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ORIGINAL PAPER

Successful implementation of ERP systems in small businesses: a case study in Korea

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Abstract The implementation of enterprise resource planning (ERP) systems supporting business processes across many different departments and partners has been known to be much more difficult than the development of a computer application supporting a single business function. In this article, we present a case study of an ERP system application by a small business. Jinyang Oil Seal Co., Ltd. is a professional oil seal manufacturer for automobiles and electronic equipment in Korea. Jinyang has recently adopted and implemented an ERP system, which has helped the organization to achieve a competitive advantage. This article reports how Jinyang coped with the typical challenges that most small business organizations face when implementing an ERP system.

Keywords Enterprise resource planning · Case study · Implementation · Jinyang Oil Seal Co., Ltd

1 Introduction

An enterprise resource planning (ERP) system is a computer information system that integrates business functions in an organization's value chain. García-Sánchez and

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Pérez-Bernal (2007) defined ERP systems as an information system that combine organizational functions and distribute shared benefits to all departments. Turban et al. (2003) addressed that ERP systems offer the capacity to handle resources based on business functional integration. Likewise, many organizations have been adopting ERP systems to streamline their business functions that can simultaneously share the latest information. ERP systems make operating processes efficient that helps to improve organizational performance in a rapidly changing environment (Mabert 2000).

Most ERP adopters believe that systems would enhance operations in terms of speed and value, and thus reduce wasteful costs (Lin 2006; Chien and Tsaur 2007; Grabski and Leech 2007). Successful ERP implementation by a company yields benefits to its customers not only because they can purchase products or goods at low prices resulting from the cost savings but also because they share the data of the production line in real time. ERP systems also help employees to focus on creative work and customer service (Ifenedo 2007).

Many business organizations that adopted ERP systems attained the benefits they sought (Hitt et al. 2002). After ERP systems were successfully implemented, companies could set up standards on financial management and operating procedures like managing inventory systems (Lin 2006). However, not all adopters had successful implementation, and some organizations failed because ERP system implementation was much more complex than just developing a computer application for a single business function. More than 90% of ERP implementations have been delayed and required additional budget amounts due to numerous changes in the original plan (Wang and Chen 2006). Even when a company realizes that its ERP implementation is not going to be successful, it is usually impossible to cancel the effort (Bingi et al. 1999). Indeed, organizational performance and productivity often suffer right after ERP implementation (Hitt et al. 2002).

Most literature on ERP implementation has focused on large enterprises that were considered to be appropriate for ERP systems (Chien et al. 2007). However, the cost of ERP systems is rapidly decreasing to let small- and medium-sized enterprises (SMEs) adopt the system (Quiescenti et al. 2006). For example, the application service provider (ASP) for ERP is an attractive source of support for SMEs that have a few IT professionals (Trimi et al. 2005; Olson 2007). Bernroider and Koch (2001) stated that SMEs have different ERP selection procedures from their larger counterparts. SMEs follow a very different way to adopt the ERP system from large enterprises in terms of "operating requirement, logistics fulfillment, and financial capabilities" (Huin 2004). Jinyang Oil Seal Co., Ltd. is a small professional oil seal manufacturer for automobiles and electronic equipment in Korea. Jinyang has recently adopted and implemented an ERP system, which turned out to be very successful in enhancing its competitive advantage. This article reports a case study of how Jinyang coped with typical challenges that most SMEs face when implementing an ERP system.

2 Jinyang's ERP adoption

Established in 1991, Jinyang has employed approximately 90 workers, has sales of $13 million a year, and has become a provider of world-class products through

continuous technological development and research activities. As a supplier to well-known large corporations, Jinyang has partnered not only with domestic companies such as Hyundai Motors, LG Electronics, and Samsung Electronics, but also with foreign companies such as Toshiba, Sharp, and Maytag. Jinyang's efforts for quality improvement have resulted in obtaining four ISO certifications, and the company was selected as the winner of the Outstanding Company Award by the Korean Government. Despite its many successful cases of product research and development, Jinyang recognized the adoption of their ERP system was the most significant factor that led to business success.

Jinyang's ERP project, initiated in the early 2000, was motivated not only by the internal needs of the organization but also by the rapid changes in their competitive business environment. Both middle- and top-level managers of Jinyang realized that the production line was neither efficient nor effective due to the high percentage of material loss and the low quality of their products. The Korean Government's support for old-fashioned manufacturers adopting information systems also motivated Jinyang's upper-level managers to invest in an ERP system.

In selecting the ERP vendor, Jinyang took into account such traditional factors as its financial situation, history, success/failure cases, and people. Of these important factors, however, passion for the success was the first consideration when Jinyang selected ComputerMate Co. as its partner for ERP system development. ComputerMate, a small software development company with not more than 10 developers, had been struggling in attracting customers mainly because of the old-fashioned mindset that made many organizations hesitate to adapt to new, computerized business environments. ComputerMate as a new software company had extraordinary passion to achieve success in implementing ERP at Jinyang in order to make it their reference site.

Another important consideration in contracting with ComputerMate was that the project manager from ComputerMate had work experience in the rubber industry. Industry experience of the project manager was a factor that could help effective communication between Jinyang and ComputerMate. While most traditional programmers prefer to work in a quiet, clean office environment, the project manager, by way of his past experience in the same industry, had already been accustomed to the noisy, sometimes disorderly working environment of Jinyang. During the negotiation stage for the contract, the project manager had already built trust and friendship not only with middle and top managers but also with low-level operation managers at Jinyang.

Jinyang had already known that an ERP system success story would rarely be reported due to the confidential nature of the project. Top management support has been regarded as the most critical success factor for ERP implementation in the literature (Akkermans and van Helden 2002; Finney and Corbett 2007; Plant 2007). Top management should understand the benefits that the company could obtain from an ERP system and must have a strong intention to restructure business processes. Jinyang had also understood that the success of their ERP project was dependent mainly upon the organization's intrinsic factors such as timely support for the project, continuous improvement of business processes, and commitment of employees to the project.

3 Jinyang's ERP implementation

3.1 Project team

Both Jinyang and ComputerMate were very careful in the organization of the project team for ERP system development and implementation. Jinyang demonstrated its full support to the project by matching one functional representative from Jinyang for the project to ComputerMate personnel, as shown in Fig. 1. It also helped ease of communication between developers and users.

Figure 1 shows the project manager, appointed by Jinyang, was the executive of its Technological Development Department and was a computer-minded engineer who had been actively involved in developing and stabilizing new production processes from the beginning of the company. The chief of the Computing Department played a role of delivering user requirements for software developers and harmonizing the conflicts between ComputerMate's developers and users at Jinyang. The changes of business processes that could cause the resistance from the workers were first reported to the project manager. Based on the judgment of whether or not the change is necessary for innovation, the project manager, sometimes with CEO, made the decision and explained to users why the new process would be inevitable, how long it would take to install, and what benefits it would bring to Jinyang. Active involvement of the executive of the Technological Development Department and the CEO made it easy for low- and mid-level employees to understand and follow the organization's direction.

Another important success factor in the literature is project team competence. The project leader's experience and project team's technical capability make ERP implementation successful and improve business process performance (Chien et al.

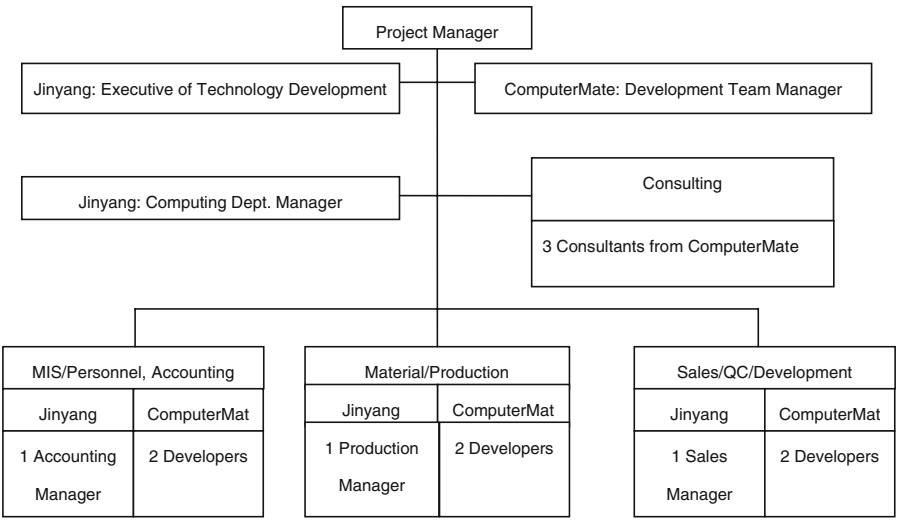

Fig. 1 Organizational chart of the project team

2007; Karimi et al. 2007; Plant 2007). Just as the project team must have implementation knowledge, so do end users need different types of knowledge to make the system successful. Through the implementation phase, end users will understand what their ERP system can do and such cumulative knowledge about the ERP system enhances the possibility of ERP success (Ptak and Schragenheim 2000; Ifenedo 2007; Park et al. 2007). Park et al. (2007) defined absorptive capacity as end users' understanding of the logics of ERP modules, and maintained that end users' absorptive capacity is an important condition for ERP implementation success. Wang et al. (2007) suggest that knowledge transfer from the ERP project team to end users is one success factor for its implementation. If cultural differences between the supplier and users of the ERP system are not overcome, ERP implementation cannot be successful (Swan et al. 1999).

3.2 Single objective of the project

In developing the objectives for IT projects, most business organizations prefer to have elegant goals such as competitive advantage, speedy operation, and user satisfaction that are often too ambiguous to most low-level employees. However, Jinyang chose one single objective, the reduction of material loss that had been a critical problem for all levels of the organization. Sharing the clear, concrete single objective has made it easy to explain why the proposed ERP system is important to the organization and to involve all the workers in the project.

Davenport (1998) maintained that successful ERP users had carefully prepared for ERP adoption. He recommended that companies should consider the following ERP implementation objectives: competitive advantage, organizational environment, and the degree to which business functions are reformed by ERP systems. Thus, ERP system implementation would be easier if a firm intends to conform its business processes to the ERP system (Ferratt et al. 2006). Before making the system development plan, ComputerMate also spent a significant amount of time analyzing Jinyang's current processes and recommended new processes.

According to Law and Ngai (2007), a company could make its ERP implementation successful and thus lead to improved organizational performance when it has a strong intention of building a system that supports its business strategies. Thus, top management should urge departments to act in harmony with each other when business processes of each department are required to be changed by ERP implementation (Plant 2007) because ERP adoption is necessary to not only introduce a new technology but also a new business strategy (Davenport 1998). As many other cases reported, Jinyang also had trouble adopting and diffusing the new processes due to the resistance from field workers and managers who were accustomed to the old, existing processes. However, the project team did not initiate developing new systems until new business processes were fully developed. Both Jinyang and ComputerMate agreed that changing business processes should be completed prior to developing new systems.

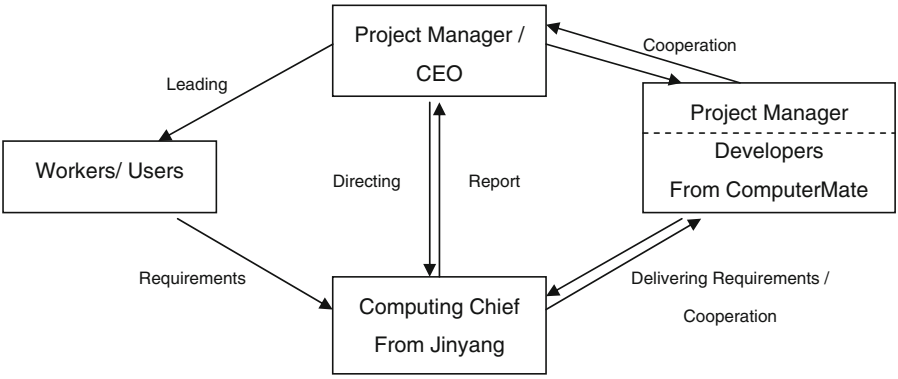

Fig. 2 Communication paths of the project team

3.3 Communication for the project

Upon the development of the ERP system (Fig. 2), ComputerMate personnel explained the developing processes to Jinyang employees until they were confident of the expected results of the proposed systems. Even though it took more time to build a sufficient level of user trust in the commitment of the developers, ComputerMate recognized that the first priority was not to advance to the next stage and finish the project until the full support from the users was obtained. Further, ComputerMate and Jinyang's CEO had frequent meetings to make sure that the project was on the right track. Through these meetings, the CEO also learned many important items for the success of the ERP project. For example, Jinyang's CEO recognized that the cost of system maintenance and user support, in addition to the system development, should be considered as the investment for competitive advantage. Table 1 presents the timeline of ERP implementation at Jinyang.

4 Evidences of success

4.1 Tremendous reduction of material loss

Prior to the implementation of the ERP system, Jinyang had estimated that approximately 5% of total material input was being lost in its production line. To make it worse, these was no consensus about the estimated percentage of loss between management and production, because no one was sure about where the loss occurred. By enabling the loss to be tracked down, the ERP system notified which part of the production was responsible for the material loss. Consequently, top managers became confident of tracing not only the material loss but also identifying their workers who are sensitive on product quality.

Table 1 Timeline of the project

Year	Progress
2001	MATE-ERP Version 1.0
	Personnel, accounting, sales, production, material, quality
2002	Point of production (POP) System Version 1.0
	Molding and post-molding
2003	System settlement
2004	Upgrade of a POP module (MATE-CIM 1.0)
	Mixing process management
	Production process monitoring
2005	Expansion of ERP and POP
	ERP system upgrade (MATE-ERP Version 3.0)
	Linking production to cost accounting system
	Linking Jinyang system to Samsung Electronics SCM
2006	System settlement
2007	Upgrade of ERP (Adoption of system process control)
	Construction of wireless control system using PDAs
	Final product examination and score card print-out
	Addition of a POP module
	Iron-ring preparation process management

4.2 Reduction of operation managers

While the number of total employees increased from 34 to 90, the number of management personnel has stayed at about the same level of 10 as the production line was equipped with computers. As shown in Tables 2 and 3, keeping the number of employees for management at the same level, in spite of the growth of sales and facility expansion, enabled Jinyang to establish a separate R&D Department with more than 10 persons. To make it better, Jinyang was given preferential tax treatment from the government for the investment into its R&D Department.

4.3 Improvement of corporate image

Most manufacturing companies in the rubber industry are known to hold unfavorable working conditions in their facilities with heavy machines, oily tools, and iron dust. Low-level employees working for the floor operations that are equipped with computers and printers have reportedly become very sensitive to keeping their working places as clean as possible. Mid-level managers have also been positive on the successful ERP implementation, and that has rarely been reported in the rubber manufacturing industry. The internal support from low- and mid-level workers made top-level managers confident in their further investment for system upgrades.

Table 2 Successful results of the project

		2001	2002	2003	2004	2005	2006	2007
Sales	Amount ($1000)	2,970	4,100	6,140	8,000	12,000	12,000	14,000
	%		28	33	23	33	0	14
Sales per employee ($1000)		85	89	112	136	176	141	161
Investment ($1000)	Government	20	50	0	50	0	15	5
	Jinyang	74	133	74	127	186	140	110
	Total	94	183	74	177	186	155	115
IT adoption		Adoption of ERP	Adoption of POP	First year for system settlement	POP upgrade	Expansion of ERP & POP	Second year for system settlement	ERP upgrade

Table 3 The number of employees at Jinyang

	Executives	R&D	Sales	Quality	Management	Floor	Total
2007	4	14	8	7	11	46	90
2006	3	11	6	7	13	45	85
2005	4	7	6	7	12	41	77
2004	2	7	3	3	9	38	62
2003	1	5	2	2	9	36	55
2002	1	4	1	2	8	28	44
2001	1	3	1	1	5	23	34

4.4 Competitive advantage for marketing

As the ERP system has successfully integrated into the operation of Jinyang, more business opportunities were brought in not only from domestic companies such as Hyundai Motors, LG Electronics, and Samsung Electronics, but also from foreign companies such as Toshiba, Sharp, and Maytag. Visitors from these global companies were encouraged by the streamlined production processes completed by the stunning success of the ERP system implementation in a small rubber manufacturing company. These visitors had not seen a successful implementation of the ERP system in SMEs like Jinyang. Jinyang, unafraid of change and upgrades, is expecting more business opportunities with potential customers who want to share its production data in an online, real time computing environment. The ERP system integrates external information into internal data (Davenport 1998; Lin 2006). Samsung Electronics, for example, made a business contract under the condition of aligning Jinyang's new system with its own ordering/purchasing systems.

4.5 Change of attitude toward IT

Resolving data inconsistency between on-site production and off-site management has obviously helped Jinyang establish low-level employees' trust in top managers. As Jinyang, was able to standardize the data transactions among departments inside the organization, through the implementation of the ERP system, employees began to feel that IT really did simplify their job and save their time. The employees' attitude regarding IT has also moved toward the positive direction as they witnessed that the operation and working environment improved tremendously. The positive attitude of employees is expected to contribute to Jinyang's efforts for adopting and using IT as its strategic weapon.

5 Lessons from Jinyang's success

5.1 Not merely computerization, but rather process innovation

Many failures in adopting ERP systems were primarily due to the fact that organizations did not consider ERP systems to drastically change their existing

business processes. All the employees, ranging from operational workers to computing department managers and top managers, must understand that the adoption of ERP systems is not merely computerizing the existing processes without changing much of them. Jinyang's top managers understood that it was necessary to change their old processes in order to realize the true benefits of an ERP system. Jinyang explained to their employees that the processes would be redesigned almost from scratch. Jinyang did not think of the ERP adoption as computerization, but rather as process innovation. The ERP system was thought of as a high performance vehicle that could take the organization to the next level. The ERP system at Jinyang, however, has never been thought of as a change agent in itself, but rather the workers were the true factor that brought the success. The CEO of Jinyang expressed his approach as follows: "Mindset is the first, software the second, and hardware the third."

5.2 Not only for the computing department, but for the whole company

It is very well-known that an invisible boundary exists between the computing department and other functions in an organization. The demarcation line is very clear and high in many organizations that create negative perceptions of the employees toward the computing department. To make it worse, some computing departments prefer to isolate themselves from other departments and thus create critical difficulties of communication. It is mainly because the role of the computing department in many organizations is still considered as a cost center for support rather than a profit center for competition. Likewise, an ERP system would fail if the project is considered as a job only for the computing department. At the beginning of the project, Jinyang exerted a great deal of effort to change the perception of end users toward the ERP system. The ownership of the system was declared to belong to the end users, and not solely to the computing department. While the computing department played a bridging role between end users and ComputerMate, end users did not stand back with a wait-and-see attitude as they had the ownership of the project. End users attempted to understand the causes and effects of problems. At Jinyang, one of the ERP success factors was the participation and involvement of the end users as well as from the computing department. In leading low-level workers to become involved in the project, the Executive of Technology Development Department of Jinyang emphasized, "Whatever they (ComputerMate) have done for us, the system remains in our house, not in their (ComputerMate's) house."

5.3 From top–down to bottom–up

Jinyang did not use only one approach for the entire process of the project. At the beginning of the project, top managers motivated their employees and sometimes enforced new processes. But, managers understood that the project would never be a success unless end-users voluntarily participated and created ideas to fix the existing process problems themselves. After showing them the prototype of the system, Jinyang and ComputerMate rewarded end users who suggested ideas for a better

system. Although the project was started by using a top–down approach, success was guaranteed when end users participated and utilized their creativity. The project manager from ComputerMate said, "I was sometimes confused. Who was designing and developing the system? At Jinyang, many users seemed to have done it together."

5.4 Data consistency among departments

In measuring the success of the ERP project, Jinyang and ComputerMate used the consistency of data between the production and other departments. Keeping data consistent among many different departments and processes was believed to be the most critical barometer of ERP success at Jinyang. Tagging all the changes made to the original data helped the computing department trace back where the consistency was broken. Floor workers became more sensitive to typing in both input and output that occurred during their work processes. The project manager from ComputerMate addressed, "The ERP system is like constructing an artificial river so that data can run through processes, departments, and the whole organization."

5.5 More focus on post-development

It is very well known that finishing an IT project with successful results is only the beginning of a long road ahead. Many successful IT projects would end up being failures if the developed systems were not maintained and supported on a continual basis. Jinyang examined their ERP system regularly in order to find problems and new requirements for its continual improvement. Keeping a good relationship with ComputerMate, even after the project was over, has been an important issue that is still being discussed in the executive meetings of Jinyang. An executive of Jinyang said, "An ERP system seems like a baby that should be taken care of by its parents. We understood that the role of the father should be taken by us while the mother's role was ComputerMate's."

6 Conclusions

The CEO of Jinyang stated, "I believe that our success is just the beginning of the long road. We need to have our employees think more creatively using systematic thinking." Jinyang is now preparing for the second generation of ERP systems that can help better streamline its business processes. By using the information they have collected from its ERP system, Jinyang is expecting that its strategic decision making would be well supported. This case study of Jinyang should provide important insights to many SMEs that are considering ERP implementation.

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