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IMPLEMENTING ENTERPRISE SYSTEMS: TOP MANAGEMENT INFLUENCE ON IMPLEMENTAION EFFECTIVENESS

How to minimize risks involved in enterprise systems (ES) implementation while maximizing benefits has become a challenge for top management. This article proposes a conceptual model exploring impacts of top management on ES implementation effectiveness. Top management influences under different ES implementation modes will then be examined. The paper concludes with potential contributions to IS researchers and practitioners.

Introduction

Enterprise systems (ES) are commercial software packages that manage and integrate business processes across organizational functions and locations. An ES, with its seamless integration of all the information flow through a company, promises long-term productivity and relieves managers from incompatible information systems and inconsistent operating practices. It is believed that in today's industries, which routinely share information electronically, it would be difficult to survive in business without an ES (Davenport, 1998). Therefore, it is not surprising that an increasing number of companies have made substantial investments in this technology as evidenced by explosive growth in sales -- US$23 billion a year -- of enterprise software packages (Williamson, 1997).

As an emerging technology, however, the results from ES implementation look quite mixed. On one hand, some typical success stories such as Autodesk, IBM and Fujitsu Microelectronics have exemplified how enterprise systems streamline organizational data flows, reduce operational costs, increase market responsiveness, strengthen management control of business, and thus greatly leverage the competitiveness of the organization. As well, for businesses that used to operate on a strictly national level and are now increasingly looking to widen their horizons, having a ES package in place to handle core business processes in the same way all over the world is a huge step towards operating as a global business (Goodwin, 1998). In some organizations, enterprise systems also serve as a lever for changing management practice and organizational structure (Davenport, 1998). For example, Union Carbide uses its enterprise systems to break down hierarchical structures and free its people to be more innovative and more flexible.

However, despite strong organizational incentives to adopting ES, implementation success is far from assured. It is reported that some companies were overwhelmed by the changes and thus abandoned their ES, while some went into bankruptcy after implementation of ES (Williamson, 1997; Bartholomew, 1997a, 1997b; Jesitus, 1997). For example, FoxMeyer Drug argues that its enterprise systems helped drive it into bankruptcy; Dow Chemical spent seven years and gave up its mainframe-based enterprise systems, which cost about half a billion US dollars (Davenport, 1998).

Risks for implementing ES lie in the nature of enterprise systems, which are generic solutions reflecting a vendor's, rather than customers', assumptions of what the best practices will be. Organizations are "forced to change their way (of) operating rather than being able to adapt software to their needs" (Lozinsky, 1995). It pushes companies toward full integration, and changes various business processes into generic ones even if the companies want to customize some of these business processes

(Davenport, 1998). Although ES customization is possible, options are limited due to complexity of an ES, time taken to compare choices, and choices that would be available suitable to specific organizational conditions. For example, a company can choose whether it wants to reorganize product revenue by geographical unit, product line, or distribution channel. SAP's R/3, a software package operated in client/server platform, offers more than 3,000 configuration tables that enable a company to tailor a particular aspect of the system to the way it chooses to do business. However, going through all of them can take a long time. For example, Dell spent more than a year on the task (Davenport, 1998).

As a result, implementing an ES spurs disruptive social-technical changes in organizations. The paradox facing organizations is obvious. The major benefits of ES are rooted in the total integration of a system. The fewer changes made to an enterprise system, the greater the enterprise system integration, and the more possible benefits to an organization. However, the greater the enterprise system integration, the more changes will occur in the existing process; thus, greater risks will be involved. Consequently, the key problem of ES implementation lies in how to minimize risks involved in changes induced by ES implementation, while maximizing ES benefits. This paradox highlights the role of top management in managing changes involved in the implementation process. The uniqueness of enterprise systems necessitates a better understanding of top management's influence on ES implementation.

This demand is intensified by a lack of attention to the current academic research on ES (Gable, 1998). Despite widespread employment of enterprise systems, very little is known about the (un)successful deployment of these systems. Among studies on enterprise systems, most are business press articles addressing issues of ES implementation process. There are also some cases describing the adoption and implementation process of ES across an organization (Hirt and Swanson, 1998). In contrast to the number of studies in the practitioner world, there is limited ES academic research to date.

To make up for these gaps, this article intends to study impacts of top management on ES implementation success. In particular, in order to identify effective tactics for managing ES implementation processes, the paper will explore these impacts under different ES implementation modes. To achieve these goals, this article will provide a research model based on previous research on information technology (IT) innovation implementation. This paper takes a perspective of innovation implementation because of the fact that ES, per se, is an IT innovation. Three forms of top management influences on implementation processes are then identified. ES implementation effectiveness is developed in order to differentiate from ES innovation effectiveness. The paper concludes with potential contributions to the IS researchers and business practitioners.

Theoretical Background and Conceptual Model

Background Research on Innovation Implementation

Since organizational change has become a necessity to cope with the uncertainties of an ever more turbulent and complex external environment, IT innovation has become an important research issue over the past decade. There are two views of innovation: From a source-based perspective (Amabile, 1988; Kanter, 1988), innovation is a new product or service created by an organization or individual for market. In contrast, a user-based perspective argues that an innovation is a technology or practice that is new to the adopting organization (Damanpour, 1991), no matter whether other organizations have used it previously (Nord and Tucker, 1987). Most studies on IT innovation base their research on user-based views (Swanson, 1994; Grover, 1993), that is, on how organizations initiate, adopt and finally implement an IT innovation (Rogers, 1995).

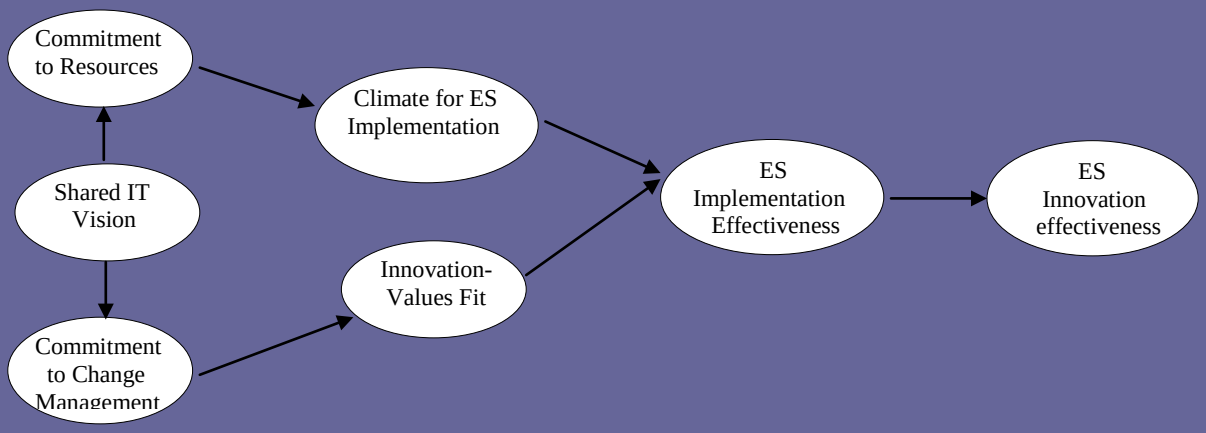
As a final stage of IT innovation processes (Roger, 1995), IT innovation implementation attempts to ensure that expected benefits of innovations are realized. It is a process of "gaining targeted employees' appropriate and committed use of an innovation" (Cooper and Zmud, 1990; Klein and Sorra, 1996). As depicted by Cooper and Zmud, new IT contribution to organizational performance can't be realized unless target users adapt to changes induced by IT innovation and become committed to IT usage. Although an organization's failure to achieve the intended benefits may be caused by IT innovations that organizations chose (Damanpour, 1991; Grover, 1993), it is increasingly evident that it is implementation failure, not innovation, that causes many organizations' inability to gain the intended benefits of the technologies they adopt (Hackman and Wageman, 1995; Reger, Gustafson, DeMarie, and Mullane, 1994).

Top management is believed to be a key factor for successful innovation implementation (Grover, et al, 1995). To exploit business value of IT innovation, top management must facilitate integration of emerging information technologies with their business processes and organizational contexts. This requires top management's strategic vision of IT innovation's role in strengthening and promoting organizational competitive advantage (Davenport, 1998). Moreover, top management must provide a positive environment for IT innovation by anticipating and overcoming resistance to the innovation, securing resources for adoption, and promoting committed usage of IT innovation (Zmud, 1984; Ramamurthy and Premkumar, 1995; Grover, 1993).

This understanding of top management's influence on innovation implementation processes, however, has not been completely examined. Compared to the importance of top management in successful innovation implementation in practice, it is largely ignored in the academic world, aggravated by the paucity of research on innovation implementation. Among the few studies on top management's influence on innovation implementation, some are not applicable to cross-organizational studies (Leonard-Barton and Deschamps, 1988), and some describe pieces of managerial influence on innovation implementation (Grover, 1993; Ramamurthy and Premkumar, 1995; Zmud, 1984). An integrative model that captures and clarifies how top management impacts innovation implementation process is necessary.

Based on the model of determinants of innovation implementation effectiveness proposed by Klein and Sorra (1996), this article will present an integrative model describing top management's influence on successful ES implementation. The primary premise of the model, depicted in Figure 1, is that (a) top management commitment to resources (TMCR) influences ES implementation effectiveness -- quality and consistency of usage of adopted ES, through affecting organizational climate for ES implementation, and (b) top management commitment to change management (TMCC) impacts ES implementation effectiveness by exerting its influences on targeted users' perceptions of innovation fit to their values. In order to achieve successful ES implementation effectiveness, both TMCC and TMCR must be supported by shared understanding between senior business managers and IT managers regarding ES's contributions to business. The following section will focus on defining key terms and explaining relationships between latent variables.

Figure 1. Conceptual Model of Top Management's Influence on ES Implementation



Key Terms and Hypotheses

ES implementation effectiveness and innovation effectiveness. Evaluating implementation has long been a barrier to conducting innovation implementation study. Since innovation implementation is the process during which an IT innovation is diffused within a targeted user community (Cooper and Zmud, 1990), innovation implementation effectiveness is thus defined as "the consistency and quality of targeted organizational members' use of a specific innovation" (Klein and Sorra, 1996). In this paper, targeted users refer to individuals who are direct users of the innovation, such as production workers. Therefore, ES implementation effectiveness reflects the extent to which ES is being used in an organization. It ranges from avoidance of the innovation (nonuse) to unenthusiastic use (compliant use) to skilled, enthusiastic and consistent use (committed use) (Klein and Sorra, 1996). Recent case study conducted by Webster (1998) has found existence of the three different users.

While ES implementation effectiveness indicates the degree of innovation acceptance after ES implementation, ES innovation effectiveness describes the benefits an organization receives as a result of its implementation of a given innovation (e.g., improvements in profitability, productivity, customer service, and employee morale) (Klein and Sorra, 1996). Since realization of ES innovation effectiveness depends heavily on committed and enthusiastic use of ES among targeted uses, it is reasonable to hypothesize that:

Hypothesis 1: ES implementation effectiveness is positively related to ES innovation effectiveness.

Climate for ES implementation. Schneider (1990) defines climate as employees' perception of the events, practices, and procedures and the kinds of behaviors that are rewarded, supported, and expected in a setting. According to Schneider, climate describes employees' shared perceptions -- not evaluations -- of the extent to which specific work practices, procedures, and rewards promote behaviors consistent with a specific strategic outcome of interest. The stronger the organizational climate for a given work practice, procedure, or behavior, the more encouraged targeted users feel to comply or to adopt.

In the context of ES implementation, an organization's climate for the ES implementation concerns targeted users' shared perceptions of the extent to which their use of ES is rewarded, supported, and expected within their organization. The stronger the climate for ES implementation, the more targeted users actively engage in consistent and effective use of ES within an organization.

Hypothesis 2: The stronger an organizational climate for ES implementation is, the better implementation effectiveness.

Innovation-values fit. Although an organizational climate for innovation implementation provides strong incentives for innovation usage, it does not ensure committed use of innovation. Users may compliantly use an innovation, which means users may accept organizational influence in order to gain specific rewards and to avoid punishments. It is only when targeted users perceive innovation usage to be congruent with their values that targeted users will internalize innovation and become committed and consistent users of innovation (Sussman and Vecchio, 1991).

Values are generalized, enduring beliefs about the personal and social desirability of modes of conduct (Kabanoff, Waldersee, and Cohen, 1995). Instead of studying various individual values, this paper focuses on organizational and group (targeted users) values shared by a large part of organizational members. These values, concerning organization and the group itself, are stable but may evolve in response to changing environment and organizational circumstances. Values can be differentiated with

high intensity and low intensity. High intensity values resemble radical and passionate views concerning desirable or undesirable action on the part of organization and its members. Values with low intensity resemble matters of little importance for organizational members.

Innovation-values fit describes the extent to which targeted users perceive that use of the innovation will foster the fulfillment of their values (Klein and Sorra, 1996). Based on their evaluation of characteristics of an innovation and its social implications, targeted users judge the fit of the innovation to their values. Innovation-values fit is good when a given innovation is highly congruent with targeted users' high-intensity values. The fit is poor when the innovation is highly incongruent with targeted users' high-intensity values, and neutral when the innovation is either moderately congruent or moderately incongruent with targeted users' low-intensity values (Klein and Sorra, 1996).

Hypothesis 3: The innovation-values fit is positively related to implementation effectiveness. A good innovation-values fit will lead to better implementation effectiveness.

Shared IT vision. A vision is vital in that it stimulates the formation of strategic missions and that it enables executives to decide what courses of action to pursue and what not to pursue. (Avison, Eardley, and Powell, 1998; Vandermerve, 1995). Vision has two inter-related meanings: First, vision is regarded as a perception of a current situation and, second, vision is considered as a prediction of future events relating to a particular context (Avison, Eardley, and Powell, 1998). Therefore, a vision implies a clear understanding of what a current situation is, and based on that, vision develops a grasp of what the situation might be, or could be, at some future time.

Shared IT vision describes an understanding among senior business officers and senior information systems officers about IT innovation and its contributions to organizational competitive advantage (Reich and Benbasat, 1996; Zviran, 1990). Lack of shared IT vision contributes to the most severe problems in innovation implementation (Grover et al., 1995). Organizations that adopt innovations without a clear shared IT vision may find the technological choices unsuitable for its business processes and organizational resources will be wasted. Specifically, for companies that have installed ES, the biggest problems are not just cost and complexity of an ES, but management incentives to implement ES without considering its business implications (Davenport, 1998). Without shared IT vision, an adoption and implementation to solve current problems will not gain commitment from top management, and is the very factor that creates even larger problems in the future.

Hypothesis 4:ES implementation with shared IT vision will lead to consistent top management commitment to resources and change, and will eventually result in positive implementation effectiveness.

Top management commitment is one of the most-studied factors in successful IT innovation implementation. Commitment is defined as a state of mind that holds people in a determined behavior (Staw, 1982). The paper has found that two aspects of top management commitment -- commitment to resources and commitment to change management -- have been studied (Hirt and Swanson, 1998; Grover, 1999; Grover et al., 1995). While the two aspects are equally important to success of innovation implementation, the former is what most studies focus on and the latter has been largely ignored.

Top management commitment to resources (TMCR). TMCR describes the extent to which top management is determined to provide enough financial and technological resources to ensure smooth completion of innovation implementation (Ginzberg, 1981). Top management commitment to resources influences organizational climate for innovation implementation in that it is a kind of higher-level management support that promotes IT innovation implementation activities among targeted users. TMCR,

by showing top management's determination to fully support innovation implementation, encourages targeted users' acceptance of new systems within an organization (Igbaria, 1990; Igbaria and Chagrabarti, 1990; Igbaria and Guimaraes, 1994). Lack of commitment to resources could lead to indifference or deliberate organizational resistance to system implementation (Grover et al., 1995), and may even cause abandonment of implementation (Ewusi-Mensah and Przasnyski, 1991). Case studies on enterprise systems suggest that the commitment of top management to resources is key to facilitating implementation processes (Hirt and Swanson, 1998).

Hypothesis 5: Top management commitment to resources (TMCR) is positively related to the organizational climate for ES implementation and its effectiveness.

Top management commitment to change management (TMCC). Recent studies have identified that change management has become the most severe source of difficulty in IT implementation, especially in the IT implementation that involves fundamental changes in organizations (Grover et al., 1995; Stoddard and Jarvenpaa, 1995). Change management refers to mitigating targeted users' resistance to change that is induced by a new innovation, and thus to facilitating organizational acceptance of IT innovation. Commitment to change management depicts the extent to which top management engages in promoting organizational receptivity of IT innovation by training, by formal presentation, and by establishing communication between top management and targeted users (Champy, 1995; Davidson, 1993; Hall et al., 1993; Hammer and Champy, 1993). By informing targeted users about characteristics of innovation and their impact on organization and targeted users, TMCC reduces uncertainties around technical changes and organizational transformation. As well it promotes the fit between innovation and targeted users' values, and eventually alleviates misuse and resistance to ES usage within an organization. In addition, it is believed that efforts devoted to solving difficult change management problems would pay off in terms of implementation success, whereas inability to manage organizational change would most likely lead to implementation failure (Grover et al., 1995). In summary, TMCC expedites organizational learning, facilitates organizational receptivity of ES, and eventually leads to implementation and innovation effectiveness.

Hypothesis 6: Top management commitment to change management (TMCC) is positively related to the innovation-values fit .

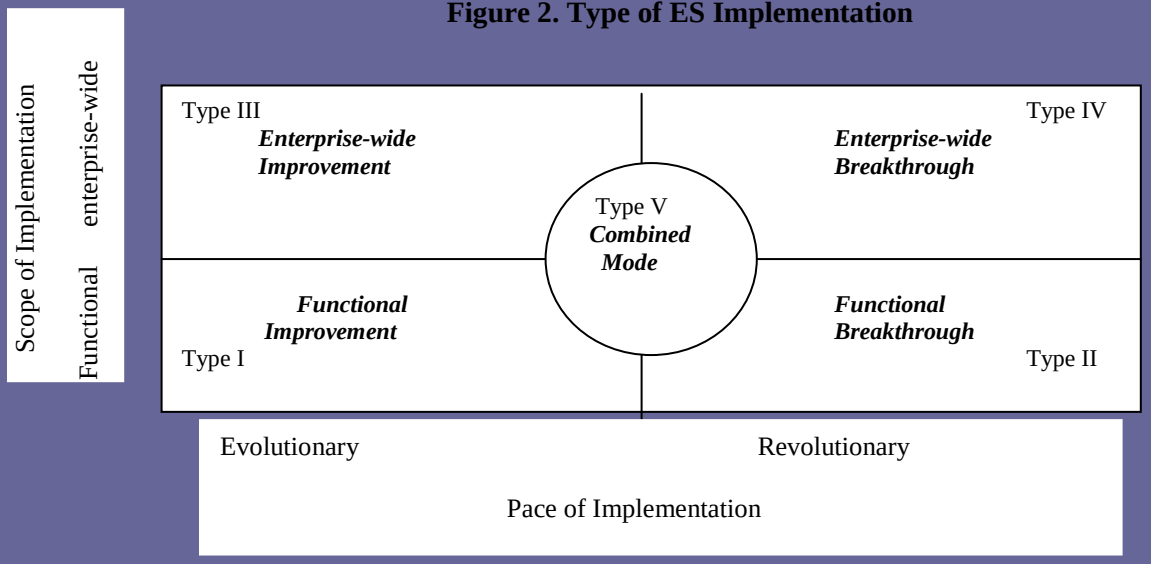
Top Management Influences Under Implementation Mode

Since different implementation modes represent different degrees of organizational change, top management's influence on IT innovation implementation should be studied under different implementation modes. To capture changes induced by IT innovation implementation, two dimensions -- pace and scope—are introduced below (Lee and Kim, 1998).

The pace of new IT implementation is characterized as evolutionary versus revolutionary (Gallivan et al., 1994; Stoddard and Jarvenpaa, 1995). The evolutionary pace of the innovation process suggests a gradual, staged approach, while the revolutionary pace is all-at-once in a short period (i.e. "big-bang"). The typical notion of the scope of implementation is functional and local or enterprise-wide (Stoddard and Jarvenpaa, 1995). The scope of implementation denotes the location of IT innovation, for example, whether it will be installed within one function, or one organization (Lee and Kim, 1998).

To clearly understand top management's role under different implementation modes, I propose five types of ES implementation, as presented in Figure 2, based on the contingency model of Lee and Kim (1998).

Figure 2. Type of ES Implementation



Type I—functional improvement. The scope of implementation is functional and the pace of implementation is evolutionary. It is supposed to be the least disruptive option, because enterprise systems will be installed in a phased process within a limited part of an organization. Implementing one or more modules in several departments of organizations is a typical example of this form of implementation. Under this implementation mode, requirements for TMCC and resources are low. Innovation effectiveness will be achieved when ES implementation is supported by shared IT vision.

Type II--functional breakthrough. The scope of implementation is functional, while the pace of implementation is revolutionary. ES implementation takes a revolutionary approach within a function. Since this mode is suitable for promptly addressing functional problems, financial and technical resources must be ensured to guarantee smooth ES implementation. At the same time, radical changes in functional practices warrant top management commitment to change management. However, since its scope is within a function or among a few departments, demands for TMCC and TMCR are not as high as those in enterprise-wide implementation.

Type III—enterprise-wide improvement. The scope of implementation is enterprise-wide but the pace of implementation is evolutionary. This mode represents a phased and planned approach to installing enterprise systems. Since it is a long term implementation, involving changes within a whole organization, there are strong demands for TMCC and TMCR to achieve implementation effectiveness.

Type IV—enterprise-wide breakthrough. The scope of implementation is enterprise-wide and the pace of implementation is revolutionary. This approach will dramatically change organizational fundamental paradigms and may generate enterprise-wide repercussions. Organizations embrace this approach when they believe that a radical improvement can be achieved by rapidly dismantling existing business processes and organizational structures (Orlikowski, 1993). The basic tenet of the approach is that people must qualify for change rather than have change adapt to people (Stoddard and Jarvenpaa, 1995). Therefore, achieving implementation effectiveness requires strong demands for TMCR but low demands for TMCC.

Type V—combined mode. The scope of implementation is larger than starting focus of ES implementation, while the pace of implementation is a combination of revolutionary and evolutionary. Three case studies of Stoddard and Jarvenpaa (1995) reveal that implementation mode need not be "clean slate" or "green field". A company may choose a revolutionary approach in its pilot implementation in one of its departments, for example, and adopt evolutionary approach (phased approach) in its enterprise-wide implementation. The underlying aim of this approach is to select the best implementation mode, tailoring various conditions among functions and within an organization. Consequently, both TMCC and TMCR are important to help targeted users accept usage of ES. Demands for TMCC and TMCR will be stronger when it is enterprise-wide implementation rather than functional implementation. Table 1 summarizes top management influence under the five implementation modes. It is believed that ES implementation with shared IT vision between top business and IS managers will accomplish better implementation effectiveness than it would without shared IT vision.

Table 1. Top Management Influence on Implementation Effectiveness under Implementation Mode

	Strong	Medium	Low	Implementation Effectiveness	
				With shared IT vision	Without shared IT vision
Type I			TMCC TMCR	High	Low
Type II		TMCC	TMCR	High	Low
Type III	TMCR		TMCC	High	Low
Type IV	TMCC TMCR			High	Low
Type V	If enterprise-wide, TMCC, TMCR	If functional, TMCC, TMCR		High	Low

Conclusion

Innovation implementation is the subject of little research, especially on ES implementation. Despite challenges faced by top management as to how to minimize risks involved during ES implementation while maximizing ES benefits, there is little attention given to the subject in the academic world. This paper contributes to the innovation implementation study by tapping managerial influences on successful ES implementation. To academic researchers, the integrative conceptual model proposed in this paper makes up for scarcity in conceptualizing top management influence on implementation effectiveness. To practitioners, this paper is useful in analyzing top managers' roles in successful ES implementation and identifying latent problems. As well, classification of five types of implementation modes helps managers position themselves and thus identify effective managerial tactics. Furthermore, differentiation between implementation effectiveness and innovation effectiveness highlights the importance of organizational implementation policies and practices in determining the strength of organizational climate for ES implementation.

The next step in examining top management influences on ES implementation effectiveness is to develop an instrument to measure the constructs involved. Testing the conceptual model in a variety of settings would not only promote our understanding of top management roles but would also help enrich the model.

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