Prentice Hall, Englewood Cliffs, NJ.

Bandura, A. (1997), Self-Efficacy: The Exercise of Control, W.H. Freeman & Company, New York.

Bandura, A. (2001), Guide for Constructing Self-Efficacy Scales, pp. 7-37.

Cohen, J. and Cohen, P. (1983), Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences, 2nd Edition, Lawrence Erlbaum Associates, Hillsdale, NJ.

Compeau, D.R. and Higgins, C.A. (1995), "Computer Self-Efficacy: Development of a Measure and Initial Test," MIS Quarterly, Vol. 19, No. 2, pp.189-211.

Compeau, D., Higgins, C.A., and Huff, S. (1999), "Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study," MIS Quarterly, Vol. 23, No. 2, pp. 145-158.

Creighton, W., Kilcoyne, M., Tarver, R., and Wright, S. (2006), "Computer Literacy Levels of Students Enrolling in a Post-Secondary Computer Applications/Information Technology Course." Vol. 24, No. 1, pp. 15-23.

Durndell, A., Haag, Z., and Laithwaite, H. (2000), "Computer Self Efficacy and Gender: A Cross Cultural Study of Scotland and Romania," Personality and Individual Differences, Vol. 28, pp. 1037-1044.

Gist, M.E. and Mitchell, T.R. (1992), "Self-Efficacy: A Theoretical Analysis of its Determinants and Malleability," Academy of Management Review, Vol. 17, No. 2, pp. 183-211.

Gist, M.E., Schwoerer, C., and Rosen, B. (1989). "Effects of Alternative Training Methods on Self-Efficacy and Performance in Computer Software Training," Journal of Applied Psychology, Vol. 74, pp. 884-891.

Hasan, B. (2003), "The Influence of Specific Computer Experiences on Computer Self-Efficacy Beliefs," Computers in Human Behavior, Vol.19, pp. 443–450.

Hasan, B. (2006), "Delineating the Effects of General and System-Specific Computer Self-Efficacy Beliefs on IS Acceptance," Information & Management, Vol. 43, pp. 565–571.

Hasan, B. and Ali, J. (2006), "The Impact of General and System-Specific Self-Efficacy on Computer Training Learning and Reactions," Academy of Information and Management Sciences Journal, Vol. 9, No. 1, pp. 17-35.

Havelka, D. (2003), "Predicting Software Self-Efficacy among Business Students: A Preliminary Assessment," Journal of Information Systems Education, Vol. 14, No. 2, pp. 145-152.

Hsu, W.K. and Huang, S.S. (2006), "Determinants of Computer Self-Efficacy—An Examination of Learning Motivations and Learning Environments," Journal of Educational Computing Research, Vol. 35, No. 3, pp. 245-265.

Karsten, R. and Roth, R.M. (1998a), "The Relationship of Computer Experience and Computer Self-Efficacy to Performance in Introductory Computer Literacy Courses," Journal of Research on Computing in Higher Education, Vol. 31, No. 1, pp. 14-24.

Karsten, R**.** and Roth, R.M. (1998b), "Computer Self-Efficacy: A Practical Indicator of Student Competency in Introductory IS Courses," Informing Science, Vol. 1, No. 3, pp. 61-68.

Kim, C.S. and Keith, N.K. (1994), "Computer Literacy Topics: A Comparison of Views within a Business School," Journal of Information Systems Education, Vol. 6, No. 4, pp. 55-64.

Marakas, G.M., Johnson, R.J., and Clay, P.F. (2007), "The Evolving Nature of the Computer Self-Efficacy Construct: An Empirical Investigation of Measurement Construction, Validity, Reliability, and Stability over Time," Journal of the Association for Information Systems, Vol. 8, No. 1, pp. 16-46.

Marakas, G.M., Yi, M.Y., and Johnson, R.D. (1998), "The Multilevel and Multifaceted Character of Computer Self-Efficacy: Toward Clarification of the Construct and an

Integrative Framework for Research," Information Systems Research, Vol. 9, No. 2, pp. 126-163.

Mcilroy, D., Sadler, C., and Boojawoon, N. (2007), "Computer Phobia and Computer Self-Efficacy: Their Association with Undergraduates Use of University Computer Facilities," Computers in Human Behavior, Vol. 23, pp. 1285–1299.

Murphy, C.A., Coover, D. and Owen, S.V. (1989), "Development and Validation of the Computer Self-Efficacy Scale," Educational and Psychological Measurement, Vol. 49, pp. 893-899.

Palaigeorgiou, G.E., Siozos, P.D., and Konstantakis, N.I. (2006), "CEAF: A Measure for Deconstructing Students' Prior Computer Experience," Journal of Information Systems Education, Vol. 17, No. 4, pp. 459-468.

Rainer, R.K., Laosethakul, K., and Astone, M.K. (2003), "Are Gender Perceptions of Computing Changing Over Time?" Journal of Computer Information Systems, Vol. 43, No. 4, pp. 108-114.

Shih, H.P. (2006), "Assessing the Effects of Self-Efficacy and Competence on Individual Satisfaction with Computer Use: An IT Student Perspective," Computers in Human Behavior, Vol. 22, pp. 1012-1026.

Shotick, J. and Stephens, P. (2006), "Gender Inequities of Self-Efficacy on Task-Specific Computer Applications in Business," Journal of Education for Business, Vol. 81, No. 5, pp. 269-273.

Smith, S.M. (2004), "Software Skills Acquisition: Confidence vs. Competence," Information Technology, Learning, and Performance Journal, Vol. 22, No. 2, pp. 33-40.

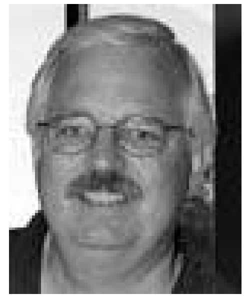
Smith, S.M. (2005), "The Digital Divide: Gender and Racial Differences in Information Technology Education," Information Technology, Learning, and Performance Journal, Vol. 23, No. 1, pp. 13-24.

Stephens, P. (2006), "Validation of the Business Computer Self-Efficacy Scale: Assessment of the Computer Literacy of Incoming Business Students," Journal of Educational Computing Research, Vol. 34, No. 1, pp. 29-46.

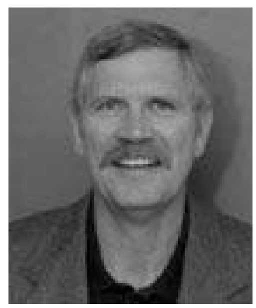
Stephens, P. and Shotick, J. (2002), "Re-Evaluation of the Computer Self-Efficacy Model: Development and Use of the Business Computer Self-Efficacy Scale," Issues in Information Systems, Vol. 3, pp. 590-596.

Thatcher, J.B. and Perrewe, P.L. (2002), "An Empirical Examination of Individual Traits as Antecedents to Computer Anxiety and Computer Self-Efficacy," MIS Quarterly, Vol. 26, No. 4, pp. 381-396.

AUTHOR BIOGRAPHIES



Rex Karsten is an Associate Professor of Management Information Systems at the University of Northern Iowa where he teaches information systems policy and information systems development. He received his Ph.D. from the University of Nebraska-Lincoln. His research has appeared in a variety of conference papers and publications including the Journal of Organizational and End User Computing, the Journal of Computer Information Systems, the Journal of Research in Educational Computing, Computers and Education, and Advances in Taxation. He currently serves on the Editorial Advisory Board for the Journal of Organizational and End User Computing.



Dennis Schmidt is a Professor of Accounting at the University of Northern Iowa where he teaches accounting information systems and taxation. He received his Ph.D. from the University of Nebraska-Lincoln. He has published his research in a variety of academic and professional journals including Journal of the American Taxation Association, Advances in Taxation, Legal Tax Research Journal, Academy of Management Journal, Strategic Management Journal, and Journal of Accountancy.

APPENDIX A
MURPHY et al. (1989) COMPUTER SELF-EFFICACY SCALE

(Scale: 1 = strongly disagree, 5 = strongly agree)

I feel confident entering and saving data (words and numbers) into a file.
I feel confident calling up a data file to view on a monitor screen.
I feel confident storing software correctly.
I feel confident handling a floppy disk correctly.
I feel confident escaping/exiting from a program or software.
I feel confident making selections from an on-screen menu.
I feel confident copying an individual file.
I feel confident using the computer to write a letter or essay.
I feel confident moving the cursor around the monitor screen.
I feel confident working on a personal computer (microcomputer).
I feel confident using a printer to make a "hardcopy" of my work.
I feel confident getting rid of files when they are no longer needed.
I feel confident copying a disk.
I feel confident adding and deleting information to and from a data file.
I feel confident getting software up and running.
I feel confident organizing and managing files.
I feel confident understanding terms/words relating to computer software.
I feel confident understanding terms/words relating to computer hardware.
I feel confident describing the function of computer hardware (keyboard, monitor, disk drives, processing unit).
I feel confident troubleshooting computer problems.
I feel confident explaining why a program (software) will or will not run on a given computer)
I feel confident understanding the three stages of data processing: input, processing, output.
I feel confident learning to use a variety of programs (software).
I feel confident using the computer to analyze number data.
I feel confident learning advanced skills within a specific program (software).
I feel confident using the computer to organize information.
I feel confident writing simple programs for the computer.
I feel confident using the user's guide when help is needed.
I feel confident getting help for problems in the computer system.
I feel confident logging onto a computer network.
I feel confident logging off a computer network.
I feel confident working on a computer network.

APPENDIX B
COMPEAU AND HIGGINS (1995) COMPUTER SELF-EFFICACY SCALE

For the following questions, imagine that you were given a new software package for some aspect of your coursework. It does not matter specifically what this software package does, only that it is intended to make your assignment easier and that you have never used it before.

The following questions ask you to indicate whether you could use this unfamiliar software package under a variety of conditions. For each of the conditions, please indicate whether you would be able to complete the assignment using the software package. Then, for each condition that you answered “yes,” please rate your confidence about your first judgment by circling a number form 1 to 10, where 1 indicates “Not at all confident,” 5 indicates “Moderately confident,” and 10 indicates “Totally confident.”

I COULD COMPLETE THE ASSIGNMENT USING THE SOFTWARE PACKAGE…

1…if there was no one around to tell me what to do as I go.	Yes	1	2	3	4	5	6	7	8	9	10
	No										
2…if I had never used a package like it before.	Yes	1	2	3	4	5	6	7	8	9	10
	No										
3…if I only had the software manuals for reference.	Yes	1	2	3	4	5	6	7	8	9	10
	No										
4…if I had seen someone else using it before trying it myself.	Yes	1	2	3	4	5	6	7	8	9	10
	No										
5…if I could call someone for help if I got stuck.	Yes	1	2	3	4	5	6	7	8	9	10
	No										
6…if someone else had helped me get started.	Yes	1	2	3	4	5	6	7	8	9	10
	No										
7…if I had a lot of time to complete the assignment for which	Yes	1	2	3	4	5	6	7	8	9	10
the software was intended.	No										
8…if I just had the built-in help facility for assistance.	Yes	1	2	3	4	5	6	7	8	9	10
	No										
9…if someone showed me how to do it first.	Yes	1	2	3	4	5	6	7	8	9	10
	No										
10…if I had used similar packages before this one to do the	Yes	1	2	3	4	5	6	7	8	9	10
same job.	No										

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