A Case Study on the Successful Upgrade of ERP System

Jaehoon Whang\textsuperscript{a}, Moon-Bong Lee\textsuperscript{b} and Kijoo Kim\textsuperscript{c}

\textsuperscript{a} College of Commerce and Law, Yonsei University
234, Wonju, Gangwon-Do, Korea, 220-710
jwhang@dragon.yonsei.ac.kr

\textsuperscript{b} College of Commerce and Economics, Dongeui University
Kaya-Dong, Pasanjin-Ku, Pusan, Korea, 614-714
mblee@dongeui.ac.kr

\textsuperscript{c} College of Business Administration, Konyang University
26 Nae-Dong, Nonsan, Chungnam, Korea, 320-711
kjkim@konyang.ac.kr

Abstract
Enterprise resource planning (ERP) solutions have been implemented by many companies rather than system development on the promise of improving processes and feasible strategic benefits. Typical feasible benefits include an adoption of global standards and processes through a proven integrated system, continuous version upgrading by vendors, and thus relatively easy system maintenance. The objective of this research is to propose a conceptual framework of ERP implementation process and identify the critical issues and factors for the successful upgrade of packaged ERP solutions. Based on the case study of five organizations that have experienced ERP system upgrade implementation, five critical factors for successful system upgrade are identified as follows: (1) clear goal statement, (2) good coordination and communications with implementation partners, (3) thorough management of customization history, (4) preparation for system requirements, and (5) role redefinition between business and IT departments.

Keywords
Enterprise resource planning system, post-implementation strategy, system upgrade

1. Introduction
Today’s turbulence in the business environment puts pressure on organizations to be sure that they can rapidly meet the customer needs and make timely decisions on their resources. Many companies have implemented an enterprise resource planning (ERP) system as a powerful alternative for an integrated information system to support speedy and accurate transaction processing and decision support functions. Moreover they have implemented a packaged ERP solution for establishing an integrated backbone system rather than traditional system development. SAP, a well-known global ERP vendor reported that about 80% of Fortune 500 corporations have already installed or are installing its R/3 system or mySAP.com solution. Likewise many Korean leading companies and Korea offices of global firms have implemented ERP solutions. Thus the ERP solution market in Korea has grown annually by over 50% until 2001, and is expanding toward the extended ERP solutions such as SCM and CRM.
While ERP vendors have reported many successful cases, we have also seen other stories about failed or out-of-control projects. For example, FoxMeyer Drug, USA argued that its system helped drive it into bankruptcy, and Mobil, Europe spent lots of investment on its system only to abandon it when its merger partner objected [Davenport, 1998]. Also Kapp (2001) mentioned that many companies including Dow Chemical, Dell Computer and Hershey Foods have suffered from difficulties in ERP implementation and stabilization because the training plans are haphazard, ill conceived, and focused on the wrong topics, and emphasized the importance of training rather than integration.

It is true that Korea’s companies have suffered from double difficulties in that they should introduce global standard practices including unit of measures and new information system requirements comparing to their traditional domestic practices and previous IT level of legacy systems. ERP implementation requires lots of investment in solution license fee and hardware as well as consulting fee for the purpose of knowledge transfer regarding on ERP project management and solution functions. However they may not fully achieve the substantial goal of business performance and may miss strategic business opportunities due to the overemphasis on best practice justification and rapid implementation [Whang & Lee, 2002].

These issues result from the lack of understanding on ERP potentials and/or impact on organizations in the ERP implementation lifecycle. Especially the post-implementation phase is very important to keep obtaining the continuous improvement. This paper proposes a set of success factors for a typical post-implementation activity, ERP system upgrade based on project reporting documents and interviews with managers of five organizations that have experienced system upgrading more than once.

2. Literature Review

2.1 Definition of ERP System

There are two widely-used definitions of ERP system. One from a manufacturing perspective by the America Production and Inventory Control Society (APICS) is ‘an accounting-oriented information system for identifying and planning the enterprise-wide resources needed to take, make, ship, and account for customer orders’. This definition can be understood as the expansion of IT applications with higher computing power in the manufacturing context along with Material Requirement Planning (MRP-I), Manufacturing Resource Planning (MRP-II), and computer integrated manufacturing (CIM).

Another definition from an information system perspective by the Gartner Group is ‘a series of applications representing the next business system, designed for balancing business functions’. This definition means that an ERP has a different technical composition in 1994 such as graphical user interface, relational database, client-server architecture and open system portability. This kind of state-of-the-art technical competency continues on the current extended ERP solutions such as web and/or mobile applications integration, SCM, and CRM for their survival as well as market leadership [Chorafas, 2001].

2.2 Prior Study on Strategic Use of IT and ERP System

There have been a number of studies that attempted to establish a clear vision of possible alternative systems by employing a categorization scheme built using important dimensions
since early 1980’s when the importance of strategic use of IT was recognized. As strategic role and impact of IT have been increased in 1990’s and realization of IT as a first-moving initiator and problem solving resource has been popularized, the paradigm has been shifted from IT function-orientation toward the business or strategic utilization of IT.

Especially, BPR or process innovation since early 1990’s has emphasized that IT enables process redesign while at the same time process innovation realizes the value of IT [Hammer, 1990; Davenport, 1993; Hammer & Champy, 1993]. The implication includes that business strategy whose infrastructure is business process has bilateral relationship with information strategy whose infrastructure is IT [Davenport & Short, 1990].

Luftman (1996) proposed two patterns for ERP system implementation in terms of strategic fit and functional integration. One is a strategic execution, which means the process redesign for accomplishing business strategy followed by implementing ERP system as a visible tool. In other words, after redesigning processes, an organization performs mapping them to the functions that ERP system provides. Another is a service level pattern, which is outsourcing ERP functions (IT infrastructure); it means introducing best practices embedded in ERP system and redesigning the processes and organizations to maximize the utilization of ERP functions toward business strategy achievement.

As long as an ERP implementation process is concerned, several researchers have developed process models. Based on the discussions with 20 practitioners and studies of three global company projects, Bancroft et al. (1998) proposed five phases: focus, as is, to be, construction and testing and actual implementation. Ross (1998) model has also five phases from 15 case studies of ERP implementation: design, implementation, stabilization, continuous improvement and transformation. Markus & Tanis (2000) categorized into four phases in the ERP life cycle based on the process theory focusing on the sequence of events leading up to implementation completion. The phases are as follows:

1. chartering - decisions defining the business case and solution constraints,
2. project - getting system and end users up and running,
3. shakedown - stabilizing, eliminating bugs, getting to normal operations,
4. onward and upward - maintaining systems, supporting users, getting results, upgrading, system extensions.

Jang, Suh & Lee (2000) classified four groups of CSF of ERP implementation and identified 27 potential factors based on the previous studies. Their empirical study showed five factors for both user satisfaction and organizational performance: top management support, IS planning, ERP implementation methodology, introduction goal, and the degree of process standardization. Also Nah et al. (2001) identified 11 critical success factors for ERP implementation based on a review of ten articles on the key factors for ERP implementation success. They also classified the factors into Markus & Tanis’ ERP life cycle model, but mentioned that all of the 11 factors are critical in the onward & upward phase, thus it is hard to figure out the specific needs and/or courses of action for the successful post-implementation phase.

Many studies on ERP systems have identified critical success factors mainly on the implementation project phase, and their methodologies are categorized into three approaches; classifying them of the expert/vendors opinions and previous studies, case study, and exploratory empirical study through analyzing a survey. Some researches have focused on proposition of new approach for ERP system development or linkage with specific business domains such as accounting or human resources management, however little research has been conducted on post implementation strategy of ERP systems.
3. Conceptual Framework Guiding the Study

ERP system implementation means the change of process in that the introduction usually brings the adoption of To-Be processes as output of BPR project and/or global standard processes embedded in the ERP solutions. Figure 1 shows a conceptual path of ERP system implementation from the practical perspective.

Path ① is a process redesign phase that includes identification of As-Is issues, process benchmarking for best practices, and development of To-Be processes. This phase is optional depending on whether a company performs a BPR project.

Path ② is a project phase that comprises system configuration and customization. Since all To-Be processes may not be accomplished by using the ERP functions in the implementation, standard processes embedded in global ERP solutions (ERP process) are positioned in the middle of As-Is and To-Be process levels. Some functions would be developed as add-on programs. ERP vendors keep collecting these business needs and may plug them in the higher version releases.

Path ③ represents a rollout and stabilization phase that includes process finalization, integration testing, rollout, and maintenance. The reasons of lower level positioning than the level of ERP process include limited time schedule for project completion, difficulties in coordination of internal conflicts, organizational resistance, and/or lack of user capabilities.

Once the system is stabilized in terms of data consistency, financial closing, and management controlling, it is needed to plan the next strategic shift while solution vendors independently continue releasing the higher versions. Typical activities in the post-implementation period include continuous business improvement, additional user skill
building, and upgrading to new releases. Some activities may be similar to those in the initial implementation period, however since the baseline is different, we expected different factors for the successful post-implementation, especially system upgrading.

4. Case Analysis and Discussion

During October, 2002 through January, 2003, we have visited and investigated five organizations which have experienced ERP system version upgrading. Following are the analysis results based on the interviews with the project managers and/or team members and the reviews on project documentations including issue logs and implementation reports.

The reasons why we conducted a case study to achieve the research goal are as follows: first, the case study provides an opportunity to induce data for better understanding of complex organizational phenomena [Yin, 1984; Benbasat et al., 1987]. Second, it increases an external validity by classifying various cases according to the organizational characteristics [Yin, 1984]. Finally, it can relatively reduce the risk of focusing on wrong issues or variables compared with other research methods.

Table 1 shows general information about five organizations that we have investigated. All of organizations implemented SAP R/3 system and had experiences of upgrading the higher release.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001 Sales volume (US$ billion)</td>
<td>8.61</td>
<td>3.37</td>
<td>0.57</td>
<td>0.22</td>
<td>4.28</td>
</tr>
<tr>
<td>No. of employees</td>
<td>2,660</td>
<td>8,700</td>
<td>436</td>
<td>1,142</td>
<td>5,851</td>
</tr>
<tr>
<td>Main business scope</td>
<td>Oil / gas production &amp; sale</td>
<td>TV monitor, LCD, PDP, color filters</td>
<td>Petroleum chemicals, lubricates</td>
<td>Detergents, cosmetics</td>
<td>Education, medical services</td>
</tr>
<tr>
<td>Upgrading period</td>
<td>4 months</td>
<td>6 months</td>
<td>4 months</td>
<td>3.5 months</td>
<td>3 months</td>
</tr>
</tbody>
</table>

Table 1. General Information on Case Organizations

(1) Changes in system requirements

No organization conducted version upgrading due to the hardware performance problems, and had any serious issues regarding on hardware switching in the system upgrade. As time goes after initial rollout, transaction data volume increases and higher utilization is expected by learning effect. Actual data volume has continuously increased, however there was no big increase in hard disk size due to secondary storage device through data archiving. Cases B and E showed only 10% increase in DB size in upgrading.

There was a double increase in RAM size in both application and data servers for higher
version requirements and/or server performance improvement. Case B increased 10GB from 4GM of DB server memory and 28GB from 14GB of application server memory in computer model switching, while Case E had no change in memory size because the business nature of educational institute is relatively very stable.

However common interest in version upgrading was changes due to the higher version requirements including operating system, DBMS, and PC. Most cases upgraded DBMS versions. It is true that the higher version provides more convenient and powerful user interface functions, but it requires higher PC requirements and consequently higher costs. Actually three cases had relatively large investment on PC upgrade when they upgraded the ERP version.

(2) Different expected benefits

It was commonly expected from the realization of additional functions to establish a web-based platform to reinforce the e-business competency and to prepare for the extended solutions toward the next shift. Also in three cases, more user convenience provided in the higher version was referred for the purpose of transaction efficiency. Realization of additional functions in higher version was not the only determinant factor but one of the major factors to make up their upgrading decision. Cases B and E adopted one or two new function(s) per module while in Case E, upgrading itself was also considered as a chance of system training and operational reinforcement.

As a strategic and process improvement, project managers in three cases mentioned the reinforcement of process standardization through establishing workflows which was not enough in the initial project. Also productivity improvement was mentioned in two cases. The reason of different benefits to be expected depends on the different levels of initial project accomplishment and post-implementation activities including continuous improvement efforts. Case D showed consistent management due to the identification of strategic directions and key performance indexes prior to the initial project.

(3) More and various user needs

Upgrading activities include resolving issues and requirements of users to increase the utilization and satisfaction. Apart from the priority or importance of issues, Case A collected 463 issues, Case C collected 120 issues, and Case E did 39 issues. Some of typical issues are related with decreasing error rates of demand forecasting, promise to delivery, inventory forecasting and increasing analytic accuracy of cost planning. Interviewees mentioned that eliminating trivial issues and solving their needs through new functions and/or customization leads to raising crucial issues such as changes of workflow, redesign of organizational responsibility and structure. Also users’ learning effect tends to bring more user requests and various practical issues.

(4) Role change of IS people

Adoption of package solution has changed the role of IS department. Since success of ERP system depends much more on user acceptance and capabilities, interviewees emphasized more user involvement, and thus a vendor’s delta training should be arranged for power users as well as IS people. Also programming tasks including report formatting may be handled by outsourcing. Thus IS department can spend more on strategic and planning tasks such as reviewing and testing regarding on extended ERP solutions, B2B solutions, application development for independent areas, and future technology trends.
(5) Other issues

A lack of management on the previous implementation history has caused difficulties in system upgrading. One reason was a change of system maintenance person. It was hard for a new person to have a full understanding on the history when the previous person quit the company. Another reason was the lack of documentation regarding on customizing and reporting programs. These made the transition process of upgrading hard.

Second, when there is a lack of top management involvement including strategic direction and project support, an upgrading task tends to remain at the level of implementation of additional functions. Some additional functions such as web-based functions deliver strategic implications, however many functions related with modifications on transaction processing do not provide significant strategic implications.

5. Conclusion

Markus et al. (2000) found problems that ERP adopters encounter as they implement and deploy ERP systems based on the case analysis of 16 ERP-adopting organizations. They insisted that the success of ERP systems depends on when it is measured and that success at one point in time may only be loosely related to success at another point in time. The problems at their onward and upward phase which includes maintaining and upgrading systems, supporting users, and system extensions are unknown business results, disappointing business results, fragile human capital, and migration problems.

Parr & Shanks (2000) proposed critical success factors from two case studies based on their project phase model (PPM) of ERP implementation projects. In the enhancement phase which is post-implementation phase, management support and definition of scope and goals were indicated as important, and five factors were considered to be of minor importance.

In this research, five cases in different industries were investigated mainly for the analysis of successful ERP system upgrading. Following are the summary of critical factors based on five case studies: first, it is necessary to make a clear upgrading goal statement, especially for the purpose of achieving strategic objectives as Parr & Shanks (2000) stated. As mentioned earlier, each case has expected different benefits, project managers in Cases B, D and E emphasized that the more clear goals and directions are set up, the higher level of project management and benefits is achieved. Also upgrading is a chance to coordinate enterprise interests from a strategic perspective, and thus a clear goal statement encourages top management involvement and focuses on target processes.

Second, good coordination and communication with implementation partners including an ERP vendor and/or a consulting firm are essential. When Nah et al. (2001) mentioned ERP teamwork and composition as a CSF throughout the ERP life cycle, they emphasized the importance of partnership management. While Markus et al. (2000) mentioned the risk of problems with product and implementation consultants in the project phase, it applies in the post-implementation phase as well. All of cases except Case E have utilized third-party consultants as well as the support of solution vendors. In Case E, the project team performed system upgrading by itself only with the solution vendor support. Most interviewees agreed that it is crucial in the upgrade planning phase to get the new release schedule, contents of new functions depending on releases, and delta training schedule and other supports from partners, and good coordination tends to fasten the upgrading project schedule.

Third, contents of decision and documentation in the system implementation process should be carefully managed. As mentioned earlier in the cases, a lack of documentation
regarding on the implementation causes difficulties in system upgrading. Thus thorough management of programming documentation and history of system maintenance is one of critical requirements for successful upgrading. Markus et al. (2000) also mentioned that documenting the reasons for configuration decisions, not just the parameters during the project phase avoids the post-implementation problems.

Fourth, even if there was little difficulty in hardware switching among the above cases, it is needed to regularly perform the status examinations, and to prepare and plan the systems requirements including PC in advance. Otherwise the version upgrades may require an unexpected investment like more PC upgrading cost than expected in Case A, B, and D.

Finally, it is needed to redefine the roles between business and IT departments. It includes assignment of delta training on power users, and emphasis on strategic tasks to IT department such as figuring out new user requirements and extended solutions, and specialization on specific technology. This activity would reinforce the business results and avoid a problem of fragile human capital expressed by Markus et al. (2000).

Like most case studies, the limitation of the study is lack of generalizability. However it proposes a new perspective for the post-implementation of ERP system, and we hope that it can provide practitioners with general guidelines and insight for implementing ERP system upgrade. In the next stage of this research, we will send out questionnaires to companies to empirically evaluate the criticality and importance of the success factors in the post-implementation phase and to find out any differences between prior and post implementation.

Reference


Luftman, JN (1996), Competing in the Information Age, Oxford University Press, New York, NY.
Ross, JW (1998), The ERP Revolution: Surviving Versus Thriving, Centre for Information Systems Research, Sloan School of Management.
Yin, R (1984), Case Study Research: Design and Methods, Sage Publications, Beverly Hills, CA.