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Attribution Analysis of Computer Self-Efficacy

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Abstract

Individuals' reactions to ERP technology and subsequent behaviors are investigated by combining Self-Efficacy Theory and Attribution Theory. Using a field study, this research determined the attributions of computer performance and their causal dimensions (i.e., locus of causality, stability, and controllability). The PLS results indicated that desirable and undesirable attributions are important antecedents to computer self-efficacy.

Introduction

One of the many challenges facing organizations as they approach the new millennium is having a highly trained and knowledgeable workforce capable of using information systems such as Enterprise Resource Planning (ERP) applications (e.g., PeopleSoft). Despite millions of dollars and hundreds of deployment hours, many organizations are experiencing failure with their ERP systems. The leading cause of ERP failure, according to one author, is lack of training (Crowley 1999).

For users, the implementation of ERP systems means that their computer-related job tasks are completed in a totally different computer environment. The complexity of these systems results in enormous learning curves and behavioral changes for users, implementers, and organizations. A variety of reactions by individuals, ranging from resisting to enthusiastically embracing ERP systems, are demonstrated, and unexpected difficulties often arise during all phases of implementation. Consequently, ERP users need to make sense of, and understand, their reactions to this technology, and their changing computer environment and computer-related job tasks. The attributions of ERP performance are important because they can either positively or negatively influence users' learning, confidence levels, effort, persistence, and use of these systems. Unfortunately, our understanding of individuals' reactions to ERP systems, and why they elect to use or avoid them, is limited.

Theoretical Foundation

Computer Self-Efficacy Theory (CSE). One important determinant of IT use and individual performance that has recently been investigated by the IS community is CSE. Compeau and Higgins defined CSE as "individual judgment of one's capability to use a computer" (1995, p. 192). Self-efficacy is an important predictor of behavior outcomes (e.g., choices, effort, persistence, and performance), and is influenced by four information sources – enactive mastery (i.e., past experiences), vicarious experience (i.e., modeling by others), verbal persuasion (i.e., coaching and evaluative feedback), and emotional arousal (e.g., Bandura 1986).

The IS community has focused on identifying and improving the CSE measurements and refining methodological issues (Marakas et al. 1998). For the most part, the relationships inherent in the Self-Efficacy Theory that have been demonstrated by other knowledge domains were also evident in the CSE literature. CSE has been established as malleable in a number of IS contexts, but to date has not been examined in an ERP environment. The extant IS literature provides empirical validation for Self-Efficacy Theory as an explanation of individuals' reactions to IT and subsequent usage behavior. The strong empirical evidence of CSE speaks to its importance as a critical predictor of future reactions to IT and usage patterns (Marakas et al. 1998). Venkatesh and Davis (1996) suggested that CSE might be critical in ascertaining the success of IT in that users would be more likely to reject computer technology when their levels of self-efficacy fell outside acceptable ranges. The majority of the IS research has examined the consequences of high or low CSE; however, few studies have examined the antecedents of CSE. Attribution Theory forms a useful basis for examining how CSE judgements are formed.

Attribution Theory. Bandura (1988) acknowledged that the theories that explain individuals' estimation of efficacy owe an intellectual acknowledgment to Attribution Theory. According to Bandura, "the factors singled out by attribution theory serve as conveyors of efficacy-related information that influence performance attainment mainly by altering people's beliefs in their efficacy" (1988, p. 38). Attributions do not influence an individual's behavior directly; instead, they provide significant information about one's self-efficacy, which in turn affects an individual's actions, thought, and emotional responses (e.g., Bandura 1986). Individuals seek a causal understanding of their behaviors by asking "why" (Weiner 1983) and "what caused the action, what is responsible for it, and what is it attributed to" (Kelley 1971). Thus, according to Attribution Theory, the impact on CSE of a mastery experience, such as computer training, will depend on how the individual interprets the experience. If they see the experienced mastery as dependent on luck, for example, there is unlikely to be a positive influence on self-efficacy. On the other hand, if

they see the experienced mastery as dependent on their hard work, self-efficacy is likely to increase.

The application of Attribution Theory, based on Bandura's Self-Efficacy Theory, to the field of IS will provide new insights into, and broaden our knowledge of individuals' reactions to, ERP systems and the subsequent usage of this technology. We need to identify and understand the attribution mechanism of computer performance because attribution intervention is one primary method for changing an individual's perceived CSE (Gist and Mitchell 1992). Understanding the relationships between the attributions of computer performance and CSE will help with the development of support and assistance mechanisms for assisting individuals to become more productive users of ERP systems. Moreover, advancing our understanding of individuals' reactions to ERP and their cognizance of these reactions ensures ERP success and realization of its benefits.

Attribution research, including IS studies, has been criticized for methodological reasons, specifically for the lack of context specific identification of attributions, and failure to ascertain their causal dimensions. Attributions are specific to a given phenomenon and unique to a particular domain (e.g., Weiner 1983). The attributions reported in other fields may not comprehensively represent the causal perceptions of end users, or they may even be entirely inappropriate in a computer environment. The causal dimensions of attributions (i.e., locus of causality, stability, and controllability) vary from situation to situation and person to person as well (Russell 1982). Thus, the primary goals of this research were two-fold: (1) to identify the attributions of users' computer performance, both successful and unsuccessful; and (2) to examine the influence of these attributions on CSE.

The research model (Figure 1) shows that CSE influences ERP performance and satisfaction, as well as productivity. CSE is influenced, in turn, by desirable and undesirable attributions. Desirable attributions do not impair performance whereas undesirable attributions impair performance (Försterling 1985). Desirable attributions should have a positive influence on CSE while undesirable attributions should have a negative effect. The attribution literature suggests, in essence, that attributions mediate the external forces on the development of self-efficacy. For the purposes of this study, attributions are treated as independent variables. This treatment is consistent with their place as mediators, since none of the external sources are included in the model. External variables were excluded because a parsimonious model empirically testing the relationships linking Self-Efficacy Theory and Attribution Theory was desired.

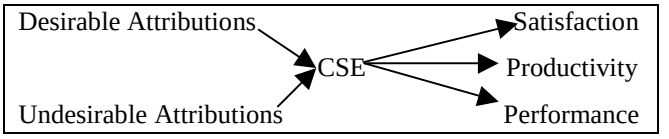

Figure 1. Attribution/CSE Research Model

Research Methodology

A survey-based field study was used to empirically verify this model. Measurements for CSE, the causal dimensions of attributions, and the three behavioral outcomes (i.e., performance, satisfaction, and productivity) were selected because of their excellent psychometric properties. Based on the literature, the authors developed 17-item measures for possible desirable attributions, and for possible undesirable attributions.

The organization participating in this exploratory study was using a phased implementation approach to roll out PeopleSoft applications. Targeted respondents were financial users who had received training and who were currently using the PeopleSoft financial applications. In all, 166 financial users completed and returned the survey (i.e., 46.7% response rate[1]).

Results

Attributions of Success and Failure. Three primary attributions[2] of success were identified from the descriptive statistics: willingness to change to new computer applications, effort, and persistence. For unsuccessful computer performance, the three primary attributions were – lack of computer training, lack of computer support, and difficult to use computer applications. Moreover, respondents indicated that desirable attributions were internal to the individual, stable, and self-controlled whereas undesirable attributions were external to the individual, unstable, and controllable by others. The results of the causal dimensions of the attributions of computer performance support the Hedonic Bias reported in the attribution literature. The Hedonic Bias indicated that individuals advanced a self-fulfilling perspective for successful performance (i.e., individuals took credit for their successful computer performance) and offered a self-protecting viewpoint for unsuccessful performance (i.e.,

[1] The actual sample size used in the analysis was 140 due to missed items in the questionnaires, specifically around undesirable attributions. The missing data issue is of particular interest in refining the measures and will be discussed at the conference.

[2] The primary attributions were those which were most frequently identified by respondents as causes of previous successful/unsuccessful performance. They had the three highest mean importance scores based on a 5-point Likert scale, ranging from 1 = not at all important to 5 = very important (all mean scores were greater than 3.0).

individuals denied responsibility for their unsuccessful computer performance) (Fiske and Taylor 1991).

Research Model. The research model was tested through structural equations modeling, specifically PLS. The measurement model and structural models were simultaneously assessed, as recommended by Chin (1998). The measurement models were generally acceptable and will be discussed by the presenters at the conference. The three primary attributions of success/failure identified by respondents were used as the indicators for desirable and undesirable attributions constructs. The results of this model indicated that 18.6% of the variance in CSE was explained by desirable and undesirable attributions of computer performance. The path from undesirable attributions to CSE was significant, and means that undesirable attributions have a negative affect on CSE (β = -.438, p < .001). The paths from CSE to productivity, performance and satisfaction were significant and positive (β = .194, p < .05; β = .244, p < .001; β = .318, p < .001, respectively), and similar to results reported in previous CSE research. CSE explained 10.1% of the variance in satisfaction, 6.0% of the variance in performance, and 3.8% of the variance in productivity.

Conclusion

The results of this study indicate that desirable and undesirable attributions are important antecedents to CSE and may mediate the influences of the four information sources of CSE. If individuals make desirable attributions (such as effort and adaptability) for previous successful performance, their self-efficacy will be higher. If, on the other hand, they attribute their previous unsuccessful computer performance to such undesirable attributions as lack of training and support or poor applications, their self-efficacy will be lower. This finding is important since it suggests that in order to assist people in becoming more confident with respect to ERP systems, we need to do more than just provide for mastery, modeling, persuasion and calmer physiological states. We also need to influence the way they mentally process these external stimuli to result in more desirable attributions.

The results also have implications from a theory building perspective. They support the Hedonic Bias identified in the attribution literature. Evidence supporting the Hedonic Bias is important for attributional retraining, which suggests that individuals' performance will increase when they learn to ascribe their unsuccessful behavior to more favorable attributions (i.e., lack of effort rather than lack of ability). Second, the finding that attributions of successful and unsuccessful computer performance differed from those attributions identified in other domains suggests that criticisms of attribution research based on lack of domain specificity may be well founded. Further work in the area of computer performance will require continued development of attribution measures specific to computer use.

The results of this empirical study advance our understanding of users' reactions to ERP systems, and their "sense-making" of their changing computer environment. These results are also valuable and advantageous to the critical issues that relate to learning ERP systems for several reasons: for developing, and improving existing, training strategies and methods; for enhancing the outcomes of ERP training and education (e.g., learning, skill development, retention of skills and knowledge, adoption, usage, and productivity); and for augmenting support and assistance mechanisms for users.

References

Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*, Prentice-Hall, New York, 1986.

Bandura, A. "Self-Regulation of Motivation and Action Through Goal Systems," in *Cognitive Perspectives on Emotion and Motivation*, V. Hamilton, G.H. Bower, and N.H. Frijda (Eds.), Kluwer Academic Publishers, Dordrecht, Netherlands, 1988.

Chin, W. W. "Issues and Opinion on Structural Equation Modeling," *MIS Quarterly* (22:1), 1998, pp. v11-xv1.

Compeau, D., and Higgins, C. "Computer Self-Efficacy: Development of a Measure and Initial Test," *MIS Quarterly* (19:2), 1995, pp. 189-211.

Crowley, A. "Training Treadmill – A Rigorous Plan of End-User Education is Critical to Whipping ERP Systems into Shape," *PC Week Online* (January 4), 1999.

Fiske, S., and Taylor, S. E. *Social Cognition*,McGraw-Hill, New York, 1991.

Försterling, F. "Attributional Retraining: A Review," *Psychological Bulletin* (98:3), 1985, pp. 495-512.

Gist, M. E., and Mitchell, T. R. "Self-Efficacy: A Theoretical Analysis of Its Determinants and Malleability," *Academy of Management Review* (17:2), 1992, pp. 183-211.

Kelley, H. H. *Attributions in Social Interactions*, General Learning Press, New Jersey, 1971.

Marakas, G. M., Yi, M. Y., and Johnson, R. D. "The Multilevel and Multifaceted Character of Computer Self-Efficacy," *Information Systems Research* (9:2), 1998, pp. 126-163.

Russell, D. R. "The Causal Dimension Scale: A Measure of How Individuals Perceive Causes," *Journal of Personality and Social Psychology* (42:6), 1982, pp. 1137-1145.

Venkatesh, V., and Davis, F. D. "A Model of the Antecedents of Perceived Ease of Use: Development and Test," *Decision Sciences* (27:3), 1996, pp. 451-481.

Weiner, B. "Some Methodological Pitfalls in Attributional Research," *Journal of Educational Psychology* (75:4), 1983, pp. 530-543.