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Exploring Alternative Models for the Adoption of Innovative Telecommunications Technologies

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Introduction

Over the past decade, IS executives have witnessed a proliferation of telecommunications technologies which are becoming increasingly intertwined with conventional data processing activities. In many instances, this technological coupling has resulted in a completely new class of applications. Further, the importance of these applications to contemporary organizations is becoming increasingly evident, particularly within the context of business process reengineering. However, the declining "half life" of telecommunications technologies and the rapid proliferation of new products in this arena challenges the ability of organizational leaders to make "rational" choices regarding the adoption of innovative technologies. Often "non-rational" imperatives such as aggressive vendor marketing, or the existence of certain technical expertise play a substantial role in adoption decisions. This study examines alternative theoretical models of "rational" and "non-rational" adoption behavior within the realm of innovative telecommunications technologies. Drawing from established theoretical and empirical work in organizational innovation, these models are formulated and empirically tested for the purpose of better understanding varying processes and consequences of decision making regarding this important new class of information technologies

Innovation: Radical and Incremental Models of Behavior

Literature within organizational innovation spans many disciplines and focuses on patterns of behavior at both organizational and individual levels (Kwon and Zmud, 1987). Innovation has been described as an idea, a product, a technology, or a program that is new to the adopting unit. In many studies, researchers have found it useful to distinguish between radical and incremental innovations. For instance, Etlie, et. al. (1984) suggest that radical innovations incorporate a technology that is a "clear, risky departure from existing practice". Dewar and Dutton (1986) suggest that this distinction is "one of the perceived degree of new knowledge embodied in a technology". Interestingly, the findings of these studies suggest that different variables are related to adoption behavior across the two classes of innovation. In a meta-analysis of empirical research which examines radical and incremental innovation, Damanpour (1991) found that "managerial

attitude toward change" along with "technical knowledge resources" facilitates radical innovation. Ettlie, et. al. (1984) found strong support for an aggressive technology policy leading to a concentration of technical specialists which in turn leads to pre-innovation conditions of championship and technology-organizational congruence in the adoption of radical innovations. Conversely, incremental innovation was dependent on more traditional structural arrangements and market oriented strategies.

Based on the extensive innovation literature and theoretical work in IS, two models of organizational adoption behavior with respect to telecommunications technologies were formulated. The dependent variable in both models represents the "innovativeness" of telecommunications technologies adopted. Model 1 follows the lines of *radical* innovation. This model presumes that organizations which recognize the strategic role of IS, whose management has a high risk taking propensity, and who are aggressive in scanning for new technology developments create the requisite structural conditions for innovation. These conditions include: the existence of telecommunications specialists, integrated IS and telecommunications groups, and a powerful IS group within the organization. Technology congruence and the extent of vendor interaction then mediate the relationship between the prior conditions and the innovativeness of telecommunications technologies adopted.

Model 2 follows a more *incremental* model for technology adoption. Here, it is assumed that environmental uncertainty and organizational size create a need to incorporate information and information technologies into various aspects of the organization. This relationship is mediated by structural arrangements such as centralization, formalization, complexity and integration. These structures either directly or indirectly influence the innovativeness of telecommunications technologies adopted. Importantly, Model 1 represents a *proactive* view of innovative technology adoption, Model 2 represents a *reactive* view. Both of these theoretical models are illustrated in Figures 1 and 2.

Methodology

Data for model testing was gathered through a large-scale survey of senior IS/Telecommunications executives. When possible, the independent (contextual) variables of each model were operationalized using validated multi-item measures. For cases in which no validated measure existed, extensive literature search, purification among a panel of experts, and pre-testing among potential respondents were used to formulate measures. To determine the level of telecommunications innovativeness, each of the potential respondents was asked to provide an innovative score for fifteen telecommunications technologies based on its uniqueness or novelty to the organization. The average of these scores was then computed for each technology. The final dependent measure of innovativeness was then scored as the mean innovative measure for all adopted technologies. Of seven hundred and seventy seven questionnaires mailed, one hundred sixty five were returned for a response rate of over twenty one percent. One hundred and fifty four responses were used in the final analysis.

Given the complexity of the research models in terms of the network of variable relationships and the implied causal effects, structural equation modeling (SEM) was chosen for assessment of variable measurement properties and model adequacy. Following the general paradigm proposed by Segars (1994), the measurement model of each variable was assessed and, if necessary, refined in order to ensure sound psychometric properties. The discriminant validity of the final measurement models was then assessed through comparison of restricted and freely estimated pairwise models. The factor score of each variable was then calculated as the final indicator of a firm's location with respect to each construct. The correlation matrix of these variables (9 x 9 for the radical model and 8 x 8 for the incremental model) was then used to estimate structural coefficients associated with model paths.

Results

With only slight modifications, the measurement models of all research variables demonstrated properties of unidimensionality. Path coefficients and model fit statistics resulting from SEM of the *radical* and *incremental* models are contained in Figures 1 and 2 respectively. Consistent with much innovation literature, the results provide strong support for diverse models of decision behavior which in turn have a significant influence on the innovativeness of technologies adopted. As evidenced through fit statistics (Chi Square, Goodness of Fit, Adjusted Goodness of Fit), both models seem an adequate representation of their respective correlation matrices. However, as expected, the relationship between contextual variables and innovativeness differs between the models. Specifically, structural attributes associated with organic organizational forms is positively associated with innovation while structural attributes associated with more mechanistic organizational forms is negatively associated with innovation. Such findings seem to suggest that a proactive organizational orientation, an aggressive technological orientation and technological expertise provide a substantial interpretational context for adoption of innovative telecommunications technologies.

Conclusions

As telecommunication and computing technologies continue to merge and become more ingrained into the fabric of business activity, organizational forms which foster innovation will become increasingly important for competitive survival. As suggested by this study, the successful design of such structures may depend more on contemporary concepts such as expertise, partnership with vendors, and environmental scanning and less on traditional structural design concepts such as centralization, formalization, and integration.

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Figure 1
Radical Model of Innovation Adoption

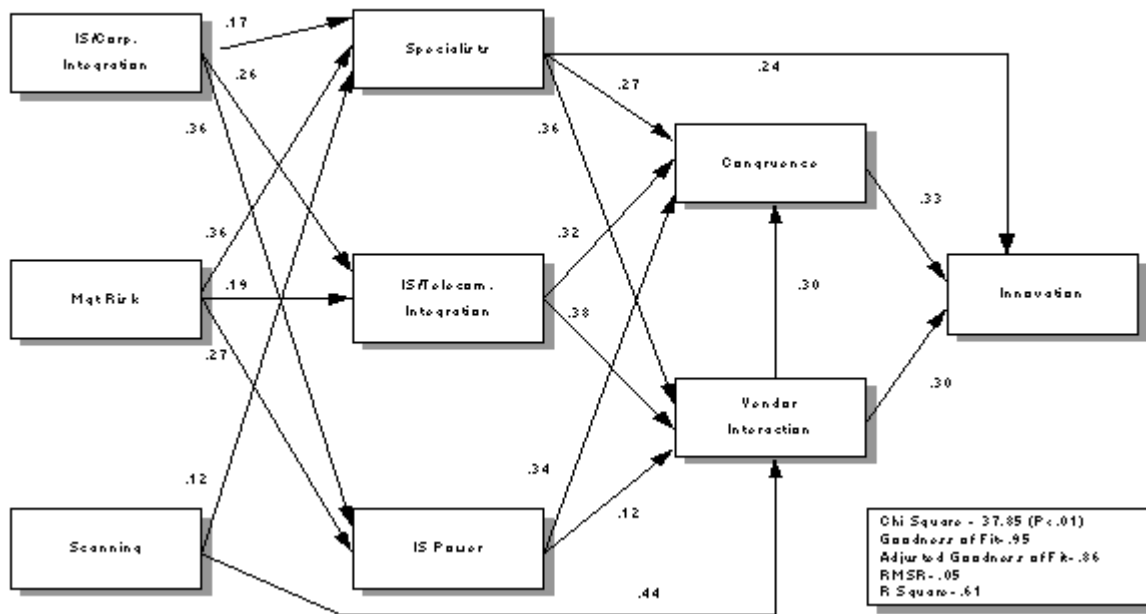


Figure 2
Incremental Model of Innovation Adoption

