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Antecedents of Generalized Computer Self-Efficacy Judgments

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ABSTRACT

Computer self-efficacy is frequently used as an explanatory variable in software training and technology acceptance investigations and it has been frequently used to predict training and learning outcomes. While self-efficacy models identify prior experience with computers as an important determinant of generalized self-efficacy judgments, relatively few studies have systematically examined the types of experience that drive such judgments. Gender and frequency of computer use have also been identified as other predictors of generalized computer self-efficacy. In this investigation, self-reported knowledge/skill attainments levels with each of nineteen computer use/knowledge dimensions are used to measure prior experience/knowledge of computers. These were collected from 340 university students at the same time that they completed a generalized computer self-efficacy scale. This data is used to test two predictions: 1) that greater prior computer knowledge/experience is directly related to higher computer self-efficacy scores and 2) for comparable levels of prior experience/knowledge, males will have higher self-efficacy scores than females. Our results provide support for the first prediction but not the second. Our findings suggest that experience/knowledge of less common computer applications may be more important in shaping self-efficacy judgments than are greater levels of experience/knowledge with common computer applications.

Keywords

Computer self-efficacy, computer skill levels, gender differences, software training, training and learning outcomes, and technology acceptance investigations

INTRODUCTION

Computer self-efficacy has emerged in recent years as an important explanatory variable in studies of the effectiveness of software training programs (Campeau and Higgins, 1995). Originally developed in Cognitive Social Learning Theory (Bandura, 1986), the construct, with reference to computing, refers to an individual judgment of one's capability to use a computer (Marakas, Yi, and Johnson, 1998).

In recent years, researchers have made strong cases for the existence of two major forms of computer self-efficacy: Generalized and Specific. Generalized Computer Self-Efficacy (GCSE) refers to an individual's judgment of efficacy across multiple computer application domains and is viewed as being associated with the cumulative effects of a lifetime of computing experiences (Marakas, Yi, and Johnson, 1998). Task Specific Computer Self-Efficacy (SCSE), on the other hand, refers to an individual's perception of efficacy in performing specific tasks within the larger general computing domain (Marakas, Yi, and Johnson, 1998), for instance, perception of one's skill level with respect to an individual software package.

In this investigation, the focus is on GCSE. The cumulative effects of computing experiences purported to drive GCSE are captured through multiple self-report measures via an online survey. Ordinal ratings of skill attainment/knowledge levels for a nineteen different computer application and knowledge areas are captured and used to compose an overall measure of prior computer experience/knowledge. Examples of the ordinal scales used for two of the 19 skill attainment/knowledge areas are included in Appendix 1.

In today's workforce, computer proficiency is a major contributor to end-user productivity. In an attempt to understand the nature of this proficiency, computer self-efficacy has been frequently used to predict computer training outcomes (e.g., Hartzel, 2003; Quinonez and Guthrie, 2002). Computer self-efficacy has also been used in the development of explanatory models for computer education/training and computer use (e.g., Campeau and Higgins, 1995; Gist and Mitchell, 1992; Johnson, 1998; Marakas, Li, and Johnson, 1998). Given that self-efficacy is used most frequently as a predictor/explanatory variable, one might think that a substantial body of literature exists to provide a firm understanding of the factors that contribute to the development of one's perceptions of computer self-efficacy. The reality, however, is that relatively few investigations have systematically examined the antecedents of computer self-efficacy judgments.

BACKGROUND

Campeau and Higgins (1995), in their original model of computer self-efficacy, suggested that prior experience with computers plays a critical role in self-efficacy judgments. The results of several investigations seem to suggest that this is indeed the case. For example, Henry and Stone (1995) found that providing opportunities for users to gain experience with computer systems can positively affect computer self-efficacy judgments. Increases in the positiveness of self-efficacy judgments has also been observed to result in teacher education students as the result of computer use (Albion, 2001), in the general population at a university as the result of computer based training (Quinonez and Guthrie, 2002), and in MBA students as the result of being trained in the use of a software package (Hartzel, 2003). Collectively, these studies suggest that self-efficacy judgments are malleable, and whose level is influenced by the amount and nature of prior computer experience.

Research suggests that gender is another important determinant of individual perceptions of self-efficacy. Several investigators have observed differences among men and women in their self-efficacy ratings, with men more likely to rate themselves higher than women (Busch, 1995; Murphy, Coover, and Owen, 1989; Quinonez and Guthrie, 2002). However, this pattern of results is most likely to be observed among individuals who rate their computer skills as moderate or advanced. Management support and ease of use have also been observed to have a significant positive impact on end-users' sense of computer self-efficacy in organizational settings (Henry and Stone, 1995).

The present study builds on the previously cited research by examining the role of two previously identified variables that appear to be important antecedents of computer self-efficacy judgments: prior experience and gender. Specifically, 1) individuals with greater amounts of prior computer experience are expected to score significantly higher on a measure of computer self-efficacy, and 2) for comparable levels of prior experience, males will have significantly higher scores on a measure of computer self-efficacy than females. The present study will also extend previous self-efficacy studies that have focused on prior experience by taking a closer and more detailed look at types of computer experiences that can be reasonably expected to drive computer self-efficacy judgments.

METHODOLOGY

Participants

The online questionnaire constructed for this study was available to undergraduate students enrolled in four different sections of IS-related courses at a regional university in the southeastern United States during Fall Semester. Three hundred forty students participated in this investigation. The IS courses were instructed by three professors using WebCT to supplement traditional course activities. All student participant were familiar with WebCT the questionnaires were available to them online throughout the semester using WebCT's survey feature. This survey allows enabled students to read and submit answer the questions online. Extra credit was offered to students as an incentive for completing the surveys.

Structure of Questionnaire

The online survey in this investigation consisted of 56 items. Most of the items were part of a widely used generalized computer self-efficacy scale. Nineteen items on the questionnaire consisted of items derived from the Beginning CODE 77 rubrics (Johnson, 2002). These items asked students to provide a rating of their proficiency levels on each of 19 dimensions of computer knowledge and use. Appendix A provides examples of the items used to measure the students' prior computer knowledge/experience.

RESULTS

The statistical analyses described below were performed on survey responses for 340 students enrolled in the four sections of the IS courses. Students in two sections (n=198) were predominantly freshmen and sophomores enrolled in an introductory

Computer Concepts course; both sections were taught by the same instructor. The remaining students were juniors and seniors enrolled in two sections of an MIS course taught by different instructors. Seventy percent (70%) of the students enrolled in the introductory course are typically non-business majors. Typically, one hundred percent (100%) of the students enrolled in the MIS course are business majors.

A composite prior experience/knowledge score was calculated by summing the student's knowledge/proficiency level ratings on each of the 19 dimensions (rubrics). Considering these 19 dimensions as individual items on a single scale was justified by a Cronbach's Alpha of .91. Items means generated while calculating Cronbach's Alpha indicated that respondents demonstrated the highest average experience/knowledge levels for the basic computer operations, word processing, e-mail, WWW, and search tools (see Table 1), Respondents demonstrated the lowest average experience/knowledge levels for time management and organization, database applications, presentation software use, streaming and push technologies, Web page construction, and netiquette.

Skill/Knowledge Dimension	Mean	Std. Deviation
Basic Computer Operations	3.31	0.66
E-mail & Mailing Lists	3.18	0.53
WWW & Browser Use	3.13	0.61
Word Processing	3.08	0.6
Search Tools	3.04	0.52
Online Information Sources	2.96	0.65
Spreadsheet	2.88	0.83
File Management	2.87	0.58
Computer Ethics	2.76	0.86
Graphics & Digital Image Use	2.64	0.86
Newsgroups	2.61	0.8
Downloading and Decompressing Files	2.54	0.88
Network and Internet Basics	2.53	0.73
Database	2.37	0.87
Realtime Streaming & Push Technologies	2.35	0.72
Time Management/Organizers	2.31	0.84
Web Page Construction	2.24	0.89
Presentation Software	2.22	0.89
Netiquette	2.14	0.49

Table 1. Mean Responses to Skill Attainment/Knowledge Rubrics

The median composite score for prior experience/knowledge was 51 and respondents with scores less than or equal to 51 were categorized as being low in overall prior computer knowledge/proficiency while those with scores above the median were categorized as being high in prior computer/knowledge proficiency. A generalized self-efficacy total score was also calculated for each student.

A one-way ANOVA was used to test the first prediction -- that students with high levels of prior computer experience/knowledge would be higher in expressed generalized self-efficacy than students with low levels of prior computer experience/knowledge. The test statistic [$F(1,335) = 79.37$] was highly significant ($p < .001$) thereby providing support for this prediction. Students with high levels of prior computer experience/knowledge ($n=170$) had a significantly higher mean self-efficacy score (142.96) than students with low levels of prior computer experience/knowledge (mean = 122.37; $n = 167$).

A regression was performed to identify variables associated with differences in prior computer experience/knowledge. The composite prior experience/knowledge score was the dependent variable and several classification variables were used as predictors: age, gender (male=1, female=2), computer experience (from 1= one to 5=extensive), computer ownership (yes, no), prior computer training (yes, no), and access to a computer beyond/outside of college or work (yes, no). The resultant regression model was highly significant [$F(6,331) = 24.37$; $p < .001$] and yielded an R of .55 and a R Square of .31. As shown in Table 2, only two predictor variables were significant, gender and computer experience.

The second prediction (that given comparable levels of prior experience/knowledge, males would have greater expressed self-efficacy than females) was tested via two one-way ANOVAs: one for students with composite prior experience/knowledge scores at or below the median and a second for the set of students with composite prior experience/knowledge scores above the median. Neither test statistic was significant. Hence, although gender was observed to be a significant predictor of prior experience/knowledge (see Table 2), no support was found for the for the second predictor when the generalized self-efficacy judgments of male and female students were compared at each of the two levels of prior experience/knowledge (low vs. high).

Classification Variable	Beta	t	p <
Gender	-.095	-2.06	.05
Age	.024	.515	ns
Computer Experience	.496	10.50	.001
Computer Ownership	-.069	-1.41	ns
Prior training	-.058	-1.24	ns
Access	-.085	-1.76	ns

Table 2. Significant Predictors of Cumulative Computer Knowledge/Proficiency

Two regression analyses were performed to assess the main aspects of prior computer experience/knowledge that drive self-efficacy expressions. Both used the generalized self-efficacy total score as the dependent measure. The first regression employed several classification variables as predictors: gender, age, computer experience, computer ownership, prior computer training , and access to a computer beyond/outside of college or work. The resultant regression model was highly significant [$F(5,331) = 24.02$; $p < .001$] and yielded an R of .52 and a R Square of .27. As shown in Table 3, all predictor variables were significant with the exception of gender and computer ownership. Some surprisingly, some of the predictors were negatively related to generalized self-efficacy.

Classification Variable	Beta	t	p <
Gender	.032	.675	ns
Age	-.108	-2.28	.05
Computer Experience	.464	9.60	.001
Computer Ownership	-.005	-.090	ns
Prior training	-.104	-2.16	.05
Access	-.127	-2.56	.05

Table 3: Significant Predictors of Generalized Self-Efficacy

The second regression employed the 19 computer experience/knowledge dimensions (rubrics) as predictors. The resultant regression model was highly significant [$F(19, 317) = 12.04$; $p < .001$] and yielded an R of .66 and a R Square of .44. Five of the computer experience/knowledge dimensions were found to be significant predictors. These are summarized in Table 4. It is interesting to note that only one of the five significant predictors (word processing) is a widely used office (word processing, spreadsheets, databases) or communication application (e-mail and WWW), i.e., the types of applications that university students typically have the most experience with. Instead, it is knowledge/proficiency of computing dimensions beyond widely used office and communication applications that systematically contribute the most to generalized computer self-efficacy judgments.

Skill/Knowledge dimension	Beta	t	p <
Basic computer operation	.181	3.43	.001
File management	.104	2.13	.05
Word Processing	.109	2.15	.05
Graphics & Digital Image use	.181	3.17	.005
Network and Internet use	.158	3.02	.005

Table 4: Significant Predictors of Generalized Self-Efficacy

DISCUSSION AND FUTURE DIRECTIONS

Computer task performance in today’s workforce is a major contributor to end-user productivity. Computer self-efficacy is widely viewed as an important predictor of computer task performance. This investigation sheds some light on the degree of consistency between pre-existing proficiency/skill levels (as measured by this subset of the Beginning CODE 77 rubrics (Johnson, 2002) and student confidence in their computer skills (as measured by the generalized computer self-efficacy scale), as well as the role of gender in perceptions of computer self-efficacy. Our results are consistent with the assertion that cumulative knowledge of and experience with computers contributes to computer self-efficacy judgments (Marakas, Yi, and Johnson, 1998).

However, our results fail to replicate previous findings indicating that given comparable levels of computer experience and backgrounds, males are more likely than female to have high self-efficacy scores (e.g. Busch, 1995; Murphy, Coover, and Owen, 1989; Quinonez and Guthrie, 2002). In this investigation, no gender differences in self-efficacy judgments were observed when prior experience/knowledge level was held constant. This may indicate that with passage of time, gender differences in computer self-efficacy have dissipated. Alternatively, gender differences may still be important, but only to the extent to which these affect cumulative prior experience/knowledge of computers.

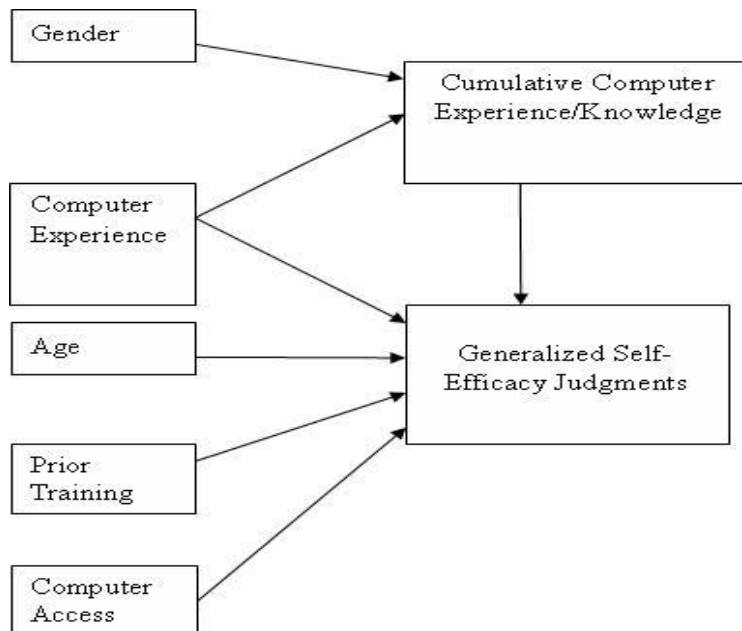


Figure 1. Summary of Major Findings

As shown in Figure 1, our results suggest that gender and computer experience are important predictors of cumulative computer skill attainment/knowledge. Computer experience is also an important predictor of generalized self-efficacy judgments. Age, prior training, and computer access were also observed to be important determinants of generalized self-efficacy judgments. Somewhat surprisingly, our findings suggest that younger respondents are more likely to higher self-efficacy scores than older respondents and self-efficacy may be more strongly influenced by computer access than by computer ownership.

Our findings suggest that knowledge of basic computer operations, file management proficiency, word processing proficiency, proficiency in graphics and digital image use, and network and Internet use are some of the most important aspects of prior computer experience/knowledge that contribute to generalized self-efficacy judgments regardless of gender. It is notable that several of these are examples of computer experience/knowledge dimensions that are less common (ordinary) than is experience with office and communication applications. This may indicate that with the passage of time, less common/ordinary computing knowledge/experiences have emerged as important drivers of generalized self-efficacy judgments. Such experiences may be those that set one's level of computer competency apart from that other computer users, especially when peers are almost universally proficient in office (word processing, spreadsheet, and presentation graphics) applications and communication applications (e-mail, Web browsers, instant messaging, etc.)

The robustness of these findings will be observed when additional statistical analyses are performed. Students in the IS courses used in this investigation also completed two other surveys that are relevant to the current investigation. The combined responses to all three surveys enable the researchers to address antecedents of generalized self-efficacy judgments (as well as antecedents of prior knowledge/proficiency) in much greater detail.

The use of Johnson's CODE 77 rubrics to measure prior knowledge and skill levels is another potential contribution of this investigation. Three examples of the rubrics used in this investigation are reproduced in Appendix A. Their content/format suggests that these rubrics might be valuably employed by IS researchers and educators in a variety of model driven and/or curricular-oriented investigations.

REFERENCES

1. Albion, P.R. (2001). Some factors in the development of self-efficacy beliefs for computer use among teacher education students. *Journal of Technology and Teacher Education*, 9, 321-347.
2. Bandura, A. (1986). *Social foundations of thought and language*. Englewood Cliffs, NJ: Prentice-Hall.
3. Busch, T. (1995). Gender differences in self-efficacy and attitudes toward computers. *Journal of Educational Computing Research*, 12, 147-158.
4. Campeau, D.R., & Higgins, C.A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 19, 189-211.
5. Gist, M.E. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of Management Review*, 17, 183-211.
6. Hartzel, K. (2001). How self-efficacy and gender issues affect software adoption and use. *Communications of the ACM*, 46, 167-171.
7. Johnson, D. (2002). *The Indispensable Teacher's Guide to Computer Skills (Second Edition)*. New York: Linworth Publishing.
8. Johnson, R.D. (1998). Development of computer skills: Revisiting the role of computer self-efficacy and behavioral modeling. *Americas Conference on Information Systems 1998*, University of Maryland. 674-675.
9. Marakas, G.M., Yi, M.Y., & Johnson, R.D. (1998). The multilevel construct of computer self-efficacy: Toward clarification of the construct and an integrative framework for research. *Information Systems Research*, 9, 126-163.
10. Marakas, G.M., Yi, M.Y., & Johnson, R.D. (1998). The multilevel construct of computer self-efficacy: An empirical investigation at the general and task-specific levels. 471-473.
11. Murphy, C.A., Coover, D., & Owen, S.V. (1989). Development and validation of the computer self-efficacy scale. *Educational and Psychological Measurement*, 49, 893-899.
12. Henry, J. W., & Stone, R. W. (1995). Computer self-efficacy and outcome expectancy: the effects on the end-user's job satisfaction. *ACM SIGCPR Computer Personnel archive*, 16 (4), 15-34.
13. Quinonez, R.E., & Guthrie, R. (2002). Computer based training, computer self-efficacy, and beginning computing. *Eighth American Conference on Information Systems*, 790-795.

APPENDIX A**Examples of Self-Reported Knowledge/Skill/Proficiency Levels.**

Source: CODE 77 Rubrics (www.doug-johnson.com/dougwri/rubrics2002.html)

Click the button that best reflects your current level of knowledge/skill attainment with basic computer operation

- I do not use a computer.
- I know the basic operations of using a mouse, clicking, and working with windows. I can use the computer to open, run and close a few specific, preloaded programs. Computer use has little effect on how I work. I am somewhat anxious I might damage the machine or its programs.
- I can set-up my computer and peripheral devices, load software, print, and use most of the operating system tools like the clipboard, clock, note pad, find command, and trash can (recycling bin). I can format a data disk, connect to my school's network, and run programs that require a CD. I have a virus protection program that scans my files on a regular basis.
- I can run several programs simultaneously, and have multiple windows open at the same time. I can customize the look and sounds of my computer. I use techniques like shift-clicking to work with multiple files. I look for programs and techniques such as using virtual memory to maximize my computer system. I feel confident enough to teach others some basic operations.

Click the button that best reflects your current level of knowledge/skill attainment with database use

- I do not use a database, nor can I identify any uses or features it might have which would benefit the way I work.
- I understand the function of a database and can locate information within one that has been pre-made. I can add or delete data in a database.
- I use databases for professional applications. I can create a simple original database that has a professional application such as an address book by defining fields and creating layouts. I can find, sort and print information that is useful to me.
- I can use formulas with my database to create summaries of numerical data. I can use database information to do mail merge in a word processing document

Click the button that best reflects your current level of knowledge/skill attainment with e-mail and electronic mailing lists

- I do not use email.
- I understand the concept of email and can explain some administrative and educational uses for it.
- I use email regularly and can:
 - read and delete messages
 - send, forward and reply to messages to
 - create nicknames, mailing lists, and a signature file
 - send and receive attachments
 - use electronic mailing lists and understand the professional uses of them
 - read and contribute to a professional electronic mailing list
- I can send group mailings and feel confident that I could administer an electronic mailing list. I can locate lists of subject-oriented mailing lists.