AN INITIAL STUDY OF THE LEARNING ORGANIZATION MODEL FOR EVALUATING INFORMATION TECHNOLOGY-BASED PROCESS IMPROVEMENT PROJECT POTENTIAL

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ABSTRACT

This paper presents the initial results of an empirical study of the learning organization concept to information technology enabled process improvement projects. A brief overview of the process change studies is presented. The Learning Organization Model is then presented as a possible framework for understanding the behavior of organizations engaged in the implementation of process improvements using information technology. An information technology oriented extension to this model is then presented. The results of the pilot study phase show that the extended Learning Organization Model does have some initial support.
Keywords: Process Improvement, Technology Implementation, Learning Organization

INTRODUCTION

During the 1990's, a substantial literature developed that emphasized the application of advanced information technology (IT) and a shift to a *process orientation* for organizing and managing the work of an enterprise to achieve competitive advantage. In their seminal works on redesigning the enterprise, Davenport [7] and Hammer and Champy [12] maintained that meaningful improvement required the fundamental rethinking of how businesses conducted operations. In this context of meaningful improvement, IT is seen as a fundamental enabler for new ways of doing business. The business environment of recent years has been marked by a rise in the importance of information technology as a key element in overall business strategy, specifically the use of Internet-based systems to promote and conduct operations [10, 25].

Despite the large number of companies engaged in process improvement and redesign, widespread success continues to be illusive. The success of a process improvement project is linked to the preparedness of an organization to undergo and manage change [19]. This paper examines the usefulness of the Learning Organization Model (LOM) described by Martin [18] and Schein [26] in understanding the preparedness of an organization to undergo process change. An extension of the traditional LOM model that explicitly addresses the influence of information technology and the preliminary results of an empirical study of this extended model are also presented.

BEHAVIORAL INFLUENCES IN PROCESS IMPROVEMENT

A review of the published works on reengineering reveals a distinctly behavioral aspect to how organizations perform process change. Environmental factors, such as culture or customer requirements often preclude the clean sheet approach [8, 17, 29]. Stoddard and Jarvenpaa [28] observed that organizations faced with competitive threats where survival was at stake were more radical in their tactics and solutions. However, organizations also tended to move towards less radical forms of change as soon as the opportunity presented itself. Clemons, Thatcher, and Row [5] also found evidence of behavioral factors in their study of reengineering risks. Companies tended to accept lower levels of innovation based on their ability to make painful choices and understand future directions.

LEARNING ORGANIZATION MODEL FOR PROCESS IMPROVEMENT

The LOM as described by Schein [26] is conceptually similar to the concept of punctuated equilibrium and Force Field analysis where opposing forces interact to promote or retard change within the organization. However, the Schein's model is more restrictive in that the fundamental forces in opposition are predefined. The LOM maintains that an organization's ability to *learn* or change is the result of an interaction between two opposing forms of anxiety referred to as the "Anxieties of Change". In this context, learning describes the activity of adopting new behaviors or instituting a change. The first of these "Anxieties of Change" is labeled Anxiety I. Schein defines Anxiety I as "the feeling associated with an inability or unwillingness to learn something new because it appears too difficult or disruptive" (page 86). Martin [18] extended this concept to the organizational resistance to radical changes brought about by an Enterprise Engineering effort. In Martin's conception of Anxiety I, focus is placed on the unwillingness to undertake disruptive action. The whole range of behaviors classified as *resistance to change* is attributed to this anxiety. The effect of this construct on the outcomes of a process improvement project or any organizational change effort is to limit the magnitude of potential improvements. Opposing "Anxiety I" in Schein's [26] Anxieties of Change is "Anxiety II" or the *fear of inaction*. This behavior is manifested as the concern that not acting will cause pain or disruption of a favorable state of affairs. Martin's [18] describes this behavior in terms of organizational *self-preservation*. This fear is manifested in the perception that the organization is at risk from forces within the competitive environment. Fear of inaction becomes a motivating force to bring about change. Every published work in the area of process improvement, incremental and radical, emphasizes the requirement to develop a *business case* for any proposed change. The business case is the formalization of the threat from inaction. This anxiety is used in process improvement and process redesign methodologies to overcome the tendency to resist changes. The LOM applied to Enterprise Engineering by Martin [18] assumes that the application of IT is subject to the same forces as the more general process redesign effort. In many respects this assumption is supported by the IT implementation literature [2, 9]. However, the implementation of enabling forms of IT is subject to additional behavioral and organizational forces. New technologies also have the ability to invoke fear and resistance within organizations. Individuals capable of coping with structural changes may resist technology changes for fear of job displacement or safety fears [2, 16]. Stoddard et al. [29] notes that the lead-time required to build information systems specified in Pacific Bell's reengineering project contributed to the diminished level of process improvement actually achieved.

RESEARCH MODEL

The research model proposed in the current study integrates both sets of issues into a common framework that provides an explicit IT extension to Martin's [18] version of the LOM (see Figure 1). Within the context of this study, the behavior described by Schein's "Anxiety I" or the *fear of action* will be labeled *Conservatism*. Although this behavior is typically discussed in a negative light, there is no empirical evidence to support an assertion that organizations are fearful or that caution is necessarily bad. Conservatism is generally used to describe a tendency to resist radical change or to take a high-risk position. This type of behavior is more descriptive of the phenomena of interest and lacks the negative connotations associated with fear. In the current study the construct Conservatism is defined as: *The degree of willingness to pursue changes to the organization and structure of current business processes and techniques.* This construct is expected to manifest itself as a constraining influence on the outcomes of process

improvement projects. High levels of conservatism in a process improvement project should serve to decrease the resulting level of change.

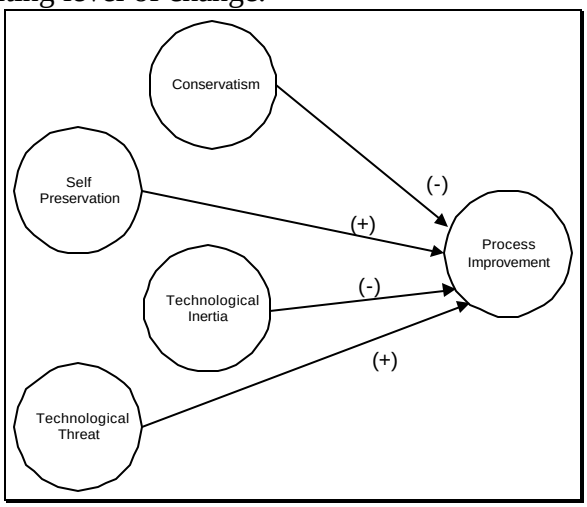

Figure 1. Extended Learning Organization Model

Self Preservation is defined as the *magnitude of concern that environmental forces threaten the organization's survival*. This construct represents the counter-force to the fear of acting (Conservatism), and in essence is the fear of inaction. Self-Preservation is fostered as part of a change management effort to galvanize an organization to act. Changes in the business environment that alter the rules of competition can place lagging companies at a disadvantage [10]. Creating this sense of urgency is needed to overcome Conservatism and organizational inertia. *Self-Preservation* is expected to provide a positive influence on the outcomes of process improvement projects, helping to overcome Conservatism and resistance to change.

The Technological Inertia construct refers to the predisposition of organization members to avoid the pain of change. Specifically, this construct refers to the potential disruptions caused by changes to the technological infrastructure and techniques used in the organization. Technological Inertia also possesses an economic based aspect that serves to dampen both technological innovation and subsequent process improvement outcomes.

Technological Pressure refers to as the cost of inaction in technology adoption [10]. The primary difference between this construct and Anxiety II is that the perceived danger from the environment is based on the advent of new technologies. Changes in technology act as a driving force for subsequent business process change [7, 20].

PILOT STUDY RESULTS

A field study of IT enabled business process improvement projects was designed to test the proposed research model and the validity of the LOM in the area of process change. A questionnaire was designed to measure respondent perceptions of external threat (competitive and technological) and resistance to change (organizational and technological inertia). Maximal use was made of pre-existing scales as a means of improving the validity and reliability of the resulting instrument [14]. The Self-Preservation and Technological Pressure scales were developed based on Porter's [24] competitive forces model and the IT-oriented extension developed by McFarlan and colleagues [4, 21]. A risk aversion scale developed by Sitkin and Pablo [27] was used to measure the Conservatism construct. This scale had shown a high level of reliability for measuring the tendency of decision-makers to exhibit more or less risk adverse behavior in a business-oriented environment. The Technological Inertia questions were adapted

from two scales published in the IT adoption literature. The component scales were taken from Moore and Benbasat [22] due to its reliability in measuring IT adoption decisions under risk (as in a process improvement project) and from Agrawal and Prasad [1] because of close conceptual with the construct under study.

Questionnaire Development

The construct validity of the instrument was assessed through a series of expert reviews. Questionnaire items were placed on individual slips of paper and the deck of questions was shuffled. Judges were asked to group like items together. The judges were then asked to provide a label for the category using their own words. Each judge created five separate groupings, which matched the number of underlying constructs. The terms used for the groupings were also quite similar across all judges. After completing the sorting procedure for all three judges, the groups were examined to determine which questions were grouped together. Figure 2 shows the overall results of the grouping procedure. The high scores along the diagonal indicate that the questions form conceptual groupings and provide evidence of construct validity [22]. Inter-rater reliability scores were also computed using Cohen's K [6] statistic. The level of inter-rater agreement was K=.61, which is lower than recommended [22]. However, tests of significance for agreement levels between each judge were highly significant with p<.0001.

Combined	Inertia	Comp. Pressure	Tech Inertia	Tech Threat	Outcomes
Inertia	15	1	0	0	0
Comp. Pressure	1	17	0	0	1
Tech Inertia	0	0	39	10	4
Tech Threat	0	2	10	14	3
Outcomes	1	1	4	2	13

Figure 2. Question Sorting Matrix

Pilot Sample and Survey Reliability

Companies that had undertaken some form of process improvement effort that incorporated information technology where recruited to participate in the pilot phase of the study. The questionnaire was mailed to the sponsors and team leaders for projects undertaken by participating companies. Sponsors and team leaders were recruited because of their role in setting the project tone and in signing off on project results. The combined scores of the project sponsor and team leader were used to obtain a measurement of the attitudes guiding the overall project. Initial Crombach Alpha scores for the Self-Preservation, Technological Pressure, Technological Inertia, and Conservatism scales were -.49, .32, .79, and .80 respectively. The values for Self-Preservation and Technological Pressure were well below levels recommended in the literature. Inspection of the Item Analysis report provided by NCSS indicated that there was a high degree of redundancy (R^2 values over .95) in the items of the original scales. The correlation matrix was examined for candidates to remove from the scales. Reliability measures for the revised Self-Preservation and Technological Pressure scales were .71 and .85 respectively, well within the acceptable range for new scales and scales that are not in wide use [14, 23].

Initial Study Results

As part of the theory building process, an initial statistical examination of the data from the pilot study was performed to determine if there was some degree of support for the proposed model. A project performance rating was computed for each subject. The performance rating was computed by first summing the responses on the project outcome items. The sum of the performance scores was then weighted with the importance of project to the strategic direction of the organization and the scope of the process change [11, 15]. The purpose of the weighting is to account for organizations that pursue large improvements in relatively insignificant processes. Improvement of non-critical processes does not produce meaningful organizational changes, and is not classified as a form of radical change [11, 15]. An overall attitude score was computed by subtracting the sum of the inertia forces (organizational and technological) from the external threat (self-preservation and technological) forces.

A correlation analysis was conducted that compared the rank order of each response based on the two sets of scores. A nonparametric Spearman Rank Correlation statistic was computed given the small sample size and use of attitudinal data. The resulting correlation between outcomes and attitude scores was .974 with a level of significance p=. 004. Although this analysis is quite preliminary, the large correlation between weighted project outcomes and attitude scores is quite promising.

CONCLUSIONS AND FUTURE DIRECTIONS

Estimated spending on process improvement projects is in the billions of dollars [3] and similar amounts are being directed towards the development of enterprise systems to enable survival in the Internet economy. Yet, the success rate of projects that require change to organizational processes has been quite limited. Hammer and Stanton [13] emphasize the need for organizational preparation as an essential ingredient for reengineering success.

The study discussed in this paper is still underway, and the results reported here are not intended to provide any definitive inferences on the usefulness of the proposed model. However, examination of the pilot study data appears quite promising. The presence of a statistically significant correlation between project outcomes and attitudes scores provides at least a cursory indication that the LOM research model proposed in the current study fits the data currently available. These findings also provide some level of confidence that the research design is sufficiently robust to detect the phenomena of interest.

The next phase of this study is to take the lessons learned in the pilot study and to perform primary data collection. Based on the findings from the item analysis of the pilot survey, redundant questionnaire items from the Self-Preservation and Technological Pressure scales were removed from the final survey instrument. The most telling lesson learned in the pilot phase is that organizations are incredibly sensitive in terms of releasing data about their process improvement efforts. This reluctance makes gathering the large sample sizes to meet the assumptions underlying many parametric statistical methods quite difficult. Given this reluctance, a more aggressive recruiting campaign is being conducted to obtain subjects for the main data collection phase of the study.

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