

Are Men More Technology-Oriented Than Women? The Role of Gender on the Development of General Computer Self-Efficacy of College Students

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ABSTRACT

Previous research has studied gender differences in people's perceptions and behaviors toward information technologies with mixed findings. In addition, the reasons causing these differences have been discussed but rarely empirically tested in the literature. In this study, we investigated the mechanisms through which gender affects the development of general computer self-efficacy (CSE) among college students. Results suggest that females feel less confident with computers because they have learned less and practiced less, and feel more anxious about using computers when compared with male counterparts. Implications from the research are also discussed.

Keywords: Gender, General Computer Self-Efficacy, Computer Knowledge, Computing Experiences, Computer Anxiety

1. INTRODUCTION

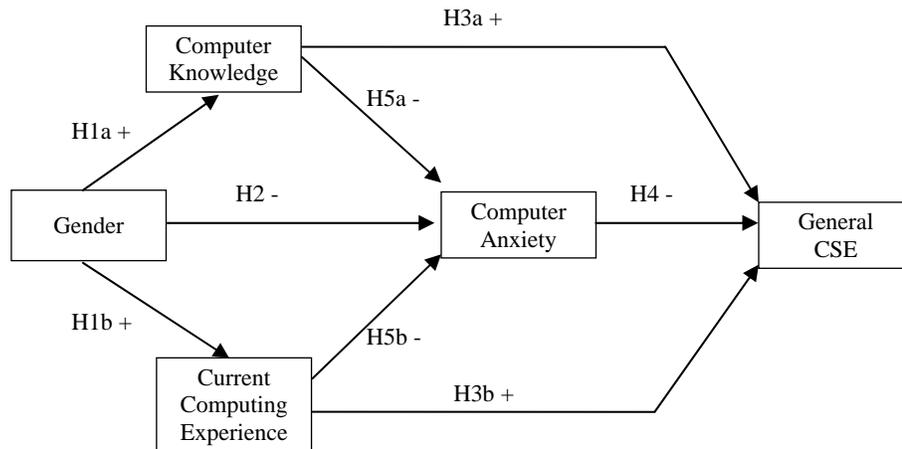
Over the decades, IS researchers have struggled to identify factors that cause people to accept and make effective use of information technologies (Compeau and Higgins, 1995; King and He, 2006). Several theories and approaches have been put forth to address this issue. For example, the early studies of Lucas (1975, 1978) provide evidence that individual or behavioral factors have large influences on IT adoption; Goodhue (1988) presents the Task-Technology Fit model to posit that information systems will enhance job performance only when there is correspondence between their functionality and the task requirements of users; Davis (1989) develops the Technology Acceptance Model (TAM) to explain the potential user's behavioral intention to use a technological innovation; Moore and Benbasat (1991) investigate people's perceptions of technology adoption based on Diffusion of Innovations; Compeau and Higgins (1995) adopt the Social Cognitive Theory and argue that one's computer behaviors are largely influenced by the person's perception of computer self-efficacy.

Whatever the theoretical perspective being selected, many researchers recommend incorporating individual characteristics into a research model either as control variables or as independent variables to study the cognitive, affective, and/or behavioral reactions of individuals to technology (Gefen and Straub, 1997; Venkatesh and Morris, 2000). Gender as a salient demographic factor has a profound influence on one's reactions to technology (Morris

et al., 2005). However, evidence concerning the effect of gender is far from conclusive. Previous studies have found that females present higher levels of anxiety (Beyer, 2008; Bozionelos, 1996; Harrison et al., 1997; Igbaria and Chakrabarti, 1990) and lower levels of attitudes toward computers (Felter, 1985; Franz and Robey, 1986; Young, 2000); however, non-significant differences (Havelka, 2003; Howard and Smith, 1986; Igbaria, 1993) have also been reported in the literature. Similar patterns exist for the actual usage of information technologies. Research demonstrates contradictory evidences that females are less likely (Taylor, 2004) or equally likely (Atan et al., 2002; Morris et al., 2005; Venkatesh and Morris, 2000) to use a target system when compared with their male counterparts. In addition, previous research focuses largely on perceptual differences between the two demographic groups; the mechanisms that cause such differences have been rarely explored in the literature (Venkatesh and Morris, 2000).

Given the fast pace of the development and proliferation of information technology, understanding the role gender plays in shaping one's attitudes and beliefs about information technology is especially important today (Morris et al., 2005). This study investigates the mechanisms through which gender affects individual perceptions toward computers. We select general computer self-efficacy as the main dependent variable for our research for two reasons: (1) as a core construct in the social cognitive theory, self-efficacy is widely accepted as a key factor regulating one's computer behaviors; (2) as a fundamental psychological

state, self-efficacy shapes one's attitudes and decisions toward IT usage by influencing key beliefs such as perceived ease of use (Davis, 1989; Venkatesh and Davis, 1996).



Notes:

1. Signs indicate a hypothesized effect is positive or negative;
2. Gender is coded as 1 for female and 2 for male.

Figure 1. Research Model

2. THEORETICAL FOUNDATIONS AND HYPOTHESES

In the study, we investigate the mechanisms through which gender affects the development of general CSE of individuals. We propose that gender affects one's reactions to computers by justifying the learning practice and influencing the attitudes, thereby shaping the perceived confidence of using computers. The research model is presented in Figure 1.

2.1 The Role of Gender on Learning Practices and Attitudes

Gender research in psychology provides a solid theoretical ground for the applied research of gender differences in numerous settings (Venkatesh and Morris, 2000). Psychology research focuses on the cognition styles underlying the decision making processes of women and men and finds that the two groups use cognitively different schematic processing (Bem and Allen, 1974). Women and men encode and process information using different socially-constructed cognitive structures that, in turn, help determine and direct an individual's perceptions (Bem, 1981). As a result, individuals tend to make decisions which reflect biases inherent in the individual's perceptions and actions (Nisbett and Ross, 1980). This means that gender schemas can be considered to be a normative guide (Kagan, 1964; Kohlberg, 1966) that causes unconscious or internalized action consistent with the schema.

In her seminal work, Bem (1981) develops a gender schema theory and proposes that sex typing is a learned phenomenon mediated by cognitive processing. Individuals learn society's gender role standards and expectations, and they accordingly develop attitudes and conduct behaviors that society deems gender appropriate (Srite and Karahanna, 2006). Because computing has developed a masculine image

similar to the traditionally masculinized subjects such as mathematics, physics and engineering (Agosto, 2004; Gilbert et al., 2003), females tend to feel less comfortable with computers than males (Beyer, 2008; Frankel, 1990; Karsten and Schmidt, 2008; Lowe and Krahn, 1989). Thus, the masculine image of computers may lead many females to, consciously or unconsciously, avoid learning and using computers.

In this study, we use two constructs – computer knowledge and current computing experience – to capture the extent to which one has accumulated knowledge and skills from past and current use of computers. Computer knowledge is defined as a self-perception of the extent of knowledge regarding the use of computers across different application domains. Current computing experience is defined as the frequency of using computers for different tasks and purposes in current situations. Gender schema theory suggests that females tend to learn less and practice less if they view computers as a male domain.

Hypothesis 1a: Gender has an effect on computer knowledge in that males tend to have higher levels of computer knowledge than females.

Hypothesis 1b: Gender has an effect on current computing experiences in that males tend to use computers more frequently than females.

Similarly, uneasy feelings with computers may lead females to develop negative attitudes toward computers. Females typically display lower computer aptitude (Beyer, 2008; Felter, 1985; Franz and Robey, 1986; Young, 2000) and feel more anxious about using computers (Harrison et al., 1997; Igbaria and Chakrabarti, 1990; Morrow et al., 1986) when compared with male counterparts, although evidence of the opposite can also be found in the literature (Igbaria, 1993).

H2: Gender has an effect on computer anxiety in a way that females tend to perceive higher levels of computer anxiety than males.

2.2 Social Cognitive Theory and General Computer Self-Efficacy

Computer Self-Efficacy (CSE) is a special application of the more general construct of self-efficacy, which is a key element of social cognitive theory developed in the field of learning and individual behavior (Bandura, 1977). Self-efficacy is defined as beliefs about one's ability to perform a specific behavior. As a perception, self-efficacy is induced from psychological procedures of deliberating information from multiple sources. These sources can be summarized into four categories (Bandura, 1977; 1982). From most to least influential, they are:

1. performance accomplishments, or one's previous mastery experience with a target behavior;
2. vicarious experience, or observations of others' performance of the target behavior;
3. verbal persuasion, or suggestions and comments from others on one's ability to perform the target behavior; and
4. emotional arousal, or physiological states caused by stressful and taxing situations.

The perceived self-efficacy helps regulate one's behavior and choice of activities based on forethought of the balance between behavior costs (or the required effort) and motivations (or the expected benefits of performing the behavior). "Expectations of personal efficacy determine whether coping behavior will be initiated, how much effort will be expended, and how long it will be sustained in the face of obstacles and aversive experiences" (Bandura, 1977, p. 191).

2.2.1 Computer Self-Efficacy at the General Level: Social cognitive theory emphasizes that behavior must be measured precisely in the analysis of efficacy and that measures should be tailored to the domain being studied (Bandura, 2001; Bandura and Adams, 1977). As a special application of the self-efficacy concept in the field of IS, CSE is commonly defined as one's judgment of his/her capability to use a computer (Compeau and Higgins, 1995). CSE exists at both the general computing behavior level and the specific computer task or application level (Marakas et al., 1998). General CSE (GCSE) refers to an individual's judgment of his or her ability to perform across multiple computer application domains; specific CSEs refer to an individual's perception of efficacy in performing specific computer-related tasks within the domain of general computing.

To understand people's reactions to computers, CSE at the general computing level is deemed a more appropriate construct for this study than any CSE addressing a specific task or application. Another motivation for studying general CSE is that "over time and multiple experiences within the general computing domain, a measure of GCSE will become an equally effective, or possibly superior, predictor of future performance with the domain as any appropriately designed task-specific measure of CSE" (Marakas et al., 2007, p. 17).

2.2.2 Key Antecedents of General Computer Self-Efficacy:

In line with the social cognitive theory that self-efficacy is formed based on the deliberation of different information sources, this study proposes that computer knowledge, current computing experience, and computer anxiety serve as the main information sources for an individual to judge his or her level of general CSE. Another information source, verbal persuasion, is not included in the research model in that its influence on the development of self-efficacy is deemed weak and vulnerable (Bandura, 1977).

To justify the exclusion of verbal persuasion, we included subjective norms in an extended model. The construct of subjective norms is conceptually close to verbal persuasion in that it assesses the social influences from related people whether one should perform the behavior in question (Fishbein and Ajzen, 1975), and has been widely used and validated, particularly in technology acceptance studies (Venkatesh et al., 2003). The extended model will be discussed in the Summary and Discussion section.

Computer Knowledge and Current Computing Experience: Both factors reflect one's direct experience with computers from the past and the present. Following the social cognitive theory, knowledge from one's own experience provides the most important source of information for the development of one's self-efficacy (Bandura, 1977).

Hypothesis 3a: The level of computer knowledge is positively associated with the level of general computer self-efficacy.

Hypothesis 3b: The frequency of current computer usage is positively associated with the level of general computer self-efficacy.

Computer Anxiety: According to social cognitive theory, anxiety is an emotional arousal that is caused partly by fear of adverse physiological reactions (nausea, dizziness, high blood pressure) to a stressful and taxing situation. "Fear reactions generate further fear of impending stressful situations through anticipatory self-arousal" (Bandura, 1977, pp. 198-199). Such fear-provoking thoughts will lead to elevated levels of anxiety and lead doubts about one's ability to perform the target behavior successfully, therefore reduce the levels of perceived self-efficacy. Compared to other sources of information, social cognitive theory suggests anxiety as less important in affecting self-efficacy.

Computer anxiety refers to a feeling of apprehension or anxiety toward using computers (Compeau et al., 1999). Computer anxiety is less likely caused by clinical physiological reactions, the so-called "computer phobia" observed among a minority of computer users (Weinberg and Fuerst, 1984). Rather, computer anxiety is more affective in nature and reflects "fear and apprehension, intimidation, hostility, and worries that one will be embarrassed, look stupid, or even damage the equipment" (Heinssen et al., 1987, p. 50). Such a psychological state of affect is expected to have a strong impact on one's perception of self-efficacy. Previous empirical studies have repeatedly observed the relationship between computer anxiety and CSE as negative and strong (Harrison and

Rainer, 1992; Staples et al., 1999; Thatcher and Perrewe, 2002).

Hypothesis 4: The level of computer anxiety is negatively associated with the level of general computer self-efficacy.

Finally, we expect to see lower levels of computer anxiety associated with higher levels of both computer knowledge and computer experience. This is a direct result of lower levels of fear, apprehension, and other emotional states as a result of greater knowledge of and experience with computers.

Hypothesis 5a: The level of computer knowledge is negatively associated with the level of computer anxiety.

Hypothesis 5b: The frequency of current computer usage is negatively associated with the level of computer anxiety.

3. METHODS

3.1 Participants

We selected students as the research subject of our study. Beyond the practical advantage of sampling convenience, the decision was made mainly for the expected homogeneity among student backgrounds which would lower the risk of unexpected confounding effects caused by diversity among ages, business professions, and management levels.

A total of 281 undergraduate business students of a medium-sized public university participated in this study. The students were enrolled in one of two MIS courses: one course was about basic computing skills designed for first year undergraduate students, the other course was an MIS survey course designed for students in their second year of study and beyond. Both courses are required core courses for business students of all majors, not just MIS majors.

Participation in the study was voluntary. Students were told that survey responses would not affect their course grades in any way. Some students failed to take the two surveys on time, and some submitted incomplete answers. This resulted in 243 usable sets of individual data for analysis for an 86.5% response rate. Demographics of participants are reported in Table 1.

		Counts	Percentage
Gender	Female	127	52.26%
	Male	116	47.74%
	Total	243	100.00%
Age	17-20	174	71.60%
	21-25	43	17.70%
	26-30	13	5.35%
	>30	13	5.35%
	Total	243	100.00%
Status	First Year	111	45.68%
	Second Year	52	21.40%
	Third Year	65	26.75%
	Fourth Year	15	6.17%
	Total	243	100.00%

Table 1. Demographics of Participants

3.2 Procedures

Data were collected at two points in time. Participants were instructed to take the first survey during the first week of their MIS course; two weeks later, the participants were instructed to take the second survey. The purpose of designing two surveys was to reduce possible common-source bias by separating the measurement of predictors and dependent variables (Podsakoff et al., 2003). More specifically, participants' demographic information (gender, age, and status) and their experiences with computers (computer knowledge, current computing experiences, and computer anxiety) were asked in the first survey, and general CSE was assessed in the second survey.

3.3 Measures

This study investigates gender effects on the development of general CSE among business students. The measurements of involved factors are explained below (with specific items reported in Appendix 1).

Computer Knowledge was measured by five questions using a 5-point Likert scale (from strongly disagree to strongly agree) asking students whether they have good knowledge and skills about operating systems and common applications (Excel, HTML, Access, and PowerPoint). Current Computing Experience was measured by seven questions asking students to rate the frequency on a five point scale (from once a month to several times a day) regarding the use of computers for different purposes. This manner of operationalization suggests the two constructs being modeled as formative indicators in the test of the research model.

Computer Anxiety was measured by a 4-item instrument adopted from Compeau et al. (1999). This instrument was based on the Computer Anxiety Rating Scale development by Heinssen and colleagues (1987), and the four items were found to best capture the feeling of anxiety associated with computer use (Compeau and Higgins, 1995).

General CSE was measured by a six-item instrument recently developed by Marakas and colleagues (2007). The six-item instrument of general CSE was developed with special attention on general computing skills across a number of situations, and was validated using data collected from business students. Marakas and colleagues (2007) also suggested that general CSE should be modeled as a formative indicator based on its theoretical conceptualization as the perceived ability of performing a certain set of activities.

Social cognitive theory claims that comments and suggestions by others have limited influence on one's perceived ability of performing a certain set of behaviors. This argument is tested in an extended model with the inclusion of subjective norms as another antecedent of general CSE. The construct of subjective norms was measured by a 2-item instrument adopted from Venkatesh and Davis (2000).

3.4 Construct Validity

The test of construct validity was conducted with Partial Least Squares (PLS) – a structural equation modeling (SEM) technique that has been commonly used in IS research. Similar to other SEM techniques (LISREL, for example),

PLS tests the validity of constructs and the structural model at the same time, and is therefore considered methodologically rigorous when compared with regression-based techniques which separate the test of construct validity (factor analysis) from the test of the research model (Gefen et al., 2000). Two other distinctive features of PLS made the technique a particularly suitable testing tool for this study:

1. PLS has the flexibility of accepting single-item constructs (gender in this study);
2. The algorithm of PLS, which is component-based rather than covariance-based, allows the modeling of formative indicators (Chin, 1998). In this study, the constructs of computer knowledge, current computing experiences, and general CSE were modeled as formative indicators based on their conceptualizations and operationalizations.

3.4.1 Validity of Formative Indicators: Conventional procedures used to assess the validity of reflective constructs such as factor analysis may not be appropriate for assessing the validity of formative constructs (Diamantopoulos and Winklhofer, 2001). A multitrait-multimethod (MTMM) approach (Campbell and Fiske, 1959) with some modifications designed for assessing the validity of formative constructs (Loch et al., 2003) was used here to examine the convergent and discriminant validity of the three formative indicators. This method is also practiced in Marakas et al. (2007) for the development of different types of CSEs.

In this method, a composite score of each formative indicator was calculated based on the sum of products between its formative items and their associated weights. The weight represents the extent to which an item contributes to the overall value of a latent variable. A correlation matrix is then calculated between items of formative constructs and all constructs under study. To establish convergent validity, items should correlate highly with items measuring the same construct, and show low correlations with items measuring other constructs. To establish discriminant validity, items should correlate highly with the assigned constructs and show low correlations with unassigned ones. If the number of items under test is large, some violations may be observed due to chance. Thus, the validity test of formative indicators is both a science and an art (Marakas et al., 2007).

There are 237 correlations calculated in the matrix (available upon request). Among them, nine correlations violated the rules discussed above. Upon close examination of the nine violations, we note that one item of computer knowledge (item 1, assessing one’s general knowledge about operating systems) correlated highly with most general CSE items. These high correlations suggest that in our sample students who knew computer operating systems well also had strong confidence with computers in general. This finding is not surprising. In fact, in their development of CSEs for different applications, Marakas et al. (2007) found that the relationship between Windows CSE and GCSE was so strong that the two constructs were hardly distinct from each other. The item was retained to preserve the integrity of the construct for two reasons: (1) the item was closely aligned with the conceptualization of the computer knowledge construct and (2) the features of a reflective indicator (indicators are exogenously determined by items; therefore, within-construct item correlations need not necessarily be high, and cross-construct item correlations need not necessarily be low (Diamantopoulos and Winklhofer, 2001)) allow violations to the rules of convergence and discriminance among valid measures.

In addition, the percentage of violations was low – the number of violations of the comparison parameters was 9 out of the 237 correlations, or a 3.8% violation rate, which is below the 5% rule suggested in Campbell and Fiske (1959). Because the overall pattern of correlations was not much different from the expectation, validity of these formative indicators could be concluded.

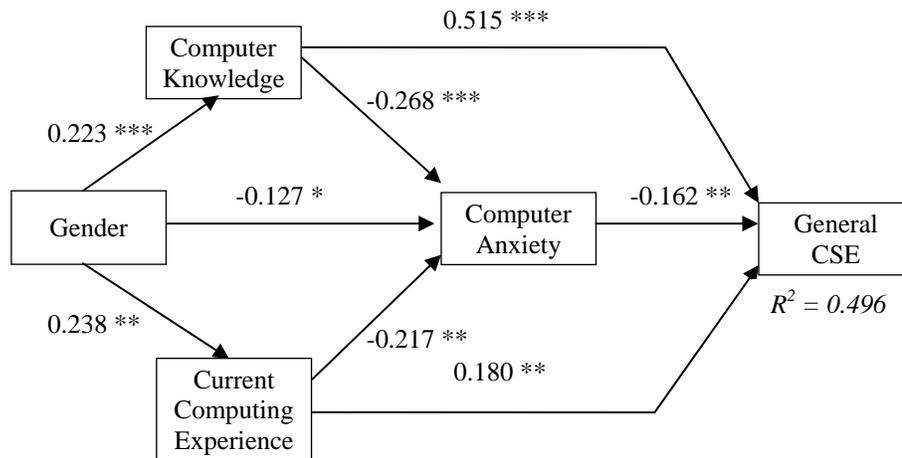
3.4.2 Validity of Reflective Indicators: Assessing the validity of reflective items follows the conventional practice based on the examination of construct reliability, convergent validity, and discriminant validity. Construct validity can be assessed by composite reliability calculated in PLS (should be larger than 0.70). Convergent validity can be assessed by the average variance extracted (AVE) among measures (should be larger than 0.50). Discriminant validity can be assessed by comparing the square root of AVEs and inter-construct correlations – the former should be larger than the latter to support discriminant validity. Close examination of Table 2 suggested that all the conditions were satisfied. Thus, validity of the reflective indicators under study could be concluded.

	Reliability	1	2	3	4	5	6
1. General Computer Self-Efficacy [†]	-	-					
2. Computer Knowledge [†]	-	0.653	-				
3. Current Computing Experience [†]	-	0.475	0.453	-			
4. Computer Anxiety	0.899	-0.433	-0.366	-0.383	0.831		
5. Gender	1	0.263	0.213	0.240	-0.230	-	
6. Subjective Norms	0.839	0.109	0.093	0.059	-0.004	0.201	0.850

Notes:

1. Reliability: composite reliability calculated in PLS
2. Numbers in bold on the leading diagonal are the square root of the average variance extracted (AVE) among reflective measures. For discriminant validity of constructs, diagonal elements should be larger than off-diagonal elements.
3. Off diagonal elements are correlations among constructs.
4. [†] These constructs are modeled as formative indicators. Calculations of construct reliability and shared variance are not relevant for them.

Table 2. Inter-Construct Correlations



Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (2-sided)

Figure 2. Testing Results

3.5 Hypothesis Testing

The test of the research model and the results are presented in Figure 2. The model demonstrated overall a good model fit with significant path coefficients (all with $p < 0.05$), satisfactory R^2 (about 50% of the variance of GCSE being explained by the model), and good construct reliability with high levels of internal consistency (Gefen et al., 2000). Examination of the resulting path significances suggested that all hypotheses were supported by the data sample.

4. SUMMARY AND DISCUSSION

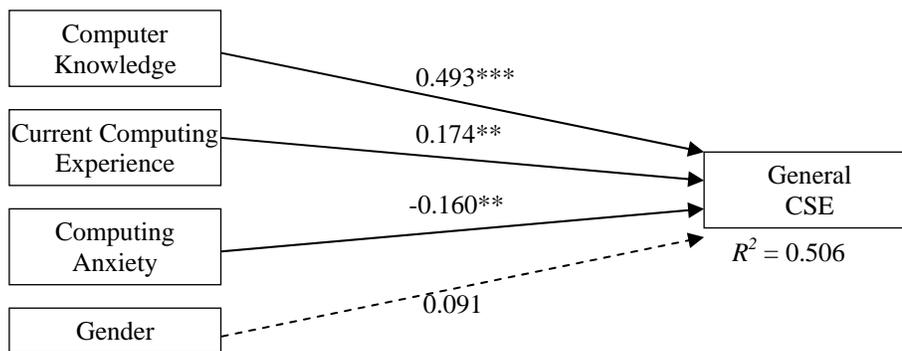
4.1 Findings of the Study

In the current research we investigated the role of gender on the development of general computer self-efficacy, hoping that the approach will enrich our understanding on the

mechanisms through which gender affects the development of general CSE. The results of our research suggest women are less computer-oriented than men. In our sample, female students were found to have less computer knowledge and fewer computing experiences, they were likely to be more anxious about using computers, and they presented lower levels of general CSE when compared with male students.

4.2 Implications for Research

Based on social cognitive theory, we argued that computer experiences and computer anxiety mediate the effect of gender on general CSE. This argument received strong empirical support from our sample. To further assess the extent of the mediation effect, we tested the following model of Figure 3:



Notes:

1. Dashed lines indicate insignificance with $p > 0.05$ (2-sided).
2. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (2-sided)

Figure 3. Effect of Gender after Controlling for Computer Knowledge, Current Computing Experiences, and Computer Anxiety

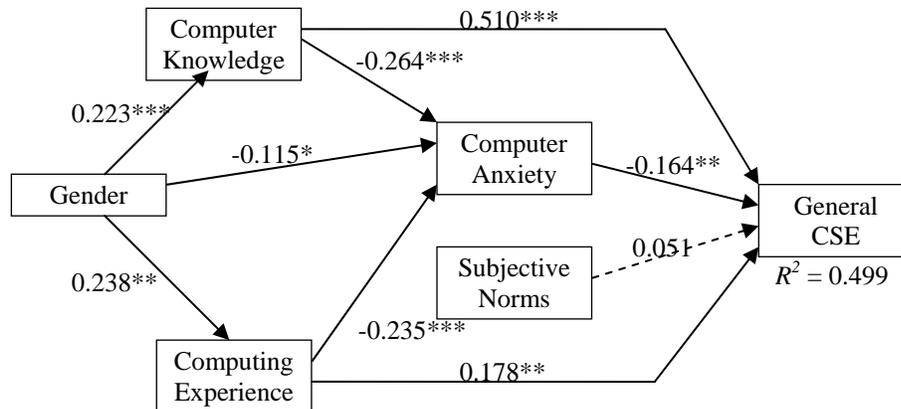


Figure 4. An Extended Model with Subjective Norms

Zero-order correlation (see Table 2) suggests that gender alone can be a strong predictor for general CSE ($r = 0.263, p < 0.001$). However, after controlling for the effects of computer knowledge, current computing experiences, and computer anxiety, gender presented an insignificant effect on general CSE ($\beta = 0.091, p = 0.073$). Combining the results with that of Figure 3, we can safely conclude that computer experiences and computer anxiety fully mediate the effect of gender on general CSE. This finding helps explain findings in the literature that females are not necessarily inferior to males regarding confidence of using computers. For example, King and colleagues (2002) found that using computers frequently for communication helps females to view computers as less of a threat.

We did not include verbal persuasion in our research model. Although it has been proposed as an antecedent of self-efficacy, verbal persuasion is deemed a weak information source for judging one's ability of performing a certain set of behaviors (Bandura, 1977). To justify the exclusion of verbal persuasion in our research model, we tested an extended model with subjective norms, which is conceptually close to verbal persuasion, as another antecedent of general CSE. The testing results of the extended model are reported in Figure 4.

Results demonstrate a weak effect of subjective norms in addition to the proposed research model ($\beta = 0.051, p = 0.39$), providing evidence that others' suggestions and comments have limited influence on one's perceived confidence of using computers.

4.3 Implications for Education

These results, in addition to providing for additional avenues for research and study, provide educators with some concrete areas on which to focus. Crews and Butterfield (2003) argued that teaching approaches would have dramatic influence on the learning performance of students – notably female students – in computing classes. Ballou and Huguenard (2008) observed that despite initial computer experience disadvantages, female students with a strong commitment to learning are able to outperform their male counterparts. Our results suggest that increasing computer experiences (in both knowledge and usage) will help females to develop more confidence with computers. Such increases

could stem from a greater utilization of computer-based exercises/assignments in core-level courses. These exercises need not be specific to Excel, Access, or other applications, nor should they be limited to MIS courses. For example, more exposure, use, and experience with searchable online databases (from a university's library or from the Internet in general) can be incorporated into many different courses across the curriculum.

However, one should also note the important mediating role of computer anxiety. To ease the perception gaps between the two demographic groups, special treatments to relieve anxious feelings towards computers are needed, especially for females. The careful creation of exercises/assignments with regard to their instructions, required effort, and necessary skill-sets can reduce the level of anxiety for all students. Departments or academic units can provide tutoring assistance within the computer labs. Greater exposure to computers throughout the curriculum will mean that the use of computers and computer-based assignments in any particular course will no longer be an outlier when compared to other courses as computers and their usage will become common-place throughout the curriculum. Of course, future studies should examine whether such efforts to reduce computer anxiety positively impact computer self-efficacy.

4.4 Limitations of the Study

Although the results are encouraging, the study has several limitations. One is about the operationalizations of the constructs of computer knowledge and current computing experiences. The operationalizations were based on a set of newly developed, rather than existing, measures. This practice is highly advocated especially for modeling formative indicators (Marakas et al., 2007). However, the lack of validity support from the existing literature and the inability to formally pilot the measures due to a lack of guidance from the literature could question the validity and generalizability of the two constructs.

Validity tests of the three formative indicators may be another concern for this study. The literature falls short on a commonly-accepted procedure to test the validity of formative indicators (Diamantopoulos and Winklhofer, 2001). The method used here was also employed in Marakas

et al. (2007) as the best practice so far in the literature. However, several measurement issues, such as the calculation of reliability and situations in which violations of comparison parameters may be accepted or unaccepted, remain unsolved. Given the increasing acceptance of formative indicators among IS researchers, these measurement issues should call for future research.

This study selected business students as the research subject. Thus, special caution is needed when applying the findings to business professionals. Future research with real business settings is desired to test the generalizability of the findings to additional contexts.

5. CONCLUSION

Previous research focuses largely on perceptual differences between the two demographic groups; the mechanisms that cause such differences have been rarely explored. The results of this study suggest that females feel less confident with computers because they have learned less and practiced less, and feel more anxious about using computers when compared with male counterparts. An increase in experiences, exposure, and practice with computers could help females develop more confidence and higher GCSE. Implications for future research and education stem from these findings.

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APPENDIX 1. INSTRUMENTS USED IN THE STUDY

Computer Knowledge

I have good knowledge and skills of... (on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5))

1. Windows or another operation system
2. Excel
3. Access
4. HTML/Website Development
5. PowerPoint

Computing Experience

Before taking the course, how often did you use a computer for the following purposes? (On a 7-point scale ranging from never (1) to a few times a day (7))

1. Using computer for job and academic work
2. Using computer for entertainment
3. Using Office software (e.g., Word, Excel)
4. Surfing online in general
5. Surfing online for information (news, weather, etc.)
6. Online chatting and other virtual communication
7. Online gaming

Computer Anxiety (Adopted from Compeau et al. (1999))

Regarding my anxiety toward a NEW computer application, in fact... (on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5))

1. I feel apprehensive about using a new application.
2. It scares me to think that I could lose a lot of information using a new application by hitting the wrong key.
3. I hesitate to use a new application for fear of making mistakes I cannot correct.
4. A new application is somewhat intimidating to me.

General Computer Self-Efficacy (Adopted from Marakas et al. (2007))

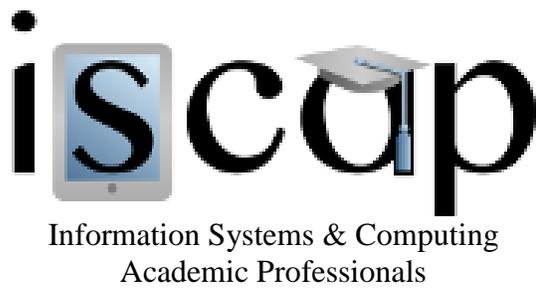
Do you agree with the following statements about your capability of using computers? (on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5))

1. I believe I have the ability to describe how a computer works.
2. I believe I have the ability to install new software applications on a computer.
3. I believe I have the ability to identify and correct common operational problems with a computer.
4. I believe I have the ability to unpack and set up a new computer.
5. I believe I have the ability to remove information from a computer that I no longer need.
6. I believe I have the ability to use a computer to display or present information in a desired manner.

Subjective Norm (Adapted from Venkatesh and Davis (2000))

Do you agree with the following statements? (on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5))

1. People important to me believe I should develop great expertise in computing.
2. Instructors from my previous courses encouraged me to learn more about computing.



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ISSN 1055-3096