ERP 시스템 성공을 위한 ERP 시스템 교육/훈련 및 관련 요인 분석†

(ERP System Education/Training and Other Related Factors Which Have Critical Influence On ERP Implementation Success)

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요 약 1990년대와 2000년대 초 현재까지 ERP 시스템 구축 시장은 괄목할 만한 성장을 계속하여 왔다. 2009년에 ERP 시장은 세계적으로 약 65조원 규모까지 성장할 것으로 예견되고 있다. 거의 모든 기업이 이러한 ERP 시스템에 의하여 일상의 사업 거래 업무를 처리하게 될 것이라 해도 과언이 아니다. 그러나 ERP 구축 프로젝트는 많은 시간, 광범위한 관련 범위, 그리고 큰 예산 비용을 요구하는 하나의 방대하고 전략적이며 복잡한 프로젝트이다. 이것은 기업에게 있어 ERP 시스템 구축은 반드시 성공하여야 할 프로젝트임을 의미하며 ERP 시스템 구축 성공요인이 무엇인가에 대한 이해가 기업 경영자들에게 매우 중요함을 뜻한다.

본 연구는 먼저 ERP 분야의 선행연구들 특히 ERP 시스템 구축 성공요인 연구 결과들을 살펴봄으로써 최근에 강조되고 있는 중요 성공요인에는 어떠한 것이 있는지 살펴본 다음에 본 설문조사 실증연구 결과를 기존의 연구와 비교적으로 소개하면서 ERP 시스템을 구축 사용하고 있는 기업 경영자들에게 유용한 관리 지침을 제공하고자 한다.

핵심주제어 : Enterprise Resource Planning(ERP), Critical Success Factors(CSF), ERP implementation, ERP education/training.

Abstract In the 1990s and 2000s there was considerable growth in implementation of Enterprise Resource Planning(ERP) Systems. It is estimated that the ERP market will grow to about $65 billion by 2009. Companies expect these systems to support many of the day to day business transactions. However, the implementation projects of ERP are big, strategic and complex projects which involve lots of time, scope and costs. Because of that, companies have to create conditions, in which they can implement chosen solution in expected time, scope and budgeted costs. This means that companies should be aware of what most critical factors for success of ERP implementations are. This study will first investigate the ERP implementation CSFs by studying prior published researches on the field of ERP implementation. Then, this study will discuss in depth some important factors of ERP implementation and represent preliminary results CSFs of ERP implementation empirical survey.

Key Words : Enterprise Resource Planning(ERP), Critical Success Factors(CSF), ERP implementation, ERP education/training.

1. INTRODUCTION

In the past two decades, many organizations have initiated Enterprise Resource Planning(ERP) systems, using such packages SAP, Oracle, PeopleSoft, etc. The ERP market is one of the fastest growing markets in the software industry. According to AMR research(2005), the No. 1 advisory firm focused on the intersection of business processes with enterprise technologies, the ERP market will grow to about $65 billion by 2009. ERP systems are expensive. The total cost of the initial implementation ranges from $50,000 to hundreds of millions of dollars including software, hardware, consultants and internal costs.

There are various purposes to adopt ERP systems: replacement of legacy systems, reduction in cycle times from order to delivery, reduction in operating costs, and so on. As one of the most important enterprise systems, ERP has attracted attention from both researchers and practitioners. Information systems researchers have extensively studied various topics in ERP. However, to date, there appears to be few studies that focused on the issue of ERP system education/training function. This study examines ERP education/training factor intensively in relation with other critical success factors that influence ERP system success.

A mixed-methods design was adopted to investigate the ERP education/training function. First, this study will research the CSFs in ERP implementation by studying published prior research on the field of ERP implementation. Based on the CSFs, especially on those factors of recent Sternad and Bobek's study(Sternad et al., 2006), this study will present preliminary results of important CSFs of ERP implementation in Korean organizations. From this analysis, this study will identify that ERP system education/training factor is significantly correlated with ERP system success. Additionally, this study will discuss the more detail issues such as ERP education curriculum development. This new ERP education/training suggestion could be adopted and expanded by other organizations that keep struggling to solve the ERP system maintenance problems.

2. RECENT ERP SYSTEMS RESEARCH REVIEW

ERP attempts to meet the practical needs of industries. The Siemens, in cooperation with SAP, a German based software company, was first to implement an enterprise-wide ERP system in 1987. Later, Dow Chemical Company implemented its own ERP system designed to enable the complete globalization of business operations in 1988(Schaaf, 1999). Since then, the ERP market has expanded worldwide and is over $47 billion in 2004 and expected to reach up to 64.7 billion in 2009(AMR, 2005). With the emergency of global value chains, ERP systems have become very important in modern business operations and are considered as a basic/core element for enterprises(Olson, 2004).

Adopting an ERP system gives a number of advantages to organization(Olson, 2004; Trimi et al., 2005).

- Improved understanding across users
- Greater accuracy
- Adoption of business best practices
- Improved business operations

However, there are some disadvantages of ERP systems(Olson, 2004; Gulledge et al., 2005).

- Cost of implementation
- Decreased lead of flexibility, freedom, and creativity

- Less empowerment because of the centralization
- Constrained team-based group decision making
- Less openness to business partners
- Unstable vendor environment

The research literature on ERP systems has grown exponentially in recent years. Botta-Genoulaz and Millet(2005) classified recent trends in ERP literature: 1) implementation of ERP, 2) management through ERP, 3) ERP tool, 4) ERP for supply chain management(SCM), 5) case studies about ERP and 6) optimization of ERP.

An ERP system is major managerial tool and technology for organizational operations management. Researchers have attempted to identify ERP impacts on organizations(Dillard et al., 2005), such as best practices(Gulledge et al., 2005) and culture issues(Martinsons, 2004).

Research on ERP tools has focused on technical issues, such as ERP architecture(Lea et al.. 2005), software evaluation(Fisher et al., 2004), embedded modules(Debreceny et al., 2005) and data analysis tools(Bendoly, 2003).

More research has been done on optimizing implemented ERP systems after companies completed their initial ERP implementation (Worley et al., 2005). ERP acceptance models, such as the Technology Acceptance Model(Amoako-Gyampah & Salam, 2004), and Diffusion of Innovation(Waarts et al., 2002) have been studied.

Since most companies are reluctant to communicate about their ERP systems, researchers have difficulty in conducting empirical studies about ERP systems. Therefore, case study is a good research method to explore some important issues of ERP applications. ERP studies have been conducted in different industries, such as industrial manufacturing, oil & gas, healthcare, and high technology. There are also case studies focusing on special geographical areas, such as China(Wang et al., 2005).

ERP maintenance and end-user education /training are two major activities in ERP post-implementation. However, only a few studies were found in ERP maintenance and there is few empirical study focused on ERP system education/training. In next section, ERP maintenance is discussed and then will focus on ERP education.

2.1 ERP MAINTENANCE

According to AMR reports(2005), maintenance, which is keeping the ERP system running smoothly, is the most costly life cycle phase in ERP applications because more money is spent on post-production changes to most software products than was spent on their initial implementation. In both 2004 and 2005, ERP vendor maintenance revenue was very close to ERP implementation revenue spending over $14 billion in ERP maintenance each year.

Glass and Vessey(1999) listed three main maintenance components in an ERP system: customization, extension, and modification. Customization involves in vendor vendor ERP software to make ERP more efficient for specific organizations. Extension refers to changes made by "add-ons", third party vendor "bolt-ons", and extensions to current legacy systems. Modification is to change the code of ERP itself to fit in organizations' own business environment.

Light(2001) described five ERP customization categories: 1) change functionality 2) adding functionality, 3) process automation, 4)amending reports/displays, and 5) new reports. Even though ERP vendors believe they have the most efficient modules with sufficient best practices, organizations sometimes place more trust in their processes. Therefore, they ask vendors to make changes of functionality to fit their requirements.

Additionally, some bolt-on standard software has to be customized to link with the ERP system. In some cases, organizations request some special functions, which are not included in vendors' products. Adding functionality can help organizations to develop functionality absent in the ERP software. Process automation offers more smoothly controlled processes to the organizations. Amending reports or displays is often needed. Adding new reports is another common ERP customization.

Nah(Nah et al., 2001) categorized ERP maintenance into six classes: corrective maintenance, adaptive maintenance, perfective maintenance, preventive maintenance, user support, and external parties. Nah et al.(2001) described three stages to indicate the level of ERP maintenance. The introduction stage is focused on user support to help users understand the functions of the current systems, and includesa adaptive, corrective, and preventive maintenance. The growth stage refers to the period where all classes except for perfective maintenance decline. The frequency of maintenance activities will continually decline until the maturity stage is achieved. The main issue in the maturity stage is perfective maintenance.

2.2 EDUCATION AND TRAINING

Lack of User Education/Training and not understanding how ERP system works, appear to be responsible for many problems ERP implementations and failures(Somers et al., 2004). Inadequate training has been one of the significant reasons of many ERP systems failure. If the employees do not understand how a system works, they will invent their own processes using those parts of the system they are able to manipulate. So, the full benefits of ERP can not be realized until end users are using the new system properly. The main reason for education and training is to increase the expertise and knowledge level of the people within the company. User education and training strategies should be developed in advance and continually updated during the implementation.

Education and training refers to the process of providing management and employees with the logic and overall concepts of ERP system. To make end user training successful, the training should start early, preferably well before the implementation begins(Umble et al., 2002). Zhang et al.(2002) described the contents of training as consisting of three aspects: (1) logic and concepts of ERP; (2) features of the ERP system software; and (3) hands-on training.

Education and training takes on a moderately important role during the latter stages, when training on continuous basis is required to meet the changing needs of the business and enhance employee skill. It may only take days to change hardware and software, but it takes weeks or months to scale learning curves(Al-Sehali, 2000). Executives often dramatically underestimate the level of education and training because of associated costs. Al-Sehali(2000) suggested that reserving 10 to 15 % of the total ERP implementation budget for training will give an organization an 80 % of chance of implementation success.

2.3 OTHER EDUCATION/TRAINING RELATED CRITICAL FACTORS

2.3.1 Change Management

The existing organizational structure and processes found in most companies are not compatible with the structure, types of information provided by ERP systems because every ERP system imposes its own logic on an organization's strategy, organization and culture.

These changes may significantly affect organizational structures, structures, policies, processes and employees, and can cause resistance, confusion, redundancies, and errors if not managed effectively. Many ERP implementations fail to achieve expected benefits because companies underestimate the efforts involved in change management(Somers et al., 2004). Because of that, it is important that an organization goes through a carefully planned transformation that is based on adequate strategy and well-defined change education and training methodologies.

Such activities appear to be important from the early stages of a project and continue throughout the adaptation and acceptance stages. If people are not properly prepared for the imminent changes, then denial, resistance and chaos will be predictable consequences of the changes created by the implementation. All employees must be educated to understand how the new system can both benefit the company and make their jobs easier.

2.3.2 Top Management's Understanding and Support for ERP

Bradford et al.(2003) identified that consensus among top managers about the determining objectives of the ERP implementation, and how these objectives will be monitored and measured, will lead higher implementation success. Well defined objectives help to keep the project constantly focused, and are essential for analyzing and measuring success. They must be clearly defined, must be measurable and controllable, and the savings must be quantified for each objective.

Akkermans and Helden(2002) added that clear goals and objectives seem to form a clear-cut CSF(Critical Success Factor), but can actually be rather problematic. This is because, at the outset of an ERP project, it is often very difficult to determine them in a clear-cut manner.

Reif(2001) pointed out that the project scope is defined as closely corresponding to the range of outcomes and the portions of the organization that will be affected by the ERP system. After that, extensive planning and an understanding of the concepts of ERP system will result in the company saving much more time in the implementation and the implementation plan and subsequent progress should be communicated regularly to employees, suppliers and customers.

2.3.3 User Involvement

ERP systems cross-functional and departmental boundaries, cooperation and involvement of all people in the organization are essential(Somers et al., 2004). Involving users, in the stage of defining organizational information system needs, can decrease their resistance to the potential ERP systems, since by which users have feelings that they are the people who choose and make the decision.

User involvement refers to participation in the system development and implementation processes by representatives of the target user groups. There are two types for user involvement: (1)Users involvement in the stage of definition of the company's ERP system needs, and (2) users participating in the implementation of ERP systems. Open and honest communication across the organization is of paramount importance to satisfy the information needs of users, and to prevent the circulation of unfounded rumours. Users need reliable information, because any project affects them directly and may even threaten their jobs. These help the user to become acquainted with the new situation, to build up confidence in the project and its members, and finally to accept the project.

2.3.4 Effective Communication

The importance of communication across different business functions and departments is well known in the IT implementation literature, because communication has a high impact from initiation phase until system acceptance, as it helps to minimize possible user resistance. Communication has to cover the scope, objectives and tasks of an ERP implementation project(Al-Mashari et al., 2003). We need effective communication in project team and within the organization. Good communication in project team can be ensured by: weekly team meetings where team and project status updates are provided; postings on the company intranet; formal and informal information sessions; etc.

The progress of the ERP project should be readily discernible to all of the employees in the organization. It has to include project status, impending changes, training announcements through company intranet, newsletters, e-mails, etc. Organization should have a communication plan in addition to education/training plan.

The communication plan has to detail several areas including the rationale for the ERP implementation, details of the business process management change, demonstration of applicable software modules, briefings of change management strategies and tactics, and establishment of contact points.

3. PRIOR RESEARCH ERP IMPLEMENTATION CSFs

In the past years several papers on subject CSFs in ERP implementation have been published. Sternad and Bobek(2006) searched computer databases and published books on that theme. They have summarized major CSFs

mentioned by authors. They showed fourteen factors were mentioned more than five times by nineteen authors. Number in brackets represents number of authors, who mentioned CSF.

These factors are:

- top management support and involvement (16);
- Clear goals, objectives and scope(14);
- project team competence and organization (13);
- user education and training(13);
- business process reengineering(BPR) (11);
- change management (10);
- effective communication (9);
- user involvement (9);
- data analysis and conversion(9);
- consultants(8);
- project management(8);
- project champion(7);
- architecture choice(package selection)(7);
- minimal customization(7).

4. PRELIMINARY SURVEY RESULTS

To investigate important CSFs of ERP implementation in Korean ERP system adopting companies an empirical study was designed. Prepared was structured interview questionnaire, which was mailed 168 companies with implemented SAP solution(SAP R/3 or mySAP ERP), Oracle or other solution. Mailed were 75 companies, which have implemented SAP solution; 42 companies, which have implemented Oracle solution and 51 companies, which have implemented other solution. There were 61 responses to the survey questionnaire, which represent 30 percentages. Of the 61 answers received, 28(or 46 percent) belonged to SAP solution, 26(or 43 percent) belonged to Oracle solution and 7(or 11 percent) belonged to other

solution(see Table 1). In Table 1 we can also see that 15 received answers belonged to small companies, 22 answers belonged to medium companies and 24 answers belonged to large companies.

<Table 1> Distribution of organization size and solution

	SAP	Oracle	Other
Small companies	2	7	6
Medium companies	8	13	1
Large companies	18	6	0
Total	28	26	7

* Korean classification of organization size used.

Companies had to make own ranking list of fifteen the most important CSF of ERP implementation. 1 meant the most important factor and 15 meant the least important factor. CSFs from survey by importance from most important to least important factor are:

1. top management understanding and support (Mean = 2.59)
2. user involvement(M = 4.76)
3. education and training(M= 4.81)
4. communication between project team and organization(M = 6.80)
5. communication within project team(M = 7.44)
6. change management(M = 7.62)
7. project team(M = 7.98)
8. consultants(M = 8.39)
9. business process reengineering(M = 9.53)
10. architecture choice(M = 9.65)
11. minimal customization(M = 9.88)
12. project management(M = 10.49)
13. data analysis and conversion(M = 11.66)

<Table 2> Comparison of ranking list CSF of Sternad&Bobek and survey

	Sternad& Bobek	Survey
Top management support	1	1
User involvement	3	2
Education and training	6	3
Communication between project team and organization	4	4
Communication within project team	5	5
Change management	12	6
Project team	2	7
Consultants	7	8
Business process reengineering	8	9
Architecture choice	13	10
Minimal customization	10	11
Project management	11	12
Data analysis and conversion	9	13

In Table 2 is represented comparison of ranking list CSF by prior literature and ranking list of CSF by this survey. It can be seen, those very top rank CSFs in both studies(Sternad&Bobek and in survey) are: top management support, user involvement, communication between project team and organization, communication within project team. The biggest differences in place of CSF between the two studies are for factors education and training, change management and project team.

Sternad&Bobek put the factor education and training on sixth place, but this survey put it on third place. Likewise, they put the factor change management on 12th place, but this survey put it on sixth place. They put the factor project team competence and organization on second place, but this survey put it on seventh place. For the other CSFs, the place of rank is changing for place up or down in table but not so much.

5. CONCLUSION

First, this study researched the CSFs in ERP implementation by studying published prior research on the field of ERP implementation. Based on the CSFs, especially on those factors of recent Sternad and Bobek's study, this study presented preliminary results of important CSFs of ERP implementation in Korean organizations.

The implementation projects of ERP systems are big, strategic and complex projects which involve lots of risks. This means that companies should be aware of what most critical factors for success of ERP implementations are. This study researched the ERP implementation CSFs by reviewing prior published research results on the field of ERP implementation. After some most important factors of ERP implementation were discussed in depth, the preliminary results CSFs of ERP implementation survey was represented.

The survey results in this paper are somehow comparable but almost the same as in the other prior studies about CSFs. Those very top rank CSFs in both studies(Sternad&Bobek and in survey) such as top management support, user involvement, communication between project team and organization, communication within project team were considered as highly important factors. The biggest differences in place of CSF between the two studies are for factors education and training, change management and project team. The Korean company ERP managers put those factors on higher rank places than other country ERP managers. For example, Sternad and Bobek put the factor education and training on sixth place, but this survey put it on third place. They put the factor change management on 12th place, but this survey put it on sixth place.

In conclusion, from this analysis, this study identified that ERP system education/training factor and education/related factors such as top management understanding and support, user involvement, effective communication, change management are significantly correlated with ERP system success. This study results give valuable practical implications to field managers who are responsible for operating their ERP systems. They should put more emphasis on education/training related factors during and after ERP system implementation process. They should be sure to reserve at least 10 to 15 % of the total ERP implementation budgets for education/training.

As the field managers pointed out through the survey, the shortage of required ERP knowledge and skills will be increased in future. ERP system is a large complex total information system. To understand and use the system is never easy job and requires lots of education and training times to study ERP solution itself. ERP practitioners and researchers recommend in union that universities should recognize this demand and take over more roles to provide ERP educated skilled students for their society. Universities should incorporate ERP systems into their curriculum and use more ERP system softwares as teaching tools.

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