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Overcoming Knowledge Integration Barriers in ERP implementation Using Action Research Approach

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ABSTRACT

This study focuses on documenting the barriers of knowledge integration between the organizational culture and the best-practices supported by an ERP system using an Action Research approach. The findings contribute to the ERP literature because they provide managers with different knowledge integration barriers that appear during ERP implementation, and how authors, using an AR methodology, surpassed these problems. Moreover, this study offers a knowledge integration perspective to understand the ERP implementation as a whole process that involves internal and external stakeholders. In this regard, the training with a holistic vision is suggested to increase the likelihood of success of the ERP implementation project. Finally, some trends for future research are provided.

Keywords

Knowledge Integration Barriers, ERP implementation, Action Research, training.

INTRODUCTION

The growing popularity of Enterprise Resource Planning (ERP) systems can be largely explained by the change of business environment as well as firms' increasing needs for infrastructures that fully integrate different information systems and business processes (Davenport, 2000). Despite its potential benefits to firms, the implementation of ERP can be complicated and problematic, as ERP system software is not a standard package which we purchase off the shelf (Davenport, 1998).

There is a lack of research studies related to the ERP implementation process from the viewpoint of knowledge integration that facilitate knowledge creation, retention and how new knowledge is absorbed and transferred to become part of the firm's core knowledge competency (Esteves and Bohórquez, 2007). The essence of knowledge integration is to create an environment in which the knowledge infrastructure can effectively support the core organizational capabilities (Grant, 1999). According to Wan, Shan and Huang (2001), successful ERP implementation can also be seen as developing new cross-functional knowledge, capabilities and competence for the organization.

Specifically, this research study focuses on documenting the problems of knowledge integration between the organizational culture and the best-practices supported by an ERP system using an Action Research (AR) approach.

THEORETICAL BACKGROUND

Action Research

According to Baskerville and Myers (2004), AR methods provide a potential avenue to improve the practical relevance of Information Systems (IS) research. This approach has been accepted as a valid research method in other applied fields such as organization development and education (e.g. Carr and Kemmis, 1986; Elden and Chisholm, 1993). In addition, many authors have argued that the particular characteristics of AR make it predominantly applicable in applied disciplines such as IS (e.g. Baskerville and Wood-Harper, 1996; West, Stowell and Stansfield, 1995). Therefore, AR provides an excellent framework for an exploratory study of the ERP implementation process. In this regard, it enables to investigate the complexity and issues within the organizational context of the enterprise (Braa and Vidgen, 1999).

Knowledge Integration

Huang, Newell, Pan and Galliers (2001) suggest that the nature of knowledge integration can be conceptualized based on four distinctive but interrelated dimensions: structural, technological, intellectual and socio-emotional. The first dimension is related with the firm complexity, the second one with the technological tools used in the organization, the third one with the employee capacity to learn and the last one addresses the point that socialization is an essential process in achieving "emotional attachment" (Lembke and Wilson, 1998) to overcome departmental boundaries. In this regard, the dynamics of

knowledge integration in the context of ERP implementation are not limited to within the departmental/organizational boundary. Instead, knowledge integration is an ongoing process which takes place inside and outside organizations. Hence, the integration process is often met with obstacles, as knowledge is frequently tacit and embedded within routines, of which few are stand-alone (Blackler, 1995). Tacit knowledge within the system and within the organization makes knowledge integration in these implementations slow and painful (Nonaka, 1994). While earlier studies have examined the impact of knowledge integration (Pisano, 1994) and its implications (Boland and Tenkasi, 1995), there are few studies that have explored the process of knowledge integration (Pan, Newell, Huang and Kok, 2001; Esteves and Bohórquez, 2007). Therefore, our main goal is to cover this gap and extend the literature related with the process of knowledge integration in an ERP implementation context.

METHODOLOGY

The methodology used in this study was an AR approach conducted in an organizational context. Authors have chosen this methodology because one of them was inside the situation, and he was part of the consulting team that participated in the ERP implementation project. Therefore, he was inevitably influenced by what was happening (McNiff, Lomax and Whitehead, 2003), and he was both participant and agent of change (Coughlan and Coghlan, 2002). In a way, the researcher's role was one of facilitating throughout the process of the research and creating insights through 'expert' opinion in the research process (Greenwood, 1999). Moreover, this topic is suitable to this methodology because to identify the knowledge integration processes, in an ERP implementation context, a researcher needs to know the ERP System, the organization in which the ERP was implemented, and the whole implementation process. Therefore, the best way to cover these requirements is to participate not only as a researcher but also as a part of the implementation team, having a dynamic and interactive participation to enhance the understanding of the whole knowledge integration process.

The fact that one of the authors was part of the consultant team contributed to a total immersion within the context of the study. This provided excellent access to the knowledge base and documents within the organization and within the ERP implementation process. Field notes of daily observations were taken as well as recording of events. This provided a deep understanding of the social and organizational context of the study. This allowed the researcher to "build a complete picture of the ERP implementation process".

The unit of the analysis was the implementation team represented by key users and consultants; hence, the knowledge integration activities, related to the ERP implementation, had considered a broader organizational context as well as the contribution of the consulting firm. A period of three months was spent documenting and participating at this research study. Data collection was done through multiple interviews, attending workshops, brainstorming sessions, informal conversations, socialization, discussions and meetings; not only inside the company but also with the other members of the consultant team.

SETTING THE SCENE

The company

Today, ABC (fictitious name) has over 250 employees, occupies over 30,000 sq. meters (323,000 sq. feet), has annual sales close to US\$50 million – which place this company within the 200 largest companies in Peru – and holds a leading position in the three fields where its business activities develop: flavors and food ingredients, animal health and nutrition products, and natural ingredients with an active and increasing participation in international markets.

The consulting firm

BigOne (fictitious name) is one of the best known consulting firms in Peru. This firm not only has projects in this country but also it is present in other Latin-American countries. Many of its clients are leading Peruvian organizations or multinational companies that want to standardize their operations around an ERP system.

Nowadays, BigOne has more than 100 full-time consultants with a deep knowledge in organizational issues and information systems. Most of them have experience in implementation of ERPs in many industries. The years of experience and the deep knowledge of the Peruvian and Latin-American environment are the competitive advantages of BigOne.

The context

Previous to the ERP implementation, ABC had islands of information with different programs that fulfilled different tasks. In this regard, the system department was responsible for program development to satisfy the requirements of the company. This department has been stronger across the years because it controlled all the information inside the organization.

However, the poor integration of the existent programs, the duplication of data and effort, and the legal requirements convince the board to acquire an ERP system.

Since the beginning, the system department was against the adoption of a new system. This department was convinced that no ERP could give the company the functionality that each area had independently. This was the truth because an ERP system is a standard package of best practices that cover the main functions of a company. However, on the other hand the programs developed by the systems department were like a “tailored wedding dress”; hence, despite all the problems mentioned above, each program fulfilled particular requirements for each individual user/area. Therefore, the collaboration of the users was very poor because they do not understand that the ERP system was better because it brings data integration and consistency of processes. Additionally, they found the ERP very bureaucratic, because after the ERP implementation they will have more constraints in terms of data validation and workflow. In this context, the board offers one of the authors the possibility to analyze the presented problems and suggest some paths to solve them.

ANALYSIS AND LESSONS LEARNED

Theoretical Model

ERP packages are designed taking into account 'best practices' of a class of organizations, rather than the unique needs of a particular organization. By adopting standard packages, organizations can substantially reduce the costs, risks and delays associated with custom software development, and they can benefit from the on-going support services provided by ERP vendors and consultants (Brehm, Heinzl, and Markus, 2001). However, not all organizations have the organizational culture capable to adopt these best practices easily in their day to day operations. In this sense, organizational culture may also be considered as a knowledge resource because it provides the context within which organizational members create, acquire, share, and manage knowledge (Holsapple and Joshi, 2001). Therefore, a key issue in the knowledge integration process, in an ERP implementation context, is to identify the main barriers that can hinder this activity.

Based on our analysis, we identified three blocks as the main Knowledge Integration Barriers: Structural Barriers, Technological Barriers, and Intellectual and Socio-Emotional Barriers. The understanding of these three dimensions is critical to align ERP best-practices with the Organizational Culture, having a smooth knowledge integration process, and within the schedule of the ERP implementation. Our theoretical model is shown in Figure 1.

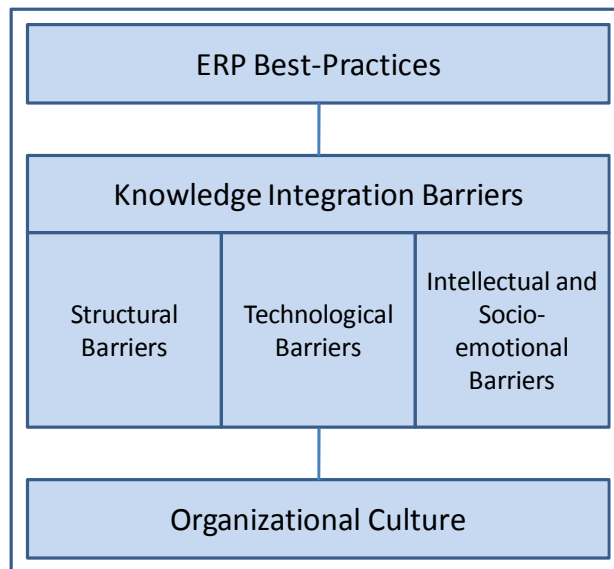


Figure 1. Theoretical Model

The next step is to use our case to describe each of the identified barriers, to provide some hint to highlight the knowledge integration process, and to promote the discussion comparing our findings with previous studies.

Structural Barriers

Organizational structure is vital for how it harnesses the knowledge, and strategically directs it towards agility and competitiveness (Mohamed, Stankosky, and Murray, 2004). Therefore, it is very important to know the organizational structure existent in the organization before the ERP implementation to prevent possible knowledge integration problems that could appear. The main structural barrier was that organizational structure limits the interaction among the different functional areas, and this fact hinders the knowledge integration process.

This problem was analyzed through informal discussions and numerous brainstorming sessions with key users and external consultants. As a result, stronger common knowledge links were found, fostering social relationships among the users and the consultant team. These relationships were crucial to the identification of the whole complexity of the organizational structure and to determine the implementation requirements later. Moreover, the level of efficiency reached in the ERP implementation process depends on how the organizational structure aligns with the nature of the tasks performed by members.

Ross and Vitale's (2000) found that the majority of the firms surveyed perceived ERP implementation to be extremely disruptive. This situation could be explained because the new system tends to require new business processes. In this regard, many organizations fail to forecast and plan for this change because they do not know their real complexity, and also, because rigid and hierarchical organizations inhibit rapid change even when only exists a few layers of bureaucratic strata (Mohamed et al., 2004). In general, ERP systems require formalization and standardization, and this behavior is indeed bureaucratic. Govers and Van Amelsvoort (2007) dealing with the question whether the introduction of ERP system promotes bureaucratization within organizations. Their results suggest that the implemented ERP system generated an increased bureaucratic effect on the organization investigated because they obtain an increase of formalization, standardization and centralization; and on the other hand a decrease of hierarchization and specialization. In order to create a situation in which ERP system supports diminish of bureaucratization and increment of business agility, the ERP system must be diffused by means of a variety approach instead of uniformity approach (Allen, 2005; Wagner and Newell, 2004). Furthermore, Markus (1983) suggests that implementation only succeeded when the organization was able to re-structure itself, and not just overlay the new Management Information System on the old organizational structure. In this regard, Hammer (1999) argues that the ERP implementation is an integrative mechanism that connects diverse departments establishing integrated processes. In our case, the independency of departments had resulted in diversity of interest and competencies in specific knowledge areas (Pisano, 1994) which made ERP implementation quite difficult.

In a previous study, Pan et al. (2001) argued that key users, who were being consulted informally, could form strategic groups to facilitate and enhance the value of their individual knowledge embedded within organizational practices and processes. They found that these communities were very useful as they helped develop and spread better ERP practices faster by connecting "hubs of knowledge" and facilitating the processes so that they became self-organizing, knowledge sharing networks of collaborative learning communities. In our study, these kinds of groups were formed after the appearance of the first knowledge integration problems because the consultant team detected that there was a need to build a new organizational structure to support the ERP implementation process.

Technological Barriers

The main technological barrier emerged because IS people within the information systems department were the authors of the previous system, and they had problems to understand and maintain easily the new ERP system. They were not comfortable providing support to ERP users because they had not internalized the routines necessary to support the new ERP system.

This problem was analyzed in formal meetings with the consultant team, the IS department of the company, and the key functional users of each department. Therefore, the development of routines that coordinate the work-related efforts of consultants, key functional users, and IS people in the organization facilitated knowledge integration because they had the opportunity to habituate automated patterns of interaction, and hence allow for the integration of knowledge required for task performance (Gersick and Hackman, 1990).

The second technological barrier was the parallel use of legacy systems. Mitleton-Kelly (2004) considers that new systems may quickly become 'legacy systems' in the sense that they do not meet the full requirements of the users and are unable to fully support business evolution. Furthermore, most of the legacy systems do not use a Relational Database Management System (RDBMS); they still use proprietary flat file systems (Michiels, Deridder, Tromp and Zaidman, 2003). The reason for this is simple: there is no central ownership of data or information items in use by these companies. This situation often leads to a rapid growth of different information models, where every part of the organization has its own view on that same information, with differences in structure and even in the semantics of these information models (Vandenborre, Heinckens, Hoffman and Tromp, 2003). In our particular case and as it was commented above, the company had islands of information

with different programs that fulfill different tasks. This context promoted the comparison between the legacy systems and the ERP system as well as a considerable duplication of effort. According to Wan et al. (2001), most of the users seem to be interested in how consistent and similar the new ERP was when compared to the legacy systems. Therefore, users did not focus on learn the use of the new ERP system and integrate their knowledge with it, but they wasted their time performing a double job to keep both systems updated.

This problem was solved with the use of legacy systems only for validation reasons. Since ERP modules, processes or reports were validated, users only will have access to the ERP environment for their day to day work. This solution reduces the amount of work in terms of duplication of efforts. Additionally, users will focus only in the ERP system; this means a reduction of the comparisons with the legacy systems, an increment of the users' productivity, and a possibility to integrate user knowledge in the ERP system.

Intellectual and Socio-emotional Barriers

These dimensions are complementary because they deal with different characteristics of human beings. The intellectual dimension is related with the learning and knowledge of users, and the socio-emotional dimension considers the feelings and the willingness to improve skills of the users. The main barriers in these dimensions were: knowledge transfer between the legacy system and the new ERP system, and between consultants and ERP users; ERP users were trying to make sense of the change; and individual knowledge was isolated in organizational silos.

Much of the knowledge was embedded in the particular legacy system and in individual users of every area, making it inaccessible by the new ERP system; hence, it is crucial to understand and share this embedded knowledge to ensure successful knowledge integration. Harrison and Leitch (2000) highlight the importance of creating knowledge-enabling structures around the existing information systems for enabling intra-organizational knowledge transfer and sharing. This perspective considers the intellectual dimension as a driver of the change in the users' mentality.

According to Ko, Kirsch, and King (2005), not much is known about knowledge transfer from consultants to ERP users, in which the knowledge structure of the participants is asymmetric. Initially, the consultant primarily possesses technical knowledge, whereas their clients, future ERP users, primarily possess business knowledge (Rus and Lindvall 2002). Hence, the knowledge initially possessed by the consultant must be integrated and embodied (Faraj and Sproull 2000) in the knowledge of the ERP users (Soh, Sia and Tay-Yap, 2000). Such shared understanding removes barriers, allowing both parties to minimize disagreements and enhance their ability to work together for effectively transferring knowledge.

The concern about users preferring old procedures and not adapting to the new ERP environment was prevailing (Soh et al. 2000). Cohen and Levinthal (1990) suggested another explanation for this behavior, users may not be resisting to the change, rather than they are trying to make sense of the change. This approach is related with the socio-emotional dimension because users need to justify that these changes are better for them. Several managers surveyed in Ross and Vitale's (2000) study admitted that they underestimated the impact that the ERP system had on individuals; and, most managers said that if they could go back, they would offer more training on how the system changes business processes. Robey, Ross and Boudreau (2002) cited user training as a key requirement for ERP implementation, and those firms, which invested wisely in training, successfully overcame socio-emotional barriers involved with the ERP implementation. Therefore, taking into account these suggestions, the next step was the improvement of users training to enhance the justification that changes are beneficial to everyone because now users know how their work fits into the whole processes of the company.

Finally, the last barrier to overcome was the individual knowledge isolated in organizational silos. The suggested solution was the identification and definition of new procedures and functions to shift the user perspective from the individual level to the organizational level. This means that to reach the knowledge integration process across the organization, there was a need to map the existing knowledge into the ERP functionality. Moreover, this new vision of the firm "as a whole" reduces the perception of the new ERP system as a bureaucratic tool, and promotes exchanges of information among departments to increase collaboration and knowledge integration in the organization. Hansen (1999) has defined it as more personalized approach to knowledge. Furthermore, Pan et al. (2001) suggest that ERP team members must instigate a process of relationship building through increased information sharing and social interaction among users. This behavior promotes the structural integration to improve knowledge integration through users' willingness to share information and ideas in the form of political transparency or process de-layering (Wan et al., 2001).

CONCLUSIONS AND FURTHER RESEARCH

According to Wan et al. (2001), very little is known about how an organization adapts to the new ERP system that implies significant contextual, social and cultural changes. Therefore, this research study contributes to the ERP literature because it

provides managers with different knowledge integration barriers that appear during ERP implementation, and how authors, using an AR methodology, surpassed these problems.

This study was built on Huang et al. (2001) four dimensions perspective (structural, technological, intellectual and socio-emotional) to understand the sources of possible problems in this kind of projects. This framework is an interesting topic to future researches. In our study, a key issue to deal with structural barriers was the promotion of new organizational structures, these strategic groups were formed after the appearance of the first knowledge integration problems to support the ERP implementation process. In term of technological barriers, IS people were reinforced in their knowledge related with the new ERP systems, and legacy systems were used only for validation purpose. Finally, for intellectual and socio-emotional barriers, there was an improvement in the transfer of knowledge between consultants and ERP users; ERP users were provided with more training to make sense of the change of the system; and individual knowledge was shared with others, promoting collaboration among departments.

Finally, the training with a holistic vision is an ignored frequent issue that most of the ERP projects must consider to increase the likelihood of success of the ERP implementation. Therefore, this is a promising path to further researches.

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