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Americas Conference on Information Systems (AMCIS)

December 2004

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ABSTRACT

Technology acceptance has been a popular topic in the information systems research field for the past several years. A variety of determinants have been found to be significant in predicting the acceptance and adoption of information technologies. Although there have been extensive research on the technology acceptance model (TAM), the impacts of the perceived radicalness of IT have not been examined. We argue that the factors related to perceived radicalness of technology play an important role in the adoption of the technology and the behavior of its users. The potential contribution of this work is in extending the TAM model to account for possible differences in potential adopters' behaviors when a radically new technology is introduced.

Keywords

Radical Technology, Technology Acceptance Model, Innovation

INTRODUCTION

Previous findings from the technology acceptance research suggest that for advantage to be attained, technology must be accepted and used (Venkatesh, Morris, Davis, and Davis, 2003). Indeed, it is when technology is fully utilized that its potential benefits are actualized. A number of variables, mediators and moderators, have been examined in a variety of theoretical models and have subsequently accounted for a significant amount of variance in the prediction of intentions and behaviors. One construct that has tremendous potential of influencing the acceptance of a technology, but has been neglected in technology acceptance research, is the perceived radicalness of the technology to be adopted. Consequently, the primary objective of this research is to examine the influence that the perception of a technology's radicalness has on its acceptance.

RADICAL TECHNOLOGIES

Radical technologies are very different from incremental technologies. On average, radical technologies are less frequently adopted than incremental innovations (Damanpour, 1996). Radical technologies create a greater challenge to the existing structure of political influence, causing more resistance during their implementation (Frost and Egri, 1991). Radical technologies are also more likely to fail than incremental technologies (Pennings, 1988). The possible reasons for the failure of radical technologies have yet to be explicitly examined in the technology acceptance literature.

It has been observed that not all technologies are created equal - an issue that should be addressed in information systems research (Lyytinen and Rose, 2003). We define radical technology as a *technology that substantially departs from existing alternatives and is shaped by novel cognitive frames* (Hughes, 1987). This definition was chosen because it encapsulates the two distinct dimensions of a radical innovation that have consistently appeared in the literature: *novelty* and *substantial change*. For example, Hill and Rothaermel (2003) state that radical technological innovation involves methods and materials that are "novel to incumbents", which requires a "quantifiably different knowledge base" (p. 258). Ettlie, Bridges, and O'Keefe (1984) also describe designating an innovation as radical if it is both new and introduces a magnitude of change. Categorizing an innovation dichotomously as "radical" or "incremental" is incomplete and potentially misleading (Henderson and Clark, 1990; Wolfe, 1994). Instead, perceived radicalness should be considered on a low to high continuum. Examples of radical technologies for novice users include geographic information systems (GIS), supply-chain systems such as SAP, or creating virtual reality objects. The degree of radicalness depends on the perception and prior experiences of the user and has multiple dimensions.

Hage (1980) identified radicalness as one of the "most critical dimensions" of an innovation (p. 188), yet this construct has yet to be examined in the technology acceptance literature. Radical technologies have a lower likelihood of adoption and success than incremental innovations (Damanpour, 1996; Pennings, 1988). A variety of reasons exist why this may be so.

For example, radical technologies appear more complex to adopters and generate greater uncertainty about the resources that are needed to use them (Gopalakrishnan and Damanpour, 1994; Pelz, 1983). Such features often create a greater challenge to the existing structure of political influence, causing more resistance during implementation (Frost and Egri, 1991). Hence, the degree of perceived *radicalness* of a technology may influence its adoption by individuals as well as organizations. However, existing variations of the technology acceptance model (TAM) are silent on the radicalness of the technology. In this paper, we extend the TAM by synthesizing it with the studies in radicalness. Our conceptualization has the potential to contribute to the better understanding of users' behaviors in adopting new technologies.

RADICIAL TECHNOLOGY ACCEPATNCE MODEL (RTAM)

Based upon conceptual and empirical similarities across eight prominent models in the user acceptance literature, Venkatesh et al. (2003) develop a unified theory of individual acceptance of technology (the unified theory of acceptance and use of technology or UTAUT). We extend UTAUT to include radicalness by synthesizing it with studies in radicalness (see Figure 1).

Prior research has suggested that the radicalness of a technology will moderate innovation relationships (Damanpour, 1991; 1996; Ziamou and Ratneshwar, 2003). The following discussion presents the moderating role of radicalness in the relationships of the salient antecedents of intention to adopt[1].

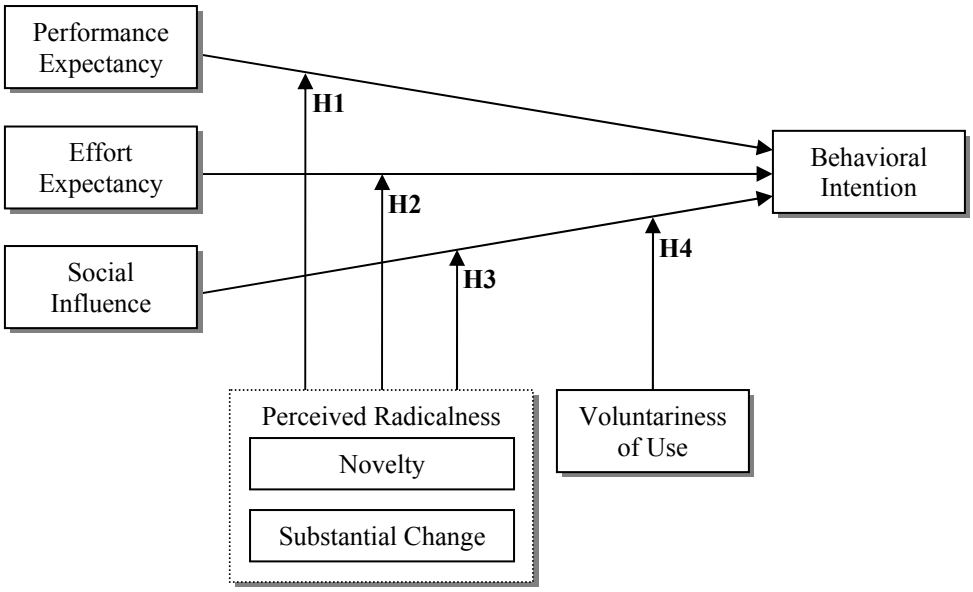

Figure 1: Radical Technology Acceptance Model (RTAM)

Perceived Radicalness

As previously mentioned, perceived radicalness has two dimensions, novelty and substantial change. These two dimensions are considered formative factors since they are distinct and are not expected to correlate or demonstrate internal consistency (Chin, 1998a). For example, a technology is considered radical to an individual when it is perceived to be both novel and substantially different from technologies from which they are familiar. If a technology is perceived as novel it does not necessarily mean that it will be perceived as substantially different, and vice versa.

[1] Facilitating conditions from UTAUT will not be examined since they may largely be captured by effort expectancy when subjects form their initial impressions regarding a technology (Venkatesh et al., 2003).

Performance Expectancy

Performance expectancy, the degree an individual believes that using a technology will help them to attain gains in job performance, is expected to be positively associated with behavioral intention (Venkatesh et al., 2003). When new functionality is offered in an innovation, explicit comparisons with current or previous functionality tend to foster positive thoughts (Ziamou and Ratneshwar, 2003). When a technology is perceived to be similar or not much different from current or previously used technologies, the perceived advantage and usefulness of that technology is not likely to be great (Gatignon and Xuereb, 1997). Consequently, we posit that when a technology is perceived to possess a higher degree of radicalness, potential adopters will expect its use to lead to higher performance.

> ***Hypothesis 1:*** *The higher perceived radicalness, the higher the influence of performance expectancy on behavioral intention*

Effort Expectancy

Effort expectancy, the degree of ease associated with using a technology, is expected to be positively associated with behavioral intention (Venkatesh et al., 2003). Radical innovations are often perceived as being more complex than incremental technologies (Gopalakrishnan and Damanpour, 1994; Pelz, 1983). Complexity is the degree to which an innovation is perceived as being difficult to use and has the exact opposite meaning of ease of effort (Davis, Bagozzi, and Warshaw, 1989; Moore and Benbasat, 1991; Thompson, Higgins, and Howell, 1991). Subsequently, we expect technologies that are perceived as radical to be perceived as more difficult and challenging to use, whereas incremental technologies tacitly reinforce the existing understandings of individuals (Orlikowski, 1993). Therefore, when the technology is perceived to have a higher degree of radicalness, the ease of use becomes of greater importance to potential adopters.

> ***Hypothesis 2:*** *The higher perceived radicalness, the higher the influence of effort expectancy on behavioral intention.*

Social Influence

Social influence, the degree an individual perceives that salient others believe that they should use a technology, is expected to be positively associated with behavioral intention (Venkatesh et al., 2003). Radical innovations are primarily context dependent in that the culture and relationships among individuals either hasten or hinder its progress (Leifer, Colarelli O'Connor, and Rice, 2001). Strong social networks encourage openness, which may accelerate the acceptance of radical technologies (Koys and DeCotiis, 1991). In the context of a strong social network, employees would more willingly share their experiences and support one another when attempting to make decisions on complex and unknown topic areas (e.g., relevance and mastery of new technologies). We posit that social contexts that comprise a cohesive culture, for example, will be better suited to adopt radical technologies. When a technology is radical, potential adopters have to rely on communications, sharing, and exchange of information and knowledge amongst salient others to make an adoption decision. Therefore, social influence will increase in significance when the technology is radical. Furthermore, Venkatesh and Davis (2000) report that compliance in mandatory settings, not voluntary contexts, increase the impact of social influences on behavior intention. Hence,

> ***Hypothesis 3:*** *The higher perceived radicalness, the higher the impact of social influence on behavioral intention*.

> ***Hypothesis 4:*** *The higher perceived involuntariness of use, the higher the impact of social influence on behavioral intention*.

Control Variables

Age, experience, and gender were hypothesized by Venkatesh et al. (2003) to moderate relationships in the UTAUT. These variables add richness to the technology acceptance literature, and we will use them as control variables to account for the variability in individual users' personal profiles.

Methodology

A lab experiment using undergraduate students from a large Midwestern university is proposed to be conducted with a sufficient sampling of participants. We believe that this sampling will be transferable to the referent population of business respondents adopting technologies because the phenomenon of interest is intention to adopt, which is a behavior that all business respondents possess (Doll, Hendrickson, and Deng, 1998). An important aspect of the research strategy is the

maintenance of adequate levels of experimental realism - the degree to which subjects believe in and take the task seriously (Sambamurthy and Chin, 1994).

The experiment stimuli will consist of two software products which are quite different in the perception of radicalness. The candidates include supply-chain technology such as SAP, geographic information systems (GIS), Access database, and e-mail. However, to ensure variability in perceived radicalness, a survey will be performed to determine the extent of perceived radicalness of these technologies prior to selecting two as target technologies in the experiments.

We will manipulate the perception of radicalness in our lab experiment. The experiment protocol involves two technologies: one high and one low in radicalness. The instrument will be designed based on existing scales and pre-tested before the commencement of experiments, which includes card sorting, pilot testing of the instrument, and experiment protocol. The partial least squares (PLS) method will be used to examine the reliability and validity of the measures as well as the estimation of the model (Chin, 1998b).

IMPLICATIONS AND CONCLUSION

The findings may help to explain the results of prior technology acceptance research and will offer a means to incorporate "radicalness" in future work. Providing a better description of the technology examined, for example by exploring the extent of novelty and change in the new and current technologies, enlightens researchers about the behavior of the potential audience and the perceived nature of the IT artifact (Karahanna, Straub, and Chervany, 1999; Venkatesh, 2000; Venkatesh and Davis, 2000).

For practitioners, we expect that our findings will help identify the drivers and inhibitors of adoption and use of new technologies. Our findings could help the providers of new technologies account for the perceptions that facilitate the adoption of new technologies. For the organizations that consider adopting new technologies, our findings could focus the attention on devising the appropriate guidelines for dealing with users' resistance caused by the perception of novelty and change inherent in radical technologies. Such guidelines could improve the acceptance of the technology by users within the organization and offer a greater opportunity for the innovation to achieve the potential advantages it offers.

REFERENCES

1. Chin, W. W. (1998a) Issues and Opinion on Structural Equation Modeling, *MIS Quarterly,* 22, 1, vii-xvi.
2. Chin, W. W. (1998b) The Partial Least Squares Approach for Structural Equation Modeling, In Modern Methods for Business Research, Marcoulides, G. A. (ed.), Lawrence Erlbaum Associates, New York, NY, 295-336.
3. Damanpour, F. (1991) Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators, *Academy of Management Journal,* 14, 3, 555-590.
4. Damanpour, F. (1996) Organizational Complexity and Innovation: Developing and Testing Multiple Contingency Models, *Management Science,* 42, 5, 693-716.
5. Davis, F., Bagozzi, R., Warshaw, P. (1989) User Acceptance of Computer Technology: A Comparison of Two Theoretical Models, *Management Science,* 35, 8, 982-1003.
6. Doll, W. J., Hendrickson, A., and Deng, X. (1998) Using Davis's Perceived Usefulness and Ease-of-use Instruments for Decision Making: A Confirmatory and Multigroup Invariance Analysis, *Decision Sciences*, 29, 4, 839-869.
7. Ettlie, J. E., Bridges, W. P., O'Keefe, R. D. (1984) Organization Strategy and Structural Differences for Radical Versus Incremental Innovation, *Management Science,* 30, 6, 682-695.
8. Frost, P. J., and Egri, C. P. (1991) The Political Process of Innovation, In Research in Organizational Behavior Cummings, L.L., and Staw, B.M. (eds.), JAI Press, Greenwich, CT.
9. Gatignon, H., and Xuereb, J.-M. (1997) Strategic Orientation of the Firm and New Product Performance, *Journal of Marketing Research,* 34, 77-90.
10. Gopalakrishnan, S., and Damanpour, F. (1994) Patterns of Generation and Adoption of Innovations in Organizations: Contingency Models of Innovation Attributes, *Journal of Engineering and Technology Management,* 11, 95-116.
11. Hage, J. (1980) Theories of Organizations, John Wiley and Sons, New York, NY.
12. Henderson, R. M., Clark, K .B. (1990) Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms, *Administrative Science Quarterly,* 35, 9-30.

13. Hill, C. W. L., Rothaermel, F. T. (2003) The Performance of Incumbent Firms in the Face of Radical Technological Innovation, *Academy of Management Review,* 28, 2, 257-274.
14. Hughes, T. P. (1987) The Evolution of Large Technical Systems, In The Social Construction of Technological Systems. Bijker, W., Hughes, T., and Pinch, T. (eds.), MIT Press, Cambridge, MA, 51-82.
15. Karahanna, E., Straub, D. W., and Chervany, N. L. (1999) Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs, *MIS Quarterly,* 23, 2, 183-213.
16. Koys, D., and DeCotiis, T. (1991) Inductive Measures of Psychological Climate, *Human Relations,* 44, 3, 265-83.
17. Leifer, R., Colarelli O'Connor, G., and Rice, M. (2001) Implementing Radical Innovation in Mature Firms: The Role of Hubs, *Academy of Management Executive,* 15, 3, 102-113.
18. Lyytinen, K., and Rose, G. M. (2003) The Disruptive Nature of Innovation Technology Innovations: The Case of Internet Computing in Systems Development Organizations, *MIS Quarterly,* 27, 4, 557-595.
19. Moore, G. C., and Benbasat, I. (1991) Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation, *Information Systems Research,* 2, 3, 192-222.
20. Orlikowski, W. J. (1993) CASE Tools as Organizational Change: Investigating Incremental and Radical Changes in Systems Development, *MIS Quarterly,* 17, 3, 309-340.
21. Pelz, D. C. (1983) Quantitative Case Histories of Urban Innovation: Are There Innovating Stages?, *Human Systems Management,* 3, 173-187.
22. Pennings, J. M. (1988) Information Technology in Production Organizations, *International Studies of Management and Organization,* 17, 4, 68-89.
23. Sambamurthy, V. and Chin, W. W. (1994) The Effects of Group Attitudes Toward Alternative GDSS Designs on the Decision-Making Performance of Computer-Supported Groups, *Decision Sciences,* 25, 2, 215-241.
24. Thompson, R. L., Higgins, C.A., and Howell, J. M. (1991) Personal Computing: Toward a Conceptual Model of Utilization, *MIS Quarterly,* 15, 1, 124-143.
25. Venkatesh, V. (2000) Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model, *Information Systems Research,* 11, 4, 342-365.
26. Venkatesh, V., and Davis, F. D. (2000) A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies, *Management Science,* 46, 2, 186-204.
27. Venkatesh, V., Morris, M. G., Davis, G. B., Davis, F. D. (2003) User Acceptance of Information Technology: Toward a Unified View, *MIS Quarterly,* 27, 3, 425-478.
28. Wolfe, R. A. (1994) Organizational Innovation: Review, Critique and Suggested Research Directions, *Journal of Management Studies,* 31, 3, 405-431.
29. Ziamou, P., and Ratneshwar, S. (2003) Innovations in Product Functionality: When and Why Are Explicit Comparisons Effective?, *Journal of Marketing,* 67, 2, 49-61.