

Organizational Learning Process: Its Antecedents and Consequences in Enterprise System Implementation

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ABSTRACT

This paper uses organizational learning as a lens to study how firms implement the enterprise system. The core research questions are: What are the critical organizational factors affecting organizational learning in ES implementation? How do these elements shape the learning process and thereby influence ES implementation outcomes? To address these questions, we conducted comparative case study with two organizations that have recently adopted ES and achieved significantly different results. Based on the empirical findings, we propose a framework that describes how organizational factors affect the four constructs of organizational learning in ES implementation context — knowledge acquisition, information distribution, information interpretation and organizational memory.

Keywords: enterprise systems; organizational learning

INTRODUCTION

Over the past few years, Enterprise Systems (ES) have generated much interest among researchers and practitioners as a potential means to enhance organizational agility (Davenport, 1998; Sambamurthy, Bharadwah, & Grover, 2003). While interest and investment in

ES have been rising steadily, actual experiences with ES have exhibited more ambiguity. Some studies report improvements in efficiency and effectiveness from ES adoption, yet others find that the expected gains are far beyond reach (Al-Mashari & Zairi, 2000). It is imperative to conduct research that can make sense of the

apparently-inconsistent ES adoption results.

Most of extant research on ES focuses on discrete critical success factors leading to on-time and within budget implementation (e.g., Bingi, Sharma, & Godla, 1999; Holland & Light, 1999; Parr & Shanks, 2000; Sumner, 2000). Yet, to leverage the business value of ES, it is not sufficient to simply adopt and install the system. Rather, employees and the organization as a whole must learn how to apply the technology effectively while they are implementing the system (Argyris & Schon, 1978; Attewell, 1992; Cooper & Zmud, 1990; Fichman & Kemerer, 1997; Purvis, Sambamurthy, & Zmud, 2001). The learning process plays a critical role in shaping IT adoption results (Tippins & Sohi, 2003). Hence studying how different forces affect the organizational learning process allows us to understand what leads to different ES implementation outcomes.

In this paper, we use organizational learning as a lens to study how firms implement ES. Extant ES literature alludes to organizational learning sporadically and most of them do so in a cursory fashion, except the work of Robey, Ross, and Boudreau (2002) and Scott and Vessey (2000). Different from these studies, this paper studies all four constructs of the underlying learning process involved in ES implementation - knowledge acquisition, information distribution, information interpretation and organizational memory (Huber, 1991). The core research questions are: What are the critical organizational factors affecting organizational learn-

ing in ES implementation? How do these elements shape the learning process and thereby influence ES implementation outcomes? To address these questions, we collect data by conducting case studies with two firms that have implemented ES within budget and on-time, but with significant different outcomes.

This paper makes three principal contributions. First, drawing on the rich data of two organizations' experiences, the paper generates an understanding of the organizational learning associated with ES implementation. Second, dealing with the complex links traced in context, this paper adds substantive content to our understanding of the central role played by organizational factors in the organizational learning enacted in ES implementation. Such an understanding has been absent from the research and practice discourses on ES. Third, the paper integrates our research findings with the more formal insights available from the IS implementation and organizational learning literature. It facilitates researchers and practitioners to explain, anticipate, and evaluate the organizational learning process associated with the ES adoption. This paper is organized as follow: First, we briefly describe theoretical background of this study. Second, we discuss our research methodology. Third, we present the empirical findings that emerged from our case study. Last is our discussion and conclusion.

THEORETICAL BACKGROUND

Firms' ability to apply IT effectively in their business activity explains the different outcomes of their IT adoption

(Armstrong & Sambamurthy, 1999; Boynton, Zmud, & Jacobs, 1994; Cooper & Zmud, 1990; Feeny & Willcocks, 1998; Sethi & King, 1994). When technologies are first introduced, they impose a substantial burden on the adopter in terms of the knowledge needed to understand and use them effectively (Argyris & Schon, 1978; Attewell, 1992; Fichman & Kemerer, 1997; Purvis, Sambamurthy, & Zmud, 2001). Organizations must undergo an intensive learning process to bridge the gap between what they have known and what the new technology requires them to know. Thus, the effectiveness of the organizational learning process plays a critical role in shaping IT adoption results. Indeed, this argument has been widely tested to be valid by the IS implementation literature (e.g., Boynton et al., 1994; Ciborra & Lanzara, 1994; Fichman & Kemerer, 1997; Lyytinen & Robey, 1999; Pentland, 1995; Purvis et al., 2001; Wastell, 1999).

Organizational learning is defined as a process enabling the acquisition of, access to and revision of organizational memory, thereby providing direction to organizational action (Robey et al., 2002). As cognitive entities, organizations are capable of observing their own actions, experimenting to discover the effects of alternative actions, and modifying their actions to improve performance (Fiol & Lyles, 1985). The breadth and depth of organizational learning are positively related to its four constructs — knowledge acquisition, information distribution, information interpretation and organizational memory (Huber, 1991). Knowledge ac-

quisition is the process by which knowledge is obtained (Huber, 1991; Robey et al., 2002; Tippins & Sohi, 2003). Information distribution is the process by which knowledge obtained is shared through formal and informal channels (Maltz & Kohli, 1996; Slater & Narver, 1995). Information interpretation is the process by which functional units reach a consensus with regard to the meaning of information (Daft & Weick, 1984; Slater & Narver, 1995; Tippins & Sohi, 2003) and organizational memory refers to organizations' storing knowledge for future use (Huber, 1991; Walsh & Ungson, 1991).

Extant ES literature alludes to organizational learning sporadically, and most of them do so in a cursory fashion, except the work of Robey et al. (2002) and Scott and Vessey (2000). In addition, the literature suggests a list of critical success factors for ES implementation, such as leadership (Lee & Sarkar, 1999), top management support and change management (Al-Mashari & Zairi, 2000). But there is no study explicitly linking these factors with organizational learning enacted in ES implementation. Different from the extant studies, our research studies how organizational factors affect the learning process, which determines ES implementation outcomes.

RESEARCH METHODOLOGY

To address our research questions, we employ a case study methodology. As an empirical inquiry investigating a contemporary phenomenon within its real-life context, a case study is particularly appropriate when examining "how" and

“why” research questions (Yin, 1994). Given the nature of our research question and desire to obtain rich explanations of organizational learning process in ES implementation, a case study methodology is the most appropriate.

We selected two organizations for their similarities as well as their differences (Glaser & Strauss, 1967), paying attention to theoretical relevance and purpose. With respect to relevance, our selection process ensured that the substantive area addressed — the on-time and within budget implementation of ES — was kept similarly. As the purpose of the research is to generate insight into how organizational factors affect organizational learning enacted and thereby ES implementation outcomes, differences were sought in organizational conditions, such as the motivation of adopting ES, user training methods, and adoption outcomes. We first conducted a study with CPM — a PC and computer peripheral manufacturing company with 800 employees located in South China. The second company we studied was MEM which was a division of a publicly listed multi-national electronic manufacturing company. This division had 750 employees and was located in North China.

In both research sites, we collected data by using multiple methods: unstructured and semi-structured interviews, archival sources, and observation. This triangulation across various techniques of data collection provides multiple perspectives on an issue, supplies more information on emerging concepts, and yields stronger substantiation of constructs and

allows for cross-checking (Eisenhardt, 1989; Pettigrew, 1990; Yin, 1994).

In this study, we had both investigators make visits to the case study sites together so that we could avoid biases due to one single researcher’s perception. In particular, we followed Eisenhardt and Bourgeois’ (1988) strategy and had one researcher handling the interview questions, while the other recording notes and observations. This tactic allows the interviewer to have the perspective of personal interaction with the informant, while the other investigator retains a different and more distant view. The interviews we conducted are shown in Table 1. Each interview lasts between one and one-and-a-half hours. They were all tape-recorded and transcribed within 24 hours after the interview.

Data Analysis

We analyzed data within each site as well as across the two sites. Given the qualitative nature of the data collected, we avoided biases by using the iterative approach of data collection, coding, and analysis. Within CPM, the first site, we relied more on open-ended and generative interview questions. After these interviews, both authors independently read the transcripts of interviews and categorized data into concepts of salient organizational factors, major organizational learning activities, and implementation outcomes. The lists of concepts were compared and contrasted. Any difference was further examined and verified with the informants. This process yielded a broad set of concepts,

Table 1. Amount of interviewees

CPM		MEM	
Interviewee's Title	Count	Interviewee's Title	Count
Senior VP in Marketing	1	Senior VP	1
Senior VP in Manufacturing	1	General Manager	1
CIO	1	Vice General Manager	1
Departmental Manager	4	Departmental Manager	5
Line Worker	5	Line Worker	4

which guided our second field study conducted in MEM.

Following the constant comparative analysis method suggested by Glaser and Strauss (1967), we systematically compared MEM's experiences with those of CPM. Data collected from MEM were first sorted into concepts generated by CPM's data. However, the list of concepts did not accommodate some findings emerging from MEM. For example, the mistrust among mid-level managers led us to study the organizational culture's effect, which did not seem to be salient to us in CPM's case. In this kind of situation, we went back to CPM to collect data related with these new concepts. The iteration between data and concepts ended when we had enough concepts to explain experiences of both sites.

RESEARCH FINDINGS

Organizational Factors and Organizational Learning in CPM

ES Vision. The vision of adopting ES was formulated when CPM was in a crisis. Its management decision-making

and inter-departmental coordination became ineffective due to its fast business expansion—more than 25% annual growth rate for four years in a row. As described by the CIO:

Our management encountered severe difficulties due to the lack of information support. The business data located in fragmented systems were inconsistent and difficult to reconcile... The coordination between departments was chaotic. For example, our accounting system didn't record the sales long after the goods were delivered and we didn't detect these mistakes until we did [a] physical count.

In addition to the internal difficulties, CPM faced a more and more competitive market, and profit margins of its major products were diminishing. To cope with these problems, the top management decided to expand its business scope and adopt the advanced packaged software—enterprise system. As explained by the CIO:

The packaged software in the market was a solution to integrate our system and streamline our business processes... It (ES adoption) is part of our business strategic plan... In addition [to] adopting an integrated system, we expected to change our practices and organizational structure in the light of ES functionalities.

With a “transform” vision of ES adoption, CPM treated it as an investment and was committed to it with slack resources. These resources allowed CPM to acquire ES knowledge by hiring consultants (the Consulting Group in our later description), whose service cost USD\$400,000. The consultant group transferred its system knowledge to CPM by helping the firm choose the right software/hardware, configure the system, and train end users. In addition, the consultants transferred the knowledge of process-oriented methodology to CPM and taught CPM managers how to use tools to draw business process diagrams. The external knowledge provided by the Consulting Group was critical to jump start CPM’s ES project, as commented by the IT manager:

ES is much more complicated than our old systems. Without the external knowledge from the consultants, I don’t think we would be able to get it implemented successfully.

Also, as described by the Senior VP of Manufacturing:

Though I had heard of the concept of process-oriented thinking, but I didn’t know how to describe our business practices by using the tools until I attended the classes... These business process diagrams were really helpful and greatly facilitated our sharing of business process ideas.

Equipped with process-oriented knowledge and graphically describing business process techniques, CPM managers were able to discuss business practices by representing business processes with a uniform set of notations. It enhanced the effectiveness of communications and facilitated information interpretation – another construct of organizational learning (this sub-process is described in later sections).

Advocacy of ES Vision

The necessity of adopting ES was first perceived by the CEO who had led the firm since it was first set up in 1988. In a top management meeting, CEO presented his idea about ES adoption and asked for attendants’ comments. After studying the feasibility of adopting ES for two weeks, the top management formulated its ES vision and started to communicate the vision with mid-level managers. The managers were called upon to embrace this vision and influence their subordinates by articulating the vision as much as possible. In addition, flyers, posters, and brochures about ES were widely distributed. Within two weeks, the message of adopting ES was disseminated across the organization. As described by a line

worker about employees' reaction to ES adoption decision:

Some people thought it would be a good opportunity for the firm and individuals to learn, while others were worried about losing their jobs after ES adoption. It took a while for us to be convinced that we would benefit from ES adoption.

Employees' concerns were addressed by the CEO in an assembly meeting, in addition to the departmental meetings. By clearly explaining the rationale for ES adoption, the CEO assured employees that their jobs would be secure as long as the firm grew healthily, which required employees to endeavor as a unit toward a common goal—enhancing the firm's competitiveness and make ES adoption a success. As explained by a line worker:

Since implementing ES was a must-do project for our company's survival, it didn't make sense for us to resist it ... If we accepted the project positively and tried to gain some ES knowledge, mostly likely we would keep our jobs and upgrade ourselves. Especially, a lot of firms were adopting ES. With the ES knowledge gained from the project, we would be more competitive in the job market.

His comments were conferred by another line-worker:

It was a good opportunity for us to learn this advanced technology ...

Being positive and supportive was a smarter choice than being worried and resistant.

The advocacy of ES vision allowed CPM to win the majority's support. It also motivated the employee to contribute, receive, and capture ES knowledge. This was revealed by the employees' passion and persistence in learning ES after work twice a week for nearly two months. In recalling the learning experience, one line worker described to us that:

Though we had to perform our job duty as before, staying overtime to learn ES was not unbearable. Since we were excited about this learning opportunity and looking forward to seeing the system implemented successfully. [Those] kind of feelings made us .. take a positive approach and [be] better able to put up with the fatigue.

The employees' endeavor in learning ES allowed CPM to distribute knowledge to the right people. The system knowledge was first transferred to the IT group, which would be responsible for the maintenance and support of the system. Also, knowledge on each module adopted was transferred to all relevant employees by formal training courses. Though the users were mainly trained to master the knowledge on the modules related to their work, a lot of employees proactively studied other modules and how different modules were inter-related. In addition, power users were formally assigned in each business unit. These power users learned

about “why” and “how”, in addition to “what”. Such knowledge empowered them to be able to re-configure the system and make necessary adjustments of parameters to meet the requirements of special events.

Administrative Structure Support

CPM set an administrative structure for the project, which included a steering committee, working committee, project function groups, IT group, and Consulting Group. The steering committee was consisted of the members of the top management team, while the working committee consisted of senior managers who were respected and trusted in the organization. The project function groups were made up by the managers and key employees of every department. The six members of the Consulting Group were from a highly-reputable consulting firm specializing in ES adoption. These committees/groups were delegated with appropriate responsibility and authority to make decisions related to ES implementation. For example, the responsibilities of the working committee included formulating project plans and ensuring the progress of the project, guiding, organizing, and promoting the interaction among function groups, analyzing and proposing solutions to problems of business process optimization, organizing managerial and technical training courses, and being in charge of job specifications and standardizing work procedures.

The administrative structure served as a formal communication channel in CPM’s learning ES, which was especially important for the acquisition of business

knowledge and information interpretation. It called for regular/irregular meetings that allowed people to have formal and informal information exchange. For example, the function groups met four times a week to generate the diagrams of the business process status quo and redesigning the firm’s business processes. According to the Inventory Manager:

Being a member of the function group made me better understand what role I should play in this project... The meetings and social gatherings provided us chances to communicate with each other. In addition to getting jobs done, they also enhanced cohesion and trust among us, which made coordination and cooperation issues much easier... It helped a lot with our reaching consensus on the business processes spanning departmental boundaries.

Control Scheme

To ensure that employees would learn and master knowledge required to apply ES effectively, the firm made employees’ performance in the ES implementation an important part of individuals’ and business units’ annual evaluation. For example, it accounted for 60% of the CIO’s annual evaluation. As commented by the Manufacturing Manager:

This evaluation scheme made it clear to everyone that he must be responsible for what he did and how he performed throughout the ES implementation process... I think this evaluation scheme

was really helpful in encouraging people to put in their effort... As we would also be evaluated as a business unit, we were encouraged to help each other in learning how to use the system.

In addition, CPM formulated strict controlling rules, that is, only when the employees passed skill tests on ES, would they be allowed to take up jobs using the system. Employees who failed these tests would have to undergo the training again or be assigned to do some other jobs. In addition to providing incentives to learning ES, these control schemes ensured minimum operation and manufacturing disruptions after the system went live.

Top Management Involvement

The committee members attended all business process-redesign meetings and training workshops on process-oriented methodology. Also, the steering committee evaluated and approved the refined business process and ES implementation plan. As commented by a mid-level manager:

They worked together with us, even though we had to work overtime continuously for months. Their personal involvement in the project made us well aware of the importance of the project and inspired us to work hard on it... Also, with their presence in the meetings, we could make decisions on business process changes on the spot, which facilitated the project's progress.

In addition to enhancing employees' morale and facilitating the project progress, top management brought constructive ideas and sound judgments on the refined business processes. Due to their possession of knowledge that was not available to mid-level managers, top management was able to challenge the business model proposed by the groups and evaluate different proposals, which ensured that the most suitable model was adopted.

Organizational Structure and Culture

CPM was organized divisionally with business units representing its major business areas. It had a culture that emphasized cooperation among employees and across functional units. Especially, the management emphasized employees' job satisfaction and career development. The firm organized many formal and informal social gatherings every year, in addition to providing free lunches for employees in its canteen. As commented by the Senior VP of Marketing:

These social gatherings allowed employees from different, maybe not directly-related, departments to know each other... It helped us build cohesive and trusting culture.

The firm's culture enabled people to share different opinions openly, which was critical for the organizational learning in ES implementation. In the sub-process of information interpretation, all groups and committees came together to discuss about the possibilities of redesigning the

organization's business processes. The discussions mainly focused on further improvement of business processes within the department and the management of activities spanning departmental boundaries and ad hoc business events. Trusting and cohesive culture facilitated the reaching of the consensus on how to get jobs done, as described by the Marketing Manager:

We benefited a lot from the innovative ideas provided by people from other departments... We freely expressed our opinion and discussed in greater details when there was any disagreement. While trying to fight for our department, we also tried to put ourselves in others' shoes. There was nothing that couldn't be worked out. Especially, we could always pass controversial issues to the Boss. He had the last say.

With the shared understanding about what the best business practices were after ES implementation, CPM was able to update its organizational memory according to changes in its organizational structure, business processes, and management white paper. The information distribution and interpretation sub-processes decided the types of organization memory for this project. First, all the activities happened during the ES implementation were recorded in the computer system as part of the project. These documents facilitated the review, coordination and communication during and after the ES implementation. Second, the organization memory

had humans as carriers. All end users and power users passed ES tests and became carriers of knowledge on how to interact with the system. They served as instructors to new comers of their departments, using the operation documentation of each module compiled by IT group. In addition, function group and committee members are the carriers of knowledge on business processes.

Organizational Factors and Organizational Learning in MEM

ES Vision. Aiming to cut purchasing cost and reduce lead time, the headquarters of MEM decided to integrate the databases in different sites located in different countries. Following this strategy, MEM was required to adopt ES which had been implemented in the headquarters and some other sites. ES implemented in MEM had its configuration and business processes exactly the same as those in other sites.

With the aim to cut costs by ES adoption, MEM was tight with resources contributed to ES project. The knowledge about the new business processes and system was acquired by learning from the Expert Team sent by headquarters. The experts spoke different languages from MEM employees. Due to the language barrier, it was difficult for MEM employees to capture the knowledge transferred by the experts, just as described by the Personnel Manager:

Language barrier was a big problem. I couldn't understand them clearly. Even worse, it was hard for them to

understand my questions. Sometimes it became so frustrating that I just kept silent. And that might have passed a wrong message, and made them [think] that I didn't have any problems in understanding what they said.

Though the employees complained about the difficulties in learning and suggested hiring native speaking consultants, the top management decided not to do so due for two main reasons: (1) the high consulting fee; and (2) the consultants' lack of knowledge about business processes to be adopted. The Senior VP believed that as long as employees in MEM put in enough effort, they could get around the language barrier problem. Hiring consultants was regarded as a waste of money and violated the principle of ES adoption - cost saving.

Advocacy of ES Vision

In one meeting, the General Manager informed the top and mid-level managers of the headquarter's decision on implementing ES at MEM and explained the rationale for this adoption. Different from CPM, the vision was not passed to employees at lower levels. Neither did all of the mid-level managers align with this vision. As told by the Sales Manager:

With all the data shared among different sites, it meant that the discount we offered to our clients would be monitored by other sales people. That would lead us (sales representatives) to compete against each other by offering higher discount rates. It would harm

both the interests of our division and the company as a whole. In my opinion, the adoption of ES was a big strategic mistake.

Some employees were against ES adoption because of their fear of losing jobs after ES adoption. As described by the Purchasing Manager:

The system was bad for each division. With central sourcing, we would lose autonomy in selecting our own supplies... Since the Boss emphasized cost saving, most likely we would be replaced by the system.

Overall, employees regarded the project owned by headquarters and stayed distant from it. With the lack of support from employees, especially some key mid-level managers, the morale of learning ES was low. MEM employees received knowledge transferred by the Expert Team passively and did not endeavor to capture the knowledge, which was reflected in their making excuses for skipping or postponing ES lessons.

Administrative Structure Support

MEM did not set up a specific administrative structure to support the ES implementation project, but had the experts from headquarters to lead the project, with assistance of the IS department. The Expert Team was in charge of the project plan and training organization. Throughout the project, the information flew mainly from the experts to MEM, and there was an insufficiency of communica-

tion among MEM employees. This arrangement affected the effectiveness of information distribution and interpretation, due to the lack of inputs from MEM employees.

Treating MEM employees as knowledge receivers, the Expert Team adopted a hierarchical approach to transfer ES knowledge, that is, the Expert Team trained the mid-level managers and the managers trained their subordinates. In these trainings, the experts verbally explained the standardized business practices set by headquarters and showed the managers how to enter and retrieve data from the system. Each manager was shown how to use the module related to his/her work only. The managers passed what they had learned to their subordinates in a similar way. Regarding the trainings, a manager made such comments:

The experts just told me what to do, rather than why I should do it that way. So after they left, I was totally lost when I encountered problems. As I was the only one who learned this module with the experts, I couldn't seek help from others within our firm...I was not confident to give advice to my subordinates when they had problems with the system.

Also, a line worker told us:

The system was too complex to me and learning experiences were really frustrating... It seemed to me that none of the people in our division really knew the system. Basically we just learned

by trial and error... So our skepticism about the system's capability in supporting our operation turned out to be right.

This training method led to little ES knowledge overlapping within the firm, and the lack of administrative structure deprived the chance for employees to share what they had learned. Thus, the firm did not have managers who knew the new business processes across department boundaries well. The low degree of information distribution made MEM encounter great problems in information interpretation, which was described as, "there was little shared understanding of business processes coming along with the system".

Control Schemes

The top management assumed that all of the employees would put in their best efforts in learning ES and participate in ES project proactively, so the firm did not set up any reward scheme for the employees' performance in the project. Neither did they formulate any control scheme to ensure that employees were able to interact with the system appropriately before the system went live. This lack of control scheme, coupled with the employees' attitude towards the project, did not provide employees enough incentive to seek for and capture ES knowledge.

Top Management Involvement

Trusting the Expert Team's capability, the top management did not participate in the project as much as in CPM. On the contrary, they almost left the

project completely in the hands of the Expert Team, though they checked whether the project was progressing as expected from time-to-time. The General Manager told us:

The Expert Team from headquarter[s] was very experienced in ES implementation after undertaking many projects in other sites. Leaving the project to them was the best choice for us.

With the lack of top management involvement, MEM lost the chance to study the feasibility of copying all business processes from headquarters, as commented by one manager:

Some of the new business processes did not suit our division. I think it would be very helpful if our boss discussed with the Expert Team and got them (business processes) modified... Well, the processes implemented were so alien to us.

Organizational Structure and Culture

MEM was organized as a matrix with control coming directly from the General Manager. It had a particularly competitive culture. The employees' career path was "up or out". The turnover rate was higher than other companies in the same industry. So the employees needed to focus on excelling themselves individually. The working relationship was described as "more competitive than cooperative" by one manager.

This culture made employees concerned about what they talked about and made them unwilling to share their ideas freely. When the General Manager called for meetings after realizing the lack of knowledge overlapping and mutual understanding of business practices, the participants chose to be silent most of the time, as described by the General Manager:

I really didn't know what went wrong. They simply didn't want to share their ideas openly. If I was in the meeting, I would lead the discussion and they

Table 2. Differences of organizational factors in CPM and MEM

Organizational Factor	CPM	MEM
ES Adoption Vision	Transform	Informato up
Advocacy of ES Vision	Strong advocacy across the firm	Limited dissemination
Top Management Involvement	Actively participated in key decision making	Left the decisions to the Expert Team from HQ
Administrative Structure Support	Steering and Working Committees and Functional Groups	No formal structure at MEM side
Control Scheme	Strict rules on the assignment jobs related with ES	No control scheme
Organizational Structure and Culture	Cohesive and trusting	Competitive and mistrusting
Employee's Attitude	Enthusiastic	Resistant and suspicious

would talk. But without my presence, the meetings were so silent. But I was too busy to attend all their meetings.

In addition, a manager explained to us:

Some managers didn't get along well and were afraid of being backstabbed. So they wouldn't talk freely. Even with [the] General Manager's presence, they chose to avoid critical problems existing in their departments... Also, some of us just didn't feel like sharing what we had learned with each other, since our exclusive possession of knowledge made us valuable to the firm.

Due to the limited information distribution and little information interpretation, there was insufficient organizational memory to guide ES application. Humans were the main organizational learning carriers in MEM, especially the mid-level managers. In addition, the business process changes were not followed by corresponding organizational structure changes. MEM ended up having a function-oriented, organizational structure and process-oriented, business practices. This situation, coupled with insufficient understanding of business practices across the organization, caused confusion about job specification of posts spanning functional units.

To summarize our research findings described in the previous sections, we present the major differences between organizational factors (Table 2) and the orga-

nizational learning processes enacted in CPM and MEM ES implementation (Table 3).

These differences between the organizational learning processes enacted in ES implementation by CPM and MEM caused significant different implementation outcomes, though both firms managed to get the system implemented within budget and on-time. We categorized these outcomes into the following: further business process refinement, users' capability to apply the system effectively and appropriately, more effective and efficient departmental coordination, better decision making, solid organizational memory, and enhanced business performance. To avoid the complexity of presentation, we list our findings one by one, following the order of the earlier-mentioned aspects of implementation outcomes.

ES Implementation Outcomes in CPM

1. By implementing ES, CPM managers learned to evaluate different business practices by analyzing the efficiency and effectiveness of business processes. The group and committee members learned process-oriented methodology, thus they were able to change business processes without the help from the consultant after the system went live. According to the Senior VP in Marketing, "we now have a team to keep studying our business processes and continuously refine them. I think this is the most important gain from ES project."

Table 3. Differences between organizational learning in CPM and MEM ES implementation

Org. Learning Sub-Process	CPM	MEM
Knowledge Acquisition	<ul style="list-style-type: none"> - System knowledge and process-oriented methodology were acquired from the consultants - Business process status quo was acquired from organizational memory 	<ul style="list-style-type: none"> - System knowledge and new standardized business process information were acquired from experts at headquarters
Information Distribution	<ul style="list-style-type: none"> - System configuration information was distributed to the IT group and power users in every business unit - System operation knowledge was distributed to all end users - Information about business processes was shared among business units 	<ul style="list-style-type: none"> - System operation knowledge and information about business processes were distributed to the relevant mid-level managers by the experts - Mid-level managers passed what
Information Interpretation	<ul style="list-style-type: none"> - Function groups and the working committee worked together to streamline the business process, focusing on the activities spanning departmental boundaries and non-routine practices 	<ul style="list-style-type: none"> - Little information interpretation during ES implementation
Organizational Memory	<ul style="list-style-type: none"> - All information related to the project was documented in computer-based repositories - Standard system operation manuals were compiled - Humans were certified and became organizational memory carriers 	<ul style="list-style-type: none"> - Humans were the main organizational memory carriers - System configuration files were archived

2. The end users and power users mastered system knowledge. End users were effective in interacting with the system. The firm did not run into any chaos due to end users' operation mistakes. In addition, power users were able to reconfigure the system to cater for the requirements of ad hoc events and new business processes.
3. By solving many problems together throughout the ES implementation project, managers knew each other better and established a more trusting relationship. This relationship, coupled with their knowledge about business practices across the whole organization, made inter-departmental coordination more effective and efficient.
4. With real-time operational data stored in the central database, the management was able to make more informed decisions and respond to market changes more swiftly.
5. With many different types of organizational memory carriers and overlapping knowledge among employees, the firm was able to maintain its organizational memory integrity when some key players left for ES consulting jobs.
6. With the support of ES, the amount of bad debts was reduced by four million U.S. dollars in the year 2002. In addition, the firm succeeded in getting around the dealership and set up their own distribution channel across the country. As described by the Senior VP of Marketing:

Without the ES, it wouldn't be possible for us to manage the inventory across the country on our own. By getting rid of the dealership, our profit margin was increased significantly.

ES Implementation Outcomes in MEM

1. There was insufficient understanding of business processes among managers. Since the business processes implemented in the system were straightforward to the Expert Team, they were not aware of the necessity of sharing the rationales for these business practices with MEM managers. This caused managers' incapability in handling ad hoc events and system errors. Thus, MEM had to turn to the Expert Team at headquarters whenever problems arose. But being located in different time zones, a difference of 13 hours, MEM couldn't get a response from the experts promptly. The efficiency promised by the ES system was greatly comprised.
2. End users could not interact with the system appropriately. The central database was often corrupted by individuals' mistaken operation. Due to the lack of knowledge about the inter-relationship between different modules, they did not take action to inform related parties of these errors immediately. This allowed the mistakes to cascade across the whole system and caused operation and manufacturing disruptions. Eight months after the within-budget and on-time implementation of the ES, MEM kept experiencing difficulties and encountered problems with this system. MEM had to limit the access privilege of most users or simply switch to manual operation for some processes.
3. With the lack of common understanding of how jobs were done across departmental boundaries, inter-departmental coordination was chaotic and relationships between some managers became distrustful.
4. Since the central database was often corrupted, managers could not make decisions based on these data. Also, since MEM abandoned the old system after ES went live, the managerial decision making could not receive the right data support for months.
5. MEM also suffered a loss of organizational memory due to the leaving of some key end users and managers. Due to the limited information distribution and little information interpretation throughout the ES project, the manager became the single carrier of knowledge transferred by the Expert Team. This knowledge structure made MEM vulnerable to personnel turnovers.
6. The operation cost was increased rather than decreased, due to the end users' inappropriate interactions with the system. For example, its inventory cost was increased by two million U.S. dollars in 2003.

The major differences between these two firm's ES implementation outcomes can be summarized by Table 4.

Developed from these two organizations' experiences, the process of organizational learning in ES implementation can be described with a model (Figure 1). This model shows the major organizational factors that emerged as salient from our data analysis. Also, it encompasses how these organizational factors affect the four constructs of organizational learning. This

Table 4. Differences of implementation outcomes in CPM and MEM

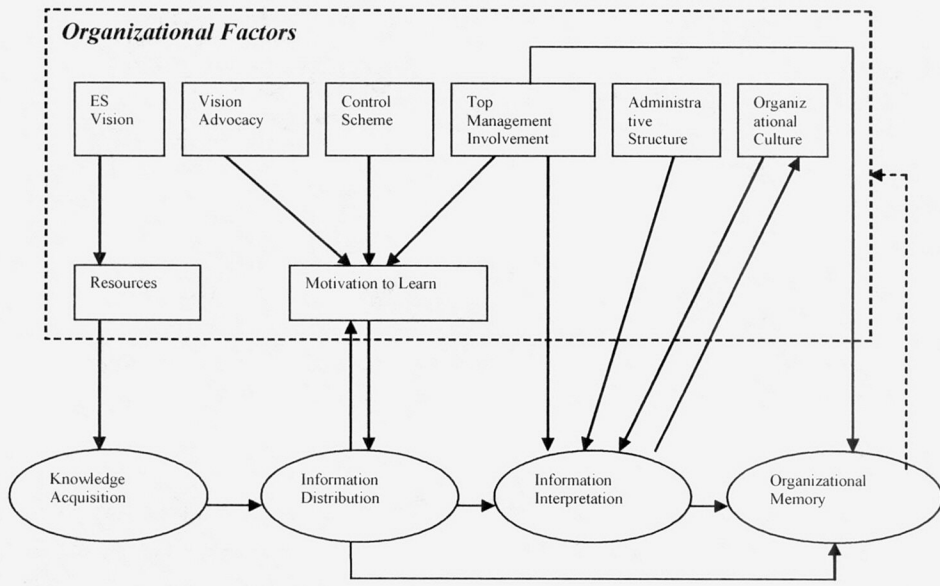
Implementation Outcomes	CPM	MEM
Relationship between business units	Trusting and valuing each other	Distrustful and competitive
Inter-department coordination	Became more effective and efficient	Coordination was difficult due to lack of business practice knowledge
Managerial decision making	Got timely and accurate information support	Couldn't use the information due to the inaccuracy of data
Loss due to employee turnover	Did not lose organizational memory	Big loss of organizational memory due to resignation of some key mid-level managers
End user's interaction with the system	Effective and appropriate	Their mistakes caused manufacturing and operation disruption
Capability to deal with ad hoc events	Could handle special events without help from consultant	Must turn to experts at HQ
Significant impact on business performance	Decreased bad debts by about 4 million USD in 2002 and set up distribution channels without new hiring	Inventory cost increased by about 2 million USD in 2003

process is proposed as an initial formulation of the key concepts and interactions that portray organizational learning in ES implementation. No claim is made that the concepts and interactions presented here are exhaustive. Further organizational learning studies on ES implementation should modify or extend the ideas presented here.

In this model, the four organizational learning constructs are influenced by organizational factors as follows:

- A. Influenced by environmental and organizational contexts, the top management formulates ES vision. Guided by this vision, the organization decides the amount of resources to be committed to the project, which leads to different ways of knowledge acquisition. The knowledge acquired directly affects the amount of knowledge that is distributed in the organization.
- B. The organization takes action to distribute knowledge to its relevant employees. This sub-process is influenced by advocacy of ES vision, top management's involvement, and the control scheme mediated by employees' motivation to receive and capture knowledge. The end users' learning experiences either reinforce or change their perception about ES adoption, which in turn influences their learning motivation. On the other hand, the breadth and depth of information distribution influences information interpretation.
- C. Top management's involvement, the administrative structure, and organizational culture, trust in particular, decide the effectiveness and outcomes of information interpretation. The interaction process in information interpretation may affect organizational culture.

Figure 1. Organizational factors affecting organizational learning in ES implementation



D. With top management involvement, the consensus on business practices implemented in ES (the result of information interpretation) was institutionalized and became organizational memory. Employees equipped with ES knowledge (the result of information distribution) are another type of ES knowledge carrier. The knowledge in organizational memory can be brought forth, affecting future learning and affecting the organization.

DISCUSSION AND CONCLUSION

While CPM and MEM both implemented ES on-time and within budget, their implementation outcomes differ sig-

nificantly. The comparative analysis method, which allows contrasting CPM with MEM on a common set of concepts, suggests that these differences can be attributed to variations in the organizational learning process which was affected by organizational factors including the firm’s ES vision, organizational culture, the ad hoc administrative structure for ES adoption, employees’ motivation to learn ES, leaders’ advocacy of ES vision, the top management’s involvement, and control scheme. To enhance the internal validity and generality of theory building from this case study, we tie our findings to existing literature (Eisenhardt, 1989).

First, the attitude of the organization’s “power elites” is important

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for ES implementation outcomes. Institutional leadership goes to the essence of the process of institutionalization, concurring with Armstrong and Sambamurthy's (1999) findings. It is particularly needed for ES implementation, which represents a transition to alternative ways of getting jobs done across the whole organization. The central responsibility of the top management is to ensure individuals and the organization as a whole learn how to apply ES effectively. This responsibility can be carried out through four key functions: advocacy of ES vision, personal involvement in the learning, setting up formal communication channels, and ordering internal conflicts.

Second, the firm's IT vision affects the amount of resources dedicated to the organizational learning in ES implementation. Firms with transformative IT vision would treat ES adoption as an investment and devote adequate resources to the project. In contrast, the firm with the vision of "automate" or "informatize up" would try to minimize the cost of ES adoption (Scott-Morton, 1991). Thus, the vision about ES adoption affects organizational learning, mediated by the resources dedicated to the project.

Third, effective learning depends on a culture of openness, mutual trust, and a self-critical disposition. Consistent with the literature of organizational learning and learning in information system development, the accessibility to expertise and trusting working environment help the business units and individuals overcome learning anxiety and learn faster (Schein, 1993; Wastell, 1999). Anxiety and uncertainty

about sharing "private" knowledge lead to the avoidance of authentic engagement in identifying and solving substantive problems.

Fourth, knowledge structure characterized by extensive knowledge overlaps, and information exchange among managers is important for successful ES implementation outcomes. The information exchange enriches organizational knowledge structure and consequently enhances the firm's absorptive capacity (Boynnton et al., 1994; Cohen & Levinthal, 1990; Purvis et al., 2001). In turn, such knowledge and enhanced absorptive capacity enable rich dialogues among managers through which truly innovative ES applications arise (Lind & Zmud, 1991; Watson, 1990). Also, know-how and know-why about the innovation should be distributed to system users. Transferring why and how knowledge to the end users can instill confidence and a sense of control, which helps users to deal with ad hoc events.

In order to ensure that the study's results can be placed in an appropriate context as well as to enable future research, it is important to examine the limitations of this study. First, we neglect the socialization of the learning process from the individual to the organizational level, which might offer insights into how the learning process can be correctly managed. Second, both organizations we conducted the study with are in a culture of high collectivism. Some strategic conducts applicable in this culture might not be appropriate for another culture. Future research on the issues we do not address in this

paper can extend our understanding of organizational learning in ES implementation.

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