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Attribution and Computer Self-Efficacy Transfer in Software Skill Acquisition

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ABSTRACT

This paper investigates the reciprocal relationship between application specific computer self-efficacy (AS-CSE), causal attributions, and the role of these attributions in the transfer of efficacy estimations from one software package to another. We argue that in the computing domain, attributions of performance in one software application will also affect efficacy estimations on software within the same application environment, despite the fact that different skill sets may be required for each. To investigate this, a field study will be conducted to investigate the relationship between AS-CSE, attributions, and the transfer of efficacy from spreadsheet software to database software. This study contributes to the literature by providing researchers with a deeper understanding of the role of attributions in software skill acquisition, not only in the original application domain but also its role in efficacy transfer. Initial results will be presented at the conference.

Keywords

Computer Self-Efficacy, Attribution Theory, Computer Training.

INTRODUCTION

Social Cognitive Theory (Bandura 1986) argues for a triadic and reciprocal relationship between cognitive, behavior, and environmental factors. Of particular interest to information systems researchers has been the role of self-efficacy. Self-efficacy is an individual's belief about his or her ability to perform a specific task and has been shown to affect how what behaviors individual's engage in, how well they perform these behaviors, how much effort will be expended, and how long effort will be sustained in the face of obstacles and aversive experiences. In turn obtained performance serve as information providers that affect future efficacy estimations (Bandura 1997). However, the nature of the relationship between performance and self-efficacy also depends on the causal attributions that individuals make about their performance (Schunk and Gunn 1986). Specifically, it has been argued that self-efficacy affects how individuals make causal attributions for performance, and in turn these attributions affect subsequent self-efficacy appraisal (Gist and Mitchell 1992, Stajkovic and Sommer 2000) on the same task.

While previous research has shown a strong relationship between efficacy estimations and attributions in the same domain, we believe that attributions can also be involved in the generalization of efficacy estimation. This occurs as individuals make attributions about their performance on a specific software application, but they then extend these beliefs to software applications that are perceived to require a similar skill set. Thus the goal of this study is to investigate the relationship between computer self-efficacy, causal attributions, and computer self-efficacy transfer.

BACKGROUND

Attribution Theory

Attribution theory focuses on how individuals interpret and explain the cause or reason of their or others behavior (Weiner 1979). Three main dimensions of these causes that have been identified are the locus of causality, stability, and controllability (Weiner 1979), of which locus of causality has been argued to be the most important dimension with respect to understanding achievement and self-efficacy (Bandura 1986, Schunk, et al. 1986, Weiner 1985). Locus of causality reflects whether the cause of the behavior or performance is thought to be internal to the individual or external. An internal locus of causation reflects the belief that the behavior or performance is within the individual's personal control while an external locus of causation reflects the belief that the behavior or performance is not under personal control. Weiner (1985) illustrated that the impact of causal attributions are most potent when individuals have little previous experience with the task or when the outcome was unexpected (particularly in the case of failure) whereas when individuals have higher levels of experience,

attributions may play a lesser role. Attribution research is important to self efficacy-performance research literature because the attribution that the individuals make affect the psychological consequences associated with the causes change the estimation of individual efficacies (Bandura 1986, 1997, Schunk, et al. 1986, Silver, Mitchell and Gist 1995).

Computer Self-Efficacy and CSE Generalizability

Bandura (1997) suggests that self-efficacy can be distinguished at three levels of generality including the task specific level, at the level of a specific class of performances within the same domain, and at the more global level. Computer self-efficacy is also thought to operate at multiple levels including general computing level (GCSE), the application environment (AE-CSE: ex. Windows XP) and the application-specific (AS-CSE: ex. Spreadsheets) level. AS-CSE is as “an individual’s perception of efficacy in performing specific computer-related tasks within the domain of general computing” (Marakas, Yi and Johnson 1998) whereas AE-CSE is an individual’s judgment of efficacy across multiple applications within an application environment. While AS-CSE has been shown to play an important role in software skill acquisition (Compeau and Higgins 1995, Johnson and Marakas 2000, Yi and Davis 2003), limited research has focused on how AS-CSE estimations generalize to other software applications. Marakas et al (1998) development of CSE as these multiple levels suggests that there are common skills that cross the application specific software that are reflective of the application environment. These include things like accessing, saving, moving files, etc. as well as similarities in interface design and related computing concepts. Thus, we argue that skills gained on a specific software package may provide individuals with efficacy information that affects future AS-CSE estimations. We also argue below that the process through which this occurs is an attribution process.

ATTRIBUTIONS AND AS-CSE TRANSFER

Bandura (1986) suggests that it is through processes such as attributional analysis that effects of past performance affect future efficacy estimations and that this attribution process is dependent upon initial efficacy estimations. Attribution processes often act as self-serving or protective (Weiner 1985). In forming their efficacy judgments, people give different weights to the previous performance. For example, when success occurs, individuals tend to internalize success, viewing performance as indicative of their capabilities. Conversely, a highly efficacious individual may place less weight for unsuccessful performance to internal causes and instead make an external attribution due to this self-serving bias. In contrast, low-efficacy persons are prone to see poor performance as stemming from personal inadequacies and are more likely to internalize failure. Specifically, previous research has suggested that both high and low efficacious individuals will make internal attributions if they perceive previous performance as a success, but when facing an unsuccessful performance, highly efficacious individuals will make external attributions whereas less efficacious individuals will be more likely to internalize failure (Silver, et al. 1995, Stajkovic, et al. 2000). These ideas are summarized in Table 1 and in hypotheses 1a & 1b.

Performance Assessment	High AS-CSE	Low AS-CSE
Successful	Internal Attribution	Internal Attribution
Unsuccessful	External Attribution	Internal Attribution

Table 1. Relationship between Performance, AS-CSE, & Attributions

H1: Individuals who perceive their performance to be a success will be more likely to make an internal attribution than those who perceive their performance to be unsuccessful.

H2: If an individual perceives their performance to be unsuccessful then individuals with higher AS-CSE will be more likely to make external attributions for poor performance than those with lower levels of AS-CSE.

Once attributions are made, these attributions in turn provide diagnostic and affective information about the cause of performance to the learners, which individuals then process as they re-assess their personal capabilities. When internal attributions are made after a successful performance, individual’s sense of personal efficacy will be enhanced (Stajkovic, et al. 2000).

H3: Individuals who make internal attributions for successful performance will be more likely to see their AS-CSE increase than individuals who make external attributions.

When an internal attribution is made for an unsuccessful performance, individuals process it as further evidence for the lack of capability. Consequently they view themselves as having limited skills, decreasing their efficacy. This is especially true of individuals with low efficacy because they tend to give more weights to the internal causes under conditions of poor performance (Stajkovic, et al. 2000).

H4: Individuals who make internal attributions for unsuccessful performance will be more likely to have their AS-CSE decrease after their performance than individuals who make external attributions.

We argue that attributions also affect efficacy estimations on software packages within the same application environment. Generalization of perceived efficacy has been proposed to be a function of the degree of similarity of task requirements and the skills they require (Bandura 1997). Thus, tasks perceived to have the same underlying skills are more likely to allow for efficacy transfer than those that do not. For example, the Windows environment enables many software applications to have similar functionality, and user interface characteristics. This can include a common process for opening, closing, and saving files as well as common ways of editing, formatting, and updating text. Thus, individuals may gain a sense of increased efficacy in spreadsheets after learning how to use a word processing package, because they perceive many of the sub skills to be common across these applications. While the skills common to both software applications may only be a small subset of the total skills, and may not accurately reflect the full set of skills necessary to effectively use the software, learners may focus on those skills they know transfer. Thus, there may be a temporary boost in efficacy on a related software package after internal attributions are made for successful performance in another software package. Efficacy is generalized as an individual sees the common skills required across the applications and, facing what is perceived as a similar task in a new software application, increases his or efficacy on that new application. Conversely, an individual's efficacy may decrease in a related software package when an internal attribution is made after an unsuccessful performance, because the individual is likely to view their lack of skill in one application and extend this belief of personal inefficaciousness to related software packages. Thus, the following hypotheses are raised.

H5: Internal attributions made after a successful performance will increase AS-CSE on a related software package.

H6: Internal attributions made after an unsuccessful performance will decrease AS-CSE on a related software package.

METHOD

Data will be collected from 200 undergraduate students enrolled in an introductory information systems fundamentals course in a southeastern university. Research participants will first receive a 10-minute training session on the Vlookup and Dsum functions of Microsoft Excel. Following this, participants will complete a survey that assesses Spreadsheet CSE, database CSE and demographic information. Following the survey, participants will take an objective multiple-choice test for both Excel and Access to establish a baseline level of experience in each. After completing this, participants will complete a series of tasks using Excel adapted from the task used by Johnson and Marakas (2000), but also including the use of Vlookup and Dsum functions. After completing the task, the task will be automatically graded and a performance score will be displayed to each participant. Participants will then judge their performance to be "successful" or "unsuccessful." Finally, participants will complete a post-test survey where they will make attributions about their performance as well as completing final assessments of Spreadsheet and Database self-efficacy.

Spreadsheet CSE will be measured using a updated, 11-item version of a scale developed by Johnson and Marakas (2000) that reflects the skills of interest in this study and database CSE will be assessed with a 10-item scale developed by Marakas, Johnson, & Clay (2004). Both scales were developed in consistent with the Marakas et al (1998) framework. Causal attributions will be measured with the 9 item Causal Dimension Scale (CDS) developed by Russell (1982). Performance will be measured using a 12-question Excel skills test adapted from the test developed by Johnson and Marakas (2000) and Yi and Davis (2001). Data will be analyzed using both regression and ANOVA.

DISCUSSION

Typically, users of computing systems are not trained on isolated systems, but instead are trained on families of related applications (i.e. the Microsoft Office Suite). If attributions about performances on a specific software package provide information about skills on other software packages, this can have strong implications for training initiatives. First, it suggests that we cannot underestimate the generalizability of efficacy estimations and the connections between software applications that trainees perceive. For example, by starting with easier software trainers can increase trainee confidence, which can then transfer to new software packages. Conversely, as individuals lose confidence in their skills this lack of confidence may not remain isolated to one software package, but instead can actually affect learning of other software, making learning more

difficult and potentially creating roadblocks to further learning. By better understanding these relationships, those involved in computer training can develop training mechanisms that take into consideration the generalizability of efficacy estimations, leading to more effective training initiatives.

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