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Development of Computer Skills: Revisiting the Role of Computer Self-Efficacy and Behavioral Modeling

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Abstract

This research investigates a computer-training model proposed by Compeau and Higgins (1995a). In that study, several unexpected results occurred. Using a laboratory experiment, this research addresses and empirically tests issues relating to those unexpected findings.

Introduction

Using Social Cognitive Theory (Bandura, 1977b; Glass & Knight, 1988; Meier, 1988), Compeau and Higgins (1995a) investigated the role that computer self-efficacy (CSE) and behavioral modeling training have in the acquisition of computer skills. In several facets of their model, they found strong support, but in others they had unexpected results, especially in those areas linked to outcome expectations. Upon investigation of this study, several issues of a theoretical, methodological, and/or measurement nature could serve to explain some of the unexpected results. This research has two goals: (1) to replicate and extend the work of Compeau and Higgins by addressing issues which may have contributed to the unexpected results; and (2) to propose a more robust model of social cognitive theory.

Background

Computer Self-Efficacy is an individual’s judgment of their ability to perform a specific software task (Compeau & Higgins, 1995b; Marakas, Yi, & Johnson, In press). Efficacy estimations are an important predictor of performance, and can be influenced by a variety of factors, including enactive mastery (previous experience in the domain), vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1997). As defined in the Compeau and Higgins’ study, behavioral modeling is the observation of someone else performing a desired behavior (i.e. vicarious experience). Behavioral modeling has found strong support as a training method across the social sciences (cf. Gist, Schwoerer, & Rosen, 1989; Latham & Saari, 1979). Previous experience, which Bandura refers to as enactive mastery, has been found to have a powerful effect on future efficacy estimations (cf. Locke, Frederick, Lee, & Bobko, 1984) and performance (Wood & Bandura, 1989).

Compeau and Higgins (1995a)

Using a theoretically developed model (Figure 1), Compeau and Higgins trained managers and professionals to use a spreadsheet and a word processing package. “Overall, this research [did] not provide support for the model as presented” (Compeau & Higgins, 1995a, p. 131). A number of possible causes for this situation can be suggested: 1) The model may be theoretically misspecified, 2) the constructs may not be adequately isolated and 3) the methodology may not capture the robustness of the phenomena.

Proposed Model

Marakas, et. al (In press) developed an empirically derived model of the CSE-performance relationship, which includes over 20 variables linked to CSE. A subset of this model contains the variables of interest in the current research (Figure 2). A key difference between this new model and the previous model is the exclusion of outcome expectancy (OE) from the model. OE is left out of the model because it doesn’t contribute to performance (Bandura, 1997). Lee, Locke, and Phan (1997) found that in the presence of efficacy estimations, high monetary rewards (OE) do not contribute to performance levels.

Inclusion of outcome expectancy (OE) in the Compeau and Higgins’ model may be due to a confusion of the construct. In expectancy theory (Vroom, 1964), OE is defined as the subjective probability that an act will lead to an outcome. Along with that outcome’s valence (the affective orientation toward that particular outcome), OE influences the motivation to perform an act (i.e. a performance decision). Thus, in an expectancy model, outcome expectancy would appropriately appear as an antecedent of the performance decision, whereas in social cognitive theory, an efficacy estimation is an antecedent of performance.
Several additional constructs not investigated by Compeau and Higgins, which are known to mediate the CSE-Performance relationship, were added to the proposed model. First, emotional arousal (or anxiety) is a known antecedent to CSE judgments (Bandura, 1977a) and also throughout the performance process. (Bandura, 1977b). Additionally, goal level and goal commitment are also closely related to efficacy estimations. Several goal setting studies have found that individuals with higher levels of self-efficacy set higher goals (Locke, 1990) and are more highly committed to those goals (Locke et al., 1984). Three other variables known to be related to CSE were controlled for: gender (cf. Miura, 1987), age (cf. Burkhardt & Brass, 1990), and professional orientation (Jorde-Bloom, 1988).

**Figure 2. Proposed Model**

**Methodological Issues**

Of all the predictors of CSE, enactive mastery is known to have the greatest influence (Bandura, 1977a). Since subjects in the study will have both enactive mastery experience (practice) and vicarious experience (modeling), it is important that changes in CSE due to modeling are measured before practice. Otherwise any effects of modeling on CSE and performance could be masked by the improvements in due to practice time (enactive mastery). In the Compeau and Higgins study, an acknowledged limitation was the fact that CSE was only measured before practice. Therefore, CSE increases due to practice (enactive mastery) would not be captured. Further, if performance did not differ between groups, then we would not be able to determine if this was due to the practice session, or to method problems. CSE should be higher after the practice session than before it (H12).

Another methodological issue of interest has to do with the specific manipulation. Giving subjects time to review their notes may have given subjects enactive mastery on the structure and syntax of the software. A cleaner manipulation would have the control group spend time on something not related to technology. For this study a control group, who watched a video not related to computing, was added.

**Measurement Issues**

A recent paper by Marakas, Yi, and Johnson (In press) developed an empirically derived, six-step framework for CSE instrument development. Based on this framework, Marakas, Johnson, and Yi (1998) developed new measures of CSE. Insight into the unexpected results may be gained by comparing how a measure developed with the benefit of a framework compares to a measure developed without such a benefit.

**Methods**

The methodology of this study paralleled that of Compeau & Higgins (1995a) and the software on which the subjects were trained was Excel. Half of the subjects received questionnaires with measures developed by Compeau and Higgins, and the other half received measures developed by Marakas, et al. Upon arriving at the training session, subjects received a pre-test questionnaire containing all variables of interest in the study. Subjects then completed a paper-pencil pre-test on their Excel knowledge. Following this, all subjects then received a 30-minute lecture on Excel. Upon completion of the lecture, subjects in group 1 received a 30-minute modeling video, subjects in group 2 were given 30 minutes to review their notes, and subjects in group 3 watched a 30 minute video unrelated to computers. After the manipulation, subjects completed a second questionnaire, measuring the same constructs as the pre-test instrument. Subjects were then given a 15-minute practice session, after which they completed a third similar questionnaire. Subjects were then given a 25-minute performance test.

Subjects in this study were undergraduate students enrolled in two sections of an introductory application software course (n = 146). The vast majority of students’ ages were between 18-24 and had limited experience with Excel.

_Prior Experience:_ Previous experience was measured with a paper-pencil task (Yi, 1998). _Outcome Expectancy_ was measured by 8 questions developed by Compeau & Higgins (1995b). _Goal level_ was measured with one question where subjects select from a grade range of 1-100. _Goal commitment:_ was measured by 6 questions (Hollenbeck, Williams, & Klein, 1989). _Computer anxiety_ was measured with the 19 item Computer Anxiety Rating Scale (Heinssen, Glass, & Knight, 1987). _Performance_ was measured using an objective performance task developed by Yi (1998). _CSE_ for half the subjects was measured using the 9 questions developed by Compeau and Higgins (Compeau & Higgins, 1995b) and the other half were measured using 10 measures developed by Marakas, et al (1998).

Results of the study will be presented.

**References**

References available upon request from author.