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Tekcal's ERP Implementation Challenge:

Climate, Fit and Effectiveness

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ABSTRACT

Tekcal had a problematic ERP implementation. Data from face-to-face interviews are mapped to a theoretical model adapted from the innovation literature to explain how Tekcal's climate for ERP implementation and ERP-values fit affected its ERP implementation effectiveness. Dimensions of climate include employees' ERP skills, incentives, obstacles and information sharing. Dimensions of ERP-values fit include organizational commitment and alignment of non-homogeneous groups. This research has implications for both practitioners and researchers who are developing theoretical explanations for ERP implementation challenges.

Keywords

Enterprise systems, ERP, implementation, climate, fit, effectiveness.

INTRODUCTION

Several ERP (Enterprise Resource Planning) implementations have been problematic. Some ERP projects have been abandoned when organizations determined that the software was not compatible with the business or not worth the costs and effort (Davenport 1998). Similar to software projects in general, ERP implementations have often been late and over budget. More serious than project delays have been ERP performance problems that threaten the revenues and viability of the organization. For example, Hershey had trouble delivering its candy for Halloween in 1999 because of ERP implementation issues and suffered an estimated $100 million loss in revenue (Scott and Vessey 2002). Similarly, Whirlpool and Gortex had ERP problems that affected their bottom line. However, the worst documented case is FoxMeyer Corporation, which blamed its bankruptcy on its troubled ERP implementation (Scott 1999).

The objective of this research is to analyze the challenges of ERP implementation. In doing so, the paper offers prescriptive lessons for practitioners and progress in a theoretical understanding of ERP implementation for researchers. While practitioner articles on ERP have been available since the middle of the 1990s, academic research on ERP implementation is still in its infancy. This paper advances ERP implementation research by building on a strong theoretical base.

The next section discusses a theoretical background on implementation. In particular, it draws on innovation implementation and a model that incorporates the climate for implementation and ERP-values fit. In the following section, the challenges of ERP implementation are discussed in terms of a case study of a high technology company called Tekcal. The discussion section analyzes and compares Tekcal to a published case using the theoretically based model. In the conclusion, the findings are summarized and limitations as well as future directions of the research are presented.

THEORETICAL BACKGROUND

The research literature on implementation is diverse, and a well-accepted theory has not emerged (Klein and Sorra 1996, Kwon and Zmud 1987). Nevertheless, this study shows how an innovation model (Klein and Sorra 1996) holds promise for addressing ERP implementation issues. Using ERP as the innovation, this study adapts constructs in the innovation model. See Figure 1. The adapted constructs, climate for ERP implementation, ERP-values fit, ERP implementation effectiveness and ERP effectiveness, are discussed in the following sections.

Climate for ERP implementation

An organization's climate for the implementation of an innovation refers to employees' shared perceptions of the extent to which their use of the innovation is rewarded, supported, and expected within their organization (Schneider, Gunnarson and Niles-Jolly 1994; Schneider, Brief and Guzzo 1996; Klein and Sorra 1996). Their perceptions depend on shared experiences, observations, discussions and information about their organization's implementation policies and practices. The more the implementation policies and practices encourage, cultivate and reward use of the innovation the stronger the climate for implementation of the innovation. Organizational practices that ensure employee skills in using the innovation; provide incentives for using the innovation; and remove obstacles to innovation use; will strengthen the climate for implementation (Klein and Sorra 1996).

IT management climate is the shared enduring perceptions of salient aspects of the IT work environment, such as the extent of information sharing between IT providers and users (Boyton, Zmud and Jacobs 1994). Different perspectives and different sub-cultures (Schein 1992) may result in a lack of understanding and conflict between IT providers and users (White and Leifer 1986).
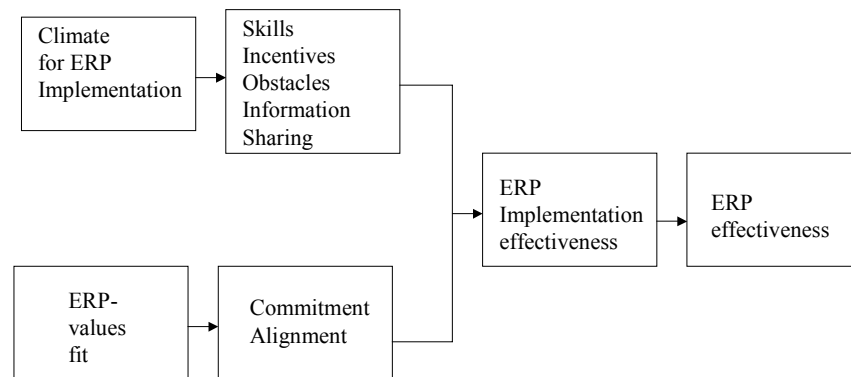

Figure 1. ERP implementation effectiveness model
(Adapted from Klein and Sorra 1996)

Adapting these two perspectives on climate (Boyton, Zmud and Jacobs 1994; Klein and Sorra 1996) to ERP, this study defines the ERP climate for implementation as the shared enduring perceptions of salient aspects of the ERP work environment, i.e., the organizational practices and procedures associated with ERP-related activities, by an organization's members. Relevant dimensions of ERP climate for implementation are: organizational practices that ensure employee skills in using the ERP, provide incentives for using the ERP and remove obstacles to ERP use that will strengthen the climate for implementation; and the extent of information sharing between ERP providers and users.

Technology imposes a high knowledge burden during implementation (Attewell 1992, Cohen and Levinthal 1990). Learning is influenced by organizational capabilities and prior user computer experience (Lucas, Walton and Ginzberg 1988). How to manage learning "the package all at once", and speeding users adoption (Lynch 1984) are concerns. ERP is complex to learn because its degree of integration introduces high user interdependencies (Davenport 1998). Consultants often are the source of ERP skills, which they need to transfer to employees. This is more effective under short-term contracts, because using outside contractors for entire projects limits the learning opportunities for internal employees (Clark, Cavanaugh, Brown and Sambamurthy 1997).

Implementation success depends on top management support, user involvement, human networking, and favorable implementation politics (Markus 1981, Ginzberg 1981, Gross and Ginzberg 1984, Doll 1985, Tait and Vessey 1988). Management support will likely provide incentives and ensure that any obstacles are removed. User involvement, human networking, and favorable implementation politics will promote information sharing. Readily available training encourages improvement of skills and reward systems motivate employees to attend classes.

For example, Nibco delivered over 1200 hours of ERP training at three sites and rewarded more than 95% attendance at classes (Brown and Vessey 2001). Management established additional incentives for all Nibco employees, removed any roadblocks and promoted information sharing through focus groups, monthly meetings, site visits and a weekly newsletter.

Despite a strong climate for ERP implementation, employees may resist an ERP implementation if the ERP is not congruent with their values.

ERP-values fit

ERP-values fit is defined as the extent to which targeted users perceive that the ERP will foster the fulfillment of their values (generalized enduring beliefs about the personal and social desirability of modes of conduct or end-states of existence) (Klein and Sorra 1996). Employees' commitment to the use of ERP depends on the perceived fit of the ERP to their values. Employees might perceive that the ERP disrupts established ways of doing things and does not meet their operational needs. In a Singapore hospital, ERP misalignments were due to changes in data ownership and workflow, increased job scope, too much flexibility in data entry and reports, and domain specifics needs (Soh et al. 2003). If the ERP is countercultural then it will cause resistance rather than commitment. For example, if the culture values autonomy then an ERP that limits autonomy will be poorly received.

Early research on implementing packaged software found that several key issues were associated with uncertainty about precise user needs (Gross and Ginzberg 1984) and discrepancies between the needs of the user and the features of the package (Lucas, Walton and Ginzberg 1988). Although these research studies are from the 1980s many of the issues persist. Specifically, in the case of ERP, discrepancies between the needs of the user and the features of the package stand out as a major on-going concern (Davenport 1998). Resolution requires mutual adaptation between the technology and the organization (Cooper and Zmud 1990, Kwon and Zmud 1987, Leonard-Barton 1988).

Commitment and organizational culture are determinants of effective implementation (El Sawy 1985, Walton 1985). Organizational culture is associated with the organization's sense of identity, its goal, its core values, its primary ways of working and a set of shared assumptions (Schein 1992). Although organizational culture has been associated with organizational effectiveness (Denison and Mishra 1995), changing organizational culture is difficult. Nevertheless, the ERP implementation management can inspire commitment. Nibco's change management efforts in information sharing helped. "At each meeting, the [Nibco "Tiger"] team attempted to measure the level of individual commitment to change" (Brown and Vessey 2001).

Dysfunctional interactions contribute to lack of alignment between cultures (Schein 1996). For example, different languages and different assumptions are barriers to mutual understanding. Some ERP implementation "misfits" are attributed to the cultural differences between Asian users and the Western European or American bias embedded in ERP packages (Soh et al. 2003). "Difficulties in communication may arise from failing to recognize and accommodate differences in values" (Schein 1992). Subcultures within an organization or cultures across organizations are likely to have different values (Sackmann 1992; Schein 1996).

Interorganizational partnerships have difficulty forming a common culture. The partners need to jointly identify the norms and values that pertain to the partnership. This avoids the futile attempt to change either of the cultures (Schein 1992). The partners build a partnership culture with shared values and norms by making partnership-specific roles, rules and procedures explicit, documenting a common history and exchanging information on corporate plans, directions and business policy (Bennett 1996, Lasher, Ives and Jarvenpaa 1991). The culture of the partnership has to be some sort of 'middle ground'; with technical people being more "business-like" and business partners recognizing the value of technical skills and knowledge. In summary, partners need to understand and respect (Bennett 1996) each other's organizational culture, while endeavoring to establish a joint partnership culture.

ERP implementation effectiveness

The effectiveness of the implementation will vary depending on the implementation climate and the ERP-values fit (Klein and Sorra 1996). When fit is homogeneous, (i.e. when there are few between-group differences) and good and the implementation climate is strong then employees are enthusiastic about the ERP. Nibco met its implementation success criteria of being on time and within budget by paying attention to climate and fit (Brown and Vessey 2001). The "Tiger team" management triad aligned business and IT groups and focused on managing the change so that the entire organization was committed. When fit differs between groups, one group will regard the ERP as advantageous while another group will consider ERP incongruent with their values. In this situation, conflict between groups is likely. The consequences will vary according to whether one group has power over another or not. When groups do not have power over each other and the climate is strong then implementation may be slow caused by delays when the opposing group resists the implementation. If the climate is weak, then users will become discouraged and there will be declining use of the system. If the climate is strong

and ERP-values fit is good for a group with more authority then the higher authority group may establish additional incentives encouraging the lower authority group despite its poor fit to comply.

ERP effectiveness

ERP investment and an effective implementation do not guarantee ERP effectiveness or business value. The business value of IT, although difficult to assess (Kauffman and Weill 1989; Weill 1992; Soh and Markus 1995), has been measured by operational performance improvements (Barua, Kriebel, and Mukhopadhyay 1995). ERP effectiveness measures include faster, more streamlined business processes, which lower costs and improve customer service (Davenport 1998; Scott and Vessey 2002).

METHOD

Lacking an established measuring instrument, a single case study method is appropriate for providing context and an in-depth understanding of ERP implementation challenges. The researcher found and made contact with a company, which had a challenging ERP implementation six months earlier. Using semi-structured questions, the researcher encouraged employees to discuss the firm's implementation problems. Several hours of face-to-face interviews were taped. The CIO was especially helpful in providing insightful comments.

TEKCAL'S ERP IMPLEMENTATION CHALLENGE

Tekcal Corporation (a pseudonym) is an organization in the high technology industry with headquarters in California. It assembles its product from components, some of which are manufactured in-house and most by suppliers. In 2003, it had 11,508 employees, revenues were $2.7 billion and profits were $182 million.

In 1995, Tekcal had several best-of-breed information systems. For example, Tolas was used for sales order processing, ASK Manman for purchasing and MRP and Dun and Bradstreet for general ledger. These systems were "maxed out" and did not have the horsepower that Tekcal needed. Integration of these systems was difficult and the systems were batch rather than real-time. So Tekcal began looking for more capability with a better solution for its systems and better use of its resources.

Tekcal made a strategic decision to outsource its IT department except for 10 or 11 people who are functional heads of infrastructure, applications, communications and facilities for example. Outsourcing gives Tekcal the capability to get needed expertise. However, with different outsourcers for infrastructure and applications, Tekcal finds it difficult to control and coordinate multiple stakeholders. A flaw has been that underneath the top person at Tekcal is the outsourcer's number one person who is motivated to make profits for his corporation. Another disadvantage of outsourcing for Tekcal is that there is no succession planning since employees went to the outsourcer. Future plans include changes to the outsourcing management structure to improve incentives and allow succession planning. The plan intends to align the outsourcer's goals more closely with Tekcal by putting Tekcal management more in control.

The plan for architecture at Tekcal is based on centralized hardware and software. This is advantageous for consolidation of information and systems management and control. On the other hand, since all transactions are flowing into one point it creates a bottleneck. In addition, Tekcal cannot have a bi-directional agreement for disaster recovery since its systems are limited to one site.

Tekcal anticipated improvements in managerial decision-making and information use after implementation of ERP. After a long study on ERP vendors, Tekcal narrowed the choice to SAP R/3 or Oracle Applications. Because its manufacturing process is relatively simple, in essence assembly of components, Tekcal decided that it did not need a very sophisticated ERP such as SAP R/3. Instead, it chose Oracle Applications for two main reasons. First, Oracle Applications was judged to have greater flexibility than SAP R/3. Second, Oracle Applications was perceived to be less complex than R/3 and easier to implement.

The plan for Tekcal 's implementation of Oracle Applications was a "big bang" approach to take 18 months. After Tekcal was advised than 18 months was too short a time frame, the implementation was pushed back 6 months to take 2 years in total. A separate organization was created for the implementation. It consisted of 80 to 100 people, including approximately 50% consultants. The rest of the team members were the outsourcers. They followed directions from the consultants who had the expertise on ERP implementation. The project team chose the hardware and used project management methodologies such as milestones and training. The cutover to the new ERP system was during Thanksgiving 1997. According to an interviewed participant:

"Life seemed to be proceeding at a normal pace. However, when Tekcal did switch over to the new ERP system it was in a similar situation to Oxford Health. Oxford Health's system problems practically finished the corporation. It was reported on

the front page of the Wall Street Journal that Oxford Health lost control of billing. It did not do billing on time and ended up doing billing 6 months later. Most of the customers rejected the bills and it needed to write off $121 million."

"Pretty much the same thing happened at Tekcal. For whatever reason, whether it was the hardware, or the software or the training, the new system slowed to a crawl. A whole lot of extra work was done to get back close to the performance we had in advance of the change. Eventually Tekcal had to spend millions of dollars on hardware just to beef up the processor to keep the business going."

Although Tekcal expected that there would be problems, the degradation that they experienced was a shock. The ERP system did not completely stall. However, transactions that should take a minute were taking 15 to 20 minutes. To remedy the situation, a lot of tuning was done and Oracle and other consultants were called in. Nevertheless, the crisis continued for about 3 months.

"The only way to get a specific transaction to run was to strip down other transactions that were running at the same time. Frustration began to set in when it continued for a very long period of time without improving that much. There seemed to be a general lack of knowledge on how to attack it. We had very high-powered consultants there, yet they seemed powerless on how to overcome the issues. This continued for 3 months and eventually we spent money on different hardware. The hardware improved it a little but did not exactly get us to the point where everyone was raving about the new system yet."

Training was part of the issue. Users were not trained effectively in how to use the system correctly.

"Oracle applications software has flexibility but the problem is it does not have many controls. It allows anything such as a process out of sequence."

Users were also running too many reports and slowing the system down with too many complex online queries.

"We did not know how to measure the upsurge in jobs being run."

Even though the complex queries needed to be shifted off the transaction system, Tekcal was so busy with the tactical issues of keeping the business running that it was slow to provide a data warehouse, which would have relieved the system delays. The project team was deemed responsible for the implementation problems.

DISCUSSION

Nibco implemented ERP (Brown and Vessey 2001) at about the same time as Tekcal did. In Table 1, the events at Tekcal are compared to those at Nibco to illustrate the applicability of the ERP implementation model in Figure 1. The ineffective ERP implementation at Tekcal was affected by the weak climate for ERP implementation and poor ERP-values fit. In contrast, Nibco took actions to produce a strong climate and good ERP-values fit that resulted in an effective ERP implementation.

Inadequate employee ERP skills, insufficient incentives and obstacles to ERP use handicapped the climate for ERP implementation at Tekcal. ERP skills include infrastructure skills to create a client/server environment, as well as ERP configuration skills, project management skills and change management skills (Bancroft et al. 1998). Although the Tekcal implementation team had consultants and outsourcers who provided relatively strong technical skills, it was lacking subject matter experts who would have contributed business knowledge, which is essential for optimal ERP configuration. User representation would have also helped communication and buy-in, as it did at Nibco (Brown and Vessey 2001). Employee skills would have been upgraded if (1) training had been rewarded and more readily and broadly available, (2) knowledge transfer from consultants to employees had been effective and (3) users had tested the system in a "sandbox" environment before "go-live".

Unlike the situation at Nibco, users at Tekcal were not given incentives to attend training and use the ERP system. Tekcal was dependent on consultants and outsourced workers to deliver a mission-critical information system, yet in neither case did the contract specify incentives based on the project performance. Their incentives were to perform well for their employer, the consulting company and the outsourcer company respectively. Tekcal management perceived that they were dependent on the consultants and did not retain authority nor monitor the project closely enough. They left the focus of ERP decision-making with the consultants because they had ERP expertise.

Innovation Model (Klein and Sorra 1996)	ERP Implementation Model	Nibco (Brown and Vessey 2001)	Tekcal
1. Climate for implementation	*1. Climate for ERP implementation*	Strong	Weak
a. Skills Employee training should be readily and broadly available	a. ERP skills Transfer from consultants to employees; training should be readily and broadly available	User attendance at training tracked and rewarded; "sandbox" available for practicing skills; consultant contract specified knowledge transfer	Consultants had ERP skills, outsourcers had IT skills, but the implementation team needed user representation Training for users inadequate
b. Incentives Motivate use of innovation	b. Incentives Motivate ERP use	A special incentive pay bonus was established for employees and stock options were also granted to all core team members as a retention incentive.	Project incentives should have been explicit in contracts for consultants and outsourcers. No bonus pay incentives for users or stock options for team members.
c. Absence of obstacles Management practices and shared experiences	c. Absence of obstacles Management practices and shared experiences	"The project co-leads informed him of the key issues and Martin eliminated any roadblocks."	Management should have used more controls and oversight to eliminate roadblocks
	d. Information sharing Between ERP providers and users	Focus groups, monthly meetings, site visits and a weekly newsletter	Inadequate information sharing among consultants, outsourcers and users
2. Innovation-values fit	*2. ERP-values fit*	Good	Poor
Commitment Perceived fit of innovation to values	a. ERP Commitment Perceived fit of ERP to values	"At each meeting, the team attempted to measure the level of individual commitment to change" using a chart	No attempt to measure or increase commitment or address misalignment with ERP
3. Implementation effectiveness	b. Alignment of non-homogeneous groups ERP providers and users	"Tiger" management represented & aligned non-homogeneous groups	Management needed to align multiple stakeholders (non-homogeneous groups)

Table 1. Applicability of ERP implementation model

Nibco used focus groups, monthly meetings, site visits and a weekly newsletter to share information between the implementation team and users (Brown and Vessey 2001). In contrast, at Tekcal organizational boundaries limited information sharing among Tekcal employees and the consultants and outsourcers. Management should have used more controls and oversight, as Nibco did, to eliminate such roadblocks. Nevertheless, it is more difficult to share information among interorganizational members than within an organization. The reasons for this are many. First, employees may have loyalty to their own organization rather than other organizations. They may be reluctant to communicate because they are confused on what information is proprietary and which is not. Second, the cultures are likely to differ across organizations making communication difficult. Finally, incentives and the reward system generally refer to internal tasks and do not address interorganizational information sharing.

The ERP-values fit was also problematic at Tekcal. The implementation team should have involved users and monitored user commitment, as Nibco did. Nibco's "Tiger" management team represented and aligned business and technology groups as they worked closely together, collocated in the "den" (Brown and Vessey 2001). Organizational commitment would have been higher at Tekcal if the IT department and implementation team were in-house and working closely with employees under a homogeneous culture. The consultants could have mitigated data entry errors by controls such as mandatory fields (Soh et al. 2003). They could have reduced online user report generation and complex queries by preparing required reports before go-live. As explained in the theoretical background, when groups differ in their perceptions then there is likely to be conflict. Upon realizing the ERP difficulties Tekcal management removed obstacles by exerting pressure on the consultants to increase ERP knowledge transfer and information sharing with Tekcal employees. Unfortunately, improving employees' ERP skills takes time. Over time Tekcal users gained skills and the implementation climate improved. ERP-values fit and user commitment increased when management intervened and the consultant and outsourcer groups became more aligned with users.

CONCLUSION

Implementing ERP is challenging for most organizations. This paper proposes an ERP implementation model using an organizational innovation approach. The climate for implementation and ERP-values fit are important determinants of ERP implementation effectiveness. Skills, incentives, and management practices for control and sharing information between ERP providers and users are important dimensions of the climate for implementation. Commitment and alignment of stakeholders are important dimensions of ERP-values fit. The ERP implementations at Tekcal and Nibco illustrate the applicability of the model. In particular, it shows the importance of the role that skills and incentives played in each implementation. Tekcal began with a poor implementation climate characterized by inadequate ERP skills and inappropriate incentives. Tekcal found that employees' lack of ERP skills and knowledge hampered its implementation. As explained above, using outside contractors for entire projects limits the learning opportunities for internal employees (Clark, Cavanaugh, Brown and Sambamurthy 1997). Its dependence on consultants and an outsourced IS department made it difficult to share information, provide adequate training and upgrade employee ERP skills. Moreover, insufficient sharing of information between consultants and Tekcal employees prevented user involvement and commitment to the ERP implementation. The ERP values-fit was poor for users until their needs were met and they realized the benefits of the ERP implementation. The contrasting situation at Nibco shows some actions that might have been beneficial at Tekcal.

This paper adapted a theoretically based innovation implementation model to an ERP implementation domain. The applicability of the new model is shown by how it guides a theoretical explanation for empirical data from a problematic ERP implementation and for secondary data from a published ERP case. This study shows that the original innovation model should be modified to include information sharing and alignment of non-homogeneous groups. Although this research is limited by its single case study methodology, this is augmented with a comparison to a published case study. Also, it is appropriate for early academic studies on a topic to use qualitative methodology such as in depth single case studies to provide context, which leads to a better theoretical understanding. External validity would be improved with a multi-organization approach. Future research can use this study to analyze other ERP implementations and assess the generalizability of the model.

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