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Nine IT Management Problems Due to Rapid IT Change

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Abstract

Information technology has become a strategic resource in many organizations. As a result, the management of IT has dramatically increased in importance. IT is also changing at a rapid rate. This change is increasing the complexity of the challenges facing IT managers.

Previous research has hypothesized that IT managers experience problems due to change in IT. The results from that research were used for a nationwide survey of 1,000 IT organizations. Two hundred forty-six respondents provided data to confirm the existence and refine the definitions of problems that IT managers experience due to changing IT. Nine problem categories emerged. They were New Integration, Support Burden, Training Demands, Resistance, Acquisition Dilemma, Errors, Vendor Oversell, Cascading Needs, and Vendor Neglect.

These findings provide a better understanding of the problems caused by changing IT and a stronger basis for future research on them. They also provide IT managers with a checklist of potential problems when faced with such change.

Practical and Theoretical Bases

The business world exists in a constantly changing environment. Information technology (IT) is a key dimension of that environment (Lederer and Mendelow 1990). Although it is difficult to imagine a business today that does not in some way rely on IT as a foundation for its activities, little is known about the problems encountered by IT management that arise from rapid changes in that key environmental dimension.

Keen (1991) predicted that by 1993 it would be impossible for firms to define an effective business strategy that does not rely significantly on IT. This growing significance of IT increases the importance and difficulty of managing it. The fact that IT constantly changes compounds the difficulty.

An MIT study, "The Management in the 1990s Research Program," indicates there is general agreement that the rate of change is accelerating (Allen and Scott Morton 1994). Other published reports indicate that IT is changing at an unprecedented rate (Boar, 1994; Geisler, 1992). Industry observers and recent surveys suggest that this changing IT is causing problems for IT management (Carey 1992; Boar, 1994; Paul 1994; ComputerWorld 1995).

Besides such observations, problems due to change in IT are grounded in theory. An environmental impact theory (EIT) proposed that changing dimensions of the environment cause management problems for IT organizations (Lederer and Mendelow 1990). The EIT was based on structured interviews with IS executives. A revised EIT suggested that IT organizations experience eleven specific categories of problems due to change in IT (Benamati, Lederer and Singh 1997).

This paper describes additional research on the problems due to changing IT as experienced by IT organizations. It specifically attempts to answer this research question with a large sample: What problems, resulting from rapid change in IT, affect IT management?

Methodology

The original and revised EIT resulted from small sample, qualitative studies. The eleven problem categories from the latter study came from the analysis of the descriptions of 142 problems experienced by sixteen IT professionals (Benamati et al. 1997).

The current study used a field survey. The survey items parsimoniously represented the 142 problems discussed in the revised EIT study. The survey asked to what extent subject organizations had experienced 39 specific problems on recent development, implementation, and support efforts.

A pilot study was conducted with five IT professionals. It was done to increase the clarity and conciseness of the survey, and to check that the items portrayed their intended meaning. The survey was distributed nationwide to a random sample of 1,000 IT professionals. The IT professionals provided a total of 246 usable responses.

Data Analysis

The goal of the analysis was to employ confirmatory factor analysis (CFA) to validate the existence of the eleven problem categories proposed in the revised EIT. The maximum likelihood (ML) method of parameter estimation was employed. In this study the latent variables were the eleven problem categories. Each of the 39 survey items was posited to measure one of the problem categories. This was based on the categorization in the revised EIT study.

This analysis employed a model generation approach. Three determiners of statistical fit were used. The first was the chi square ratio. The common rule of thumb for an acceptable fit is a chi-square to degrees of freedom ratio of less than 2.0 (Hatcher 1994). Two fit indexes were also used as recommended by Hatcher (1994). They were the Bentler and Bonett's (1980) non-normed fit index (NNFI) and Bentler's (1989) comparative fit index (CFI). Hatcher recommends the NNFI and CFI because each tends to better reflect model fit regardless of sample size. Values over .9 for each of these indexes indicate a relatively good fit.

The CFA resulted in a problem type measurement model that was statistically and theoretically acceptable. The model displayed a chi-square to degrees of freedom ratio of 1.50 and a CFI and NNFI of .94 and .93 respectively, indicative of an acceptable fit (Bentler and Bonett 1980; Bentler 1989; Hatcher 1994). Therefore, this model was accepted as the measurement model for problem types. Table 1 lists the problem categories and their indicator variables.

To test whether the extent to which the meaning of each measurement was consistent, this study applied two tests of reliability, coefficient alpha and composite reliability. All coefficient alphas exceeded 0.70 except that of Training Demands which was 0.63. Nunnally (1978) and Hatcher (1994) both indicated that values of 0.60 are often acceptable in social sciences research. Also, all indexes of composite reliability in the model, except Training Demands at .648, exceeded the preferred level of .70 (Hatcher 1994). Training Demands exceeded the minimally acceptable level of .60 (Hatcher 1994).

To test whether the extent to which the model measured what it was intended to measure, three types of validity were examined. The first, content validity, was supported through the feedback of the pilot subjects. Their feedback was incorporated in the final survey. The second and third types, convergent validity and discriminant validity, were tested statistically and supported.

Findings

This research found support for the revised EIT model (Benamati et al. 1997). Nine of the eleven problem categories originally posited by Benamati et al. (1997) were supported by the data. Six problem categories, *New Integration*, *Support Burden*, *Training Demands*, *Resistance*, *Acquisition Dilemma*, and *Errors*, had factor scores significantly higher than the final three, *Vendor Oversell*, *Cascading Needs* and *Vendor Neglect*.

The most severe problem appears to be the *New Integration* requirements created by new IT. Changing IT has resulted in fresh challenges to integrate the wide variety of new IT, both with existing and other new IT. The appropriate placement of expertise in the IT organization (i.e., *Support Burden*) and both developing and keeping those skills (*Training Demands*) in the organization are also quite problematic.

On the other hand, the relatively lower factor scores of the second category grouping (*Vendor Oversell*, *Cascading Needs* and *Vendor Neglect*) indicate that these categories are not as critical a source of problems for IT organizations.

Implications for Research

The current study has confirmed the existence of categories of problems due to changing IT. More focused examination of each individual problem category could be useful to facilitate a better understanding of their challenges. Such study should also consider the effects of each category of problem, why some categories appear more prominent than others, and the interrelationships among them. Also, another sample should be collected to verify both the instrument and findings from this study.

A study similar to this one could also examine the existence of the coping mechanisms applied to the problems caused by changing IT. Additional research could then determine how IT organizations attempt to deal with the problems and how successfully they do so.

In a related manner, another stream of research should investigate the change in IT itself. Finally, all of these research efforts could also focus on identifying differing organizational characteristics that might be responsible for the problems and their solutions.

Implications for Practice

The survey items in Table 1 can provide a checklist of problems that arise from the use of new IT. Managers can assess each item, the extent to which they currently experience it, and the extent to which they feel they should take actions to avoid it. Generally, IT managers should give hard thought to the fact that problems will be encountered.

Anticipating and planning for them can help to avoid project delays and budget overruns. When problems are experienced, managers can take solace in the fact that they are not the only ones struggling with changing IT. Others are experiencing this phenomenon as well.

Table 1. Final Problem Type Measurement Model

| Factors | Items |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Acquisition Dilemmas | Difficulty choosing between available new ITs Difficulty staying informed about available new ITs |
| Cascading Needs | Cost of a test environment for new IT Unanticipated dependence on new IT Unanticipated need for additional new IT |
| Errors | Explainable errors in new IT Inadequate documentation of new IT Unexplainable errors in new IT |
| New Integration | Incompatibility between multiple ITs Need to create new interfaces between multiple ITs Need to rewrite existing interfaces |
| Resistance | Disagreement about the use of new IT Fading enthusiasm for one new IT when another becomes popular New IT not being used to its full extent Reluctance of users to accept new IT |
| Support Burden | Inability to prevent users from improperly reconfiguring new IT Inadequate IS organization structure to support new IT Lack of external expertise about new IT |
| Training Demands | Difficulty keeping staff who have experience with new IT Diminished productivity with new IT Time required to become proficient with new IT |
| Vendor Neglect | Failure of an IT vendor to stay in business Inability to pinpoint problems when integrating multiple ITs Insufficient experience of an IT vendor with its IT IT vendor lack of knowledge about integrating multiple ITs Pressure from an IT vendor to move to new IT |
| Vendor Oversell | Overselling of new IT capabilities by a vendor Premature vendor marketing of unavailable IT |

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