ISSN 1822-6515
ECONOMICS AND MANAGEMENT: 2010. 15

ERP SYSTEM IMPLEMENTATION: A CASE STUDY OF THE CONSTRUCTION ENTERPRISE

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Abstract

The enterprise resource planning software market has been growing at a very fast pace over the last few years and has been predicted to keep growing rapidly in the long term.

The objective of the study is to investigate, analyze and systematize the factors that influence implementation of the ERP system in the construction company in Latvia and benefits and barriers of ERP system implementation.

This paper argues that ERP systems are an increasingly important source of organizational change with major implications for the organization and management of work. Potential benefits include drastic declines in inventory, reduction in working capital, abundant information about what customer wants and needs, along with the ability to view and manage the extended enterprise of customers, suppliers, and alliances as an integrated whole. Common problems associated with cost over-runs, technical problems and inadequate training and documentation are well known. Less well known are the longer term and more profound implication for the organization work, the size and shape of the organization, the dynamic of power and control in the organization and the skills used by employees and needed by the organization post-ERP.

Keywords: Enterprise Resource Planning (ERP), ERP system, ERP implementation, Enterprise Information Systems.

Introduction

With the development of new technologies many companies now consider technological improvements an essential part of their long-term competitive strategy, and consequently try to apply these technologies. Computer technology has brought about many benefits in helping the construction industry meet increasingly complex challenges. It has achieved a wide range of successful applications at the project level such as engineering design, project estimating, scheduling, planning and control, and integrated project management.

The development in global information technologies and the competitive market climate have pushed many companies to transform their businesses. Enterprise resource planning (ERP) is one of the process-orientation tools that can enable such a transformation. This paper provides a comprehensive review of the state of research in the ERP field relating to ERP system implementation and additional gained opportunities.

ERP is a complex multimodal software application which tries to integrates all the processes of the company, having as a purpose its perfection and growth in efficiency (Bingi *et.al*, 2000). From a functional point of view, an ERP integrates all enterprise function (production and R&D, financial, human resources, marketing), and management function (prevision and planning, organizing, decision, coordination and control).

H. Klaus and G. Gable analyzed the concept of ERP, in order to explain its origin. They consider that the designation is not related to the role and characteristics of this system. The integrated system of type ERP is not focused on the resource management and it is not very developed within planning area, as its name may suggest it. It is rather **focused on the integration of all organization departments, functions and processes** within a single computer informational system, capable of supporting all these areas, with their individual and specific requirements. Each department has its own computer informational sub-system, optimized according to the specific characteristics of the developed activity, but the ERP system combines all the characteristics within an integrated software program that runs on a unique database so that all the organizations can better share the information. Moreover, the current versions of ERP systems spread over the limits of organization.

ERP systems implementation process is well documented. Enterprises recently tend to implement their new enterprise information systems like ERP system in order to gain their competitive advantages and bring up their business efficiency, but the efficiency gained from this new implementation is not quite clear and is difficult to be identified. The most of studies focus mainly on ERP implementation and how to increase the success rate of implementing ERP systems. ERP implementation concept was described by Davenport (2000); Markus et al. (2000); Chen (2001); Huang and Palvia (2001). Unfortunately, a lot of organizations didn't gain the intended success by implementing the ERP system because they used the software without operating the necessary organizational changes. In order to make these systems generate the intended effects, their implementation requires, sometime, radical changes. Specialists claim the fact that an efficient

ISSN 1822-6515
ECONOMICS AND MANAGEMENT: 2010. 15

exploitation and the benefits of the informational technology can be reached only if the organizations apply the Business Process Reengineering- BPR, in conformity with their current and future perspectives, before implementing any informational ERP system as well as other systems.

Even now, some managers ask themselves: "Which are the organizations that should use an integrated informational system of the ERP type?" The answer is: all the organizations that aim at an efficient integrated management of the available resources. K. Sheikh (2002) claims that the implementation and usage of a performing integrated informational system is a basic condition for the organizations belonging to this century. ERP systems are very powerful tools, strategic tools, which seek to streamline and integrate operation processes and information flows in order to synergies the organizational resources through information and to gain a competitive advantage.

The enterprise resource planning software market has been growing at a very fast pace over the last few years and has been predicted to keep growing rapidly in the long term. The implementation of ERP systems involves sophisticated business processes integration and conflicts between different departments of the organization. Furthermore, it also costs organizations a huge amount of money and manpower.

The objective of the study is to analyze implementation of the ERP system in the construction enterprise in Latvia, as well as problems and success factors of ERP system implementation.

Development decision process

Development strategy should be corroborated with the others strategies of the organization and with general strategy, integrated with strategic objectives (long term objectives, but medium and short term objective should also be considered). Technological development strategy should be integrated with development strategy for production system of the organization. ERP implementation strategy should be integrated in information technology (IT) development strategy of the organization. Figure 1depicts the flow-chart for enterprise development decision process.

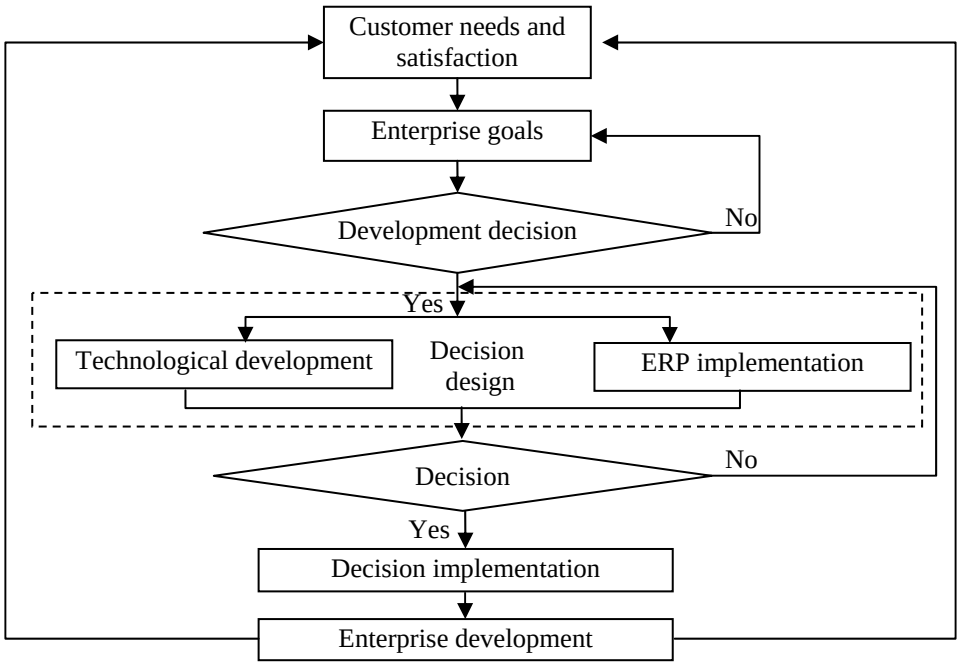

Figure 1. Flow-chart for development decision process

The choice of information system, for which many options exist, must be driven by, and closely aligned with, the broader framework of competitive positioning decisions. In today's increasingly competitive business environment, many companies are driven to seek various ways to increase their effectiveness and ability to stay ahead of (or keep up with) the competition. This situation may drive many companies to invest in a new ERP system as a step toward this goal.

Usually, large companies need ERP applications like SAP and Oracle (for more then 250,000$). Medium size businesses go for mid-range ERP applications and this is a busy segment that includes QAD, Microsoft's Navision, iScala etc. (from 50,000$ to 250,000$). Small business owners usually think ERP is for someone else, someone bigger. That isn't necessarily so anymore. Small, shoestring ERP applications are

available for even the smallest enterprise. Small companies use popular low cost business applications that are complete but simplified systems. ERP systems can be categorizes by price (license fee, and implementation expenses) (Burns (2003)). Burns estimates implementation costs for pricier systems at 2:1 to 1:1 for medium size ERP. From this analyses it can be considered that whatever type of enterprise we take, on whatever stage of the life-cycle, we have a large offer of ERP's to choose from.

Every ERP system should be rooted in the business, as it often pervades the business, encompassing and changing almost every area. Author has concluded that there is no system that is best for all companies, but rather there is a process company can go through to find the right system. One of the important questions in ERP system's selection process is "Build or Buy?"

ERP systems can be totally integrated (vertically – at the level of the organization's functions and activities and horizontally – at the level of hierarchy) or partially integrated (respectively they integrate only a part of the processes/functions/ activities and/or hierarchy levels).

Some organizations acquire the systems from the market with some modifications, some develop them internally, but others acquire them from the market without modifications. Most of the ERP systems used by organizations are developed especially for them by specialized companies in collaboration with external companies or specialists.

Implementation of ERP system in enterprise

The studied enterprise (subsequently termed enterprise X) is a subsidiary enterprise of international construction company in Latvia. The enterprise was established in the 1995 and had a staff of about 110. In the construction industry in Latvia, the studied enterprise was ranked among the top five construction firms according to their annual revenue. Recently, the types of projects in which enterprise X is involved have included: housing and hi-tech buildings, infrastructure, and mass transit projects. The parent company has a wide selection of metal products and services. It supplies metal-based components, systems and integrated systems to the construction and engineering industries. It has operations in 27 countries and there are about 12 000 employees.

Enterprise X had developed several single-functionality programs to facilitate independent management. For instance, a construction information system was based on FoxPro language was developed to collect enterprise information. Despite being out of date, the systems were able to meet the basic requirements of conventional construction management style. Owing to the need to provide more real and accurate information for both top management staff and project clients, enterprise X decided to evaluate whether it was necessary to implement an ERP system to enhance its IT competence.

During 2007 enterprise X initiated a 2-month evaluation study to look at the possibility of introducing an ERP system. Finally the system selected was iScala, because of this system using in other representatives in other countries. Once the decision to adopt was made, a central ERP manufacturing team was formed comprising 4 divisional representatives from enterprise X and two IT consultants from parent company, as well as 3 external consultants. This group partly had worked together before. The team was co-located in an office area at the enterprise X in Latvia. Those selected for the team were generally the individuals within a particular division who were most knowledgeable about ERP systems, having attended professional events about such systems, and having been involved in the evaluation discussions.

The implementation project was initiated on June 2007, and the project team was established on September 2007. The project team surveyed available ERP software and conducted RFP preparation for about one month. During October 2007, the implementation contract was awarded to an ERP implementation consultant and the ERP implementation project began in November 2007. Full system using started in January 2008.

In order to identify difficulties and success factors of the ERP system's implementation author performed a survey. The instrument for collecting the data was a questionnaire structured in set of questions regarding the personnel preoccupation for ERP implementation. To allow author to collect the most accurate data from the respondents, the questionnaire was unbiased. Respondents for this survey were represented by all employees from enterprise X who was involved in ERP system implementation and using process.

The most important problems of ERP system implementation

There are several studies dealing with difficulties in enterprise system implementation. The researchers use different concepts, which have various scopes and meanings. As a result, comparing and integrating their findings is difficult. The number of recognized categories of problems and issues experienced by companies

adopting ERP system varies from two (Themistocleous *et.al*., 2001) through three (Grossman and Walsh, 2004; O'Leary, 2000) to five (Kim *et.al*., 2005). The identified groups cover issues of various nature and scope, e.g., technical, operational, legal, business/economic, organizational, managerial etc.

The respondents opinions regarding the problems observed in ERP system, divided into the described categories, are presented in Table 1. Within each category, various difficulties are listed together with a short description.

Table 1. Problems occurring during ERP system implementation

Problem	Details
Organizational problems:	
Project goals	Lack of clearly defined goals of the implementation project; incorrectly defined goals; lack of priorities
Company's condition	Poor company organization; unclear organizational procedures; unclear strategy
Communication	Problems with communication and information flow; different understanding of the same ideas by different departments
Decision making	Problems with decision making (e.g., regarding personnel); indecisiveness of company representatives
Personnel availability	Key employees unavailable; workers' lack of time
Conflicts	Conflicts between a company's departments; conflicts during organizational change
Implementation management	Mistakes in project management; lack of risk management; lack of implementation tasks' coordination
Changes in a company	Organizational and ownership changes during the project; changes in requirements; changes in company organizational structure imposed by the introduced system
Training	Inadequate training phase of a project; cutting training
Social problems:	
Employees' knowledge and education	Lack of management competence; lack of personnel computer literacy; lack of knowledge about company operations, enterprise systems and their implementation
Top management	Lack of top management support and involvement; lack of project understanding by top management
Implementation team	Lack of implementation team members' commitment; inadequate composition of implementation team (e.g., too few people, people not empowered to make decisions)
Motivation	Lack of employees' motivation to perform implementation tasks and learn new skills
Resistance to new system	Resistance of middle management, IT staff, and system users; people avoiding implementation duties
Resistance to change	People highly accustomed to existing solutions and unwilling to change
Project manager	Lack of a project manager; inadequate person appointed as a project manager; necessity of sharing time between implementation tasks and organizational duties
System provider's competence	Consultants lacking competence, knowledge, and experience; problems with the availability of system provider's services
Project acceptance	People not convinced about the project; lack of general acceptance for the project; problem with project acceptance by people not involved in implementation duties
Personnel's fear	Fear about possible consequences of implementation project: loss of job, position, and status
Users' responsibility	Lack of responsibility and care among people entering data into the system
Technical problems:	
Data	Problems with completing and organizing system data; problems with transferring data from legacy systems to ERP system
System efficiency	Users unable to enter data on-line; problems with customer and provider order handling
System drawbacks	Implementers unaware of program's errors and shortcomings; lack of efficient application testing;
Economic problems:	
High costs	Inadequate financial budget for the project; loss of financial resources; lack of financial flexibility and resource allocation

The problems discovered in Table 1 refer to practically all stakeholders involved in the project: employees, implementation team members (who are functional departments' managers in enterprise X), and top management representatives. Next, the organizations suffered from the high costs involved and problems connected with goals definition.

The study recognize mainly organizational problems connected with time overruns and the alignment of organizational structure with ERP system. They also acknowledge system deficiencies and lack of users' involvement as the most important impediments during ERP system implementation. Other important difficulties cover mostly organizational and technical issues. Also single problems of a social and economic nature are mentioned.

The most important success factors of ERP system implementation

This study's respondents also represented their viewpoints about ERP system implementation success factors (see Table 2).

Table 2. ERP system implementation success factors (based on Soja P., 2006)

Factors	Factor description
Project manager	The project manager is the person from the enterprise who sacrifices most of his working time to implementation duties.
Project team	The implementation team consists of various people having high qualifications and knowledge about the enterprise. The empowerment of the project team members to make decisions and their high position in the enterprise hierarchy
Cooperation with supplier	Good cooperation with the system supplier who is competent and offers high level of services.
Top management	Top management participation in the project schedule and goals definition. The top management support for the project and the management members involvement in implementation duties. Top management awareness regarding the project goals and complexity, labour required, existing limitations.
Linking with strategy	Linking the implementation project with enterprise strategy (implementation as a method of achieving the enterprise's strategic goals).
Detailed schedule	Detailed implementation scope, plan, and schedule with responsibility allocation. The work time assured for the implementation team members (work time schedule).
Pre-implementation analysis	The enterprise analysis and diagnosis prior to the start of implementation and the creation of the enterprise functioning model with the integrated system support.
Organizational change	The change in the enterprise organization and its business processes.
System reliability	The ERP system reliability, its user friendliness and fit to the enterprise's needs.
Monitoring and feedback	The implementation monitoring and feedback – information Exchange between the project team and end users.
Appropriate training	The adequate training program suitable to the enterprise's needs.
Financial budget	The financial resources assured during the implementation.
IT infrastructure	The appropriate IT infrastructure assured for the implementation project.
Implementation experience	The project team members' experience gained during former information systems implementation.

A total 14 success factors for ERP implementation have been identified, based on an analyses of the questionnaire. Team work and composition in the ERP implementer-vendor-consultant is a key factor influencing ERP implementation success. Good coordination and communication betweens the implementation partners are essential. Since ERP covers a wide range of functional areas, it is also important to have a cross-functional ERP core team. It is extremely critical that partnership trust is present and the team members are working well together. Another very critical factor is change management program and culture. An organizational culture where the employees share common values and goals and are receptive to change is most likely to succeed in ERP implementation. Other critical factors include top management support, business plans and vision, effective communication, project management, software development, monitoring and evaluation of performance. With a better understanding of the issues involved in ERP implementations, management will be able to make critical decisions and allocate resources that are required to make ERP implementation a success.

Conclusions

This paper presents results of ERP system's implementation process, the benefits and barriers of ERP system when applied to enterprise X in Latvia. ERP implementation is costly, lengthy, risky, and replete with complex organizational factors, such as initially unknown requirements, the level of user acceptance, and

rapidly changing IT environments. For an international company, the headquarters' successful experience can provide a guideline to assist the local office to implement new system effectively and efficiently. This paper also argues that ERP systems are an increasingly important source of organizational change with major implications for the organization and management of work. A successfully implemented ERP can link all areas of an enterprise including customer relation, manufacturing, human resource, financial management and distribution with customers and suppliers, and forming a highly integrated system with shared data. Potential benefits include drastic declines in inventory, reduction in working capital, abundant information about what customer wants and needs, along with the ability to view and manage the extended enterprise of customers, suppliers, and alliances as an integrated whole. Common problems associated with cost over-runs, technical problems and inadequate training and documentation are well known. Less well known are the longer term and more profound implication for the organization work, the size and shape of the organization, the dynamic of power and control in the organization and the skills used by employees and needed by the organization post-ERP.

Analyzing the difficulties reported by the responding personnel, this article categorizes the problems into economic, technical, organizational, and social issues.

In particular, this study suggests that the most significant difficulties experienced by the organizations are as follows:

- social problems connected with the knowledge, education, and attitudes of all stakeholders involved in the ERP system project within the company.
- high costs connected with ERP system implementation.
- organizational problems connected with planning activities of ERP system implementation, such as goal setting and the assessment of a company's condition.

On the basis of this study's results, we can formulate some recommendations for ERP system adopters. Firstly, the implementers should pay special attention to the organizational and initial phase of the ERP system project. At this stage, the implementers should assess organizational readiness for the ERP system project and the availability of sufficient financial resources for the project. Furthermore, once the decision about the project is made, the adopters ought to ensure that the ERP system project is a business-driven initiative, which should be reflected in the definition of appropriate project goals.

The assessment of the project feasibility should also consider the human resources needed for the ERP system implementation. The organization must assess the capabilities of the available people, their knowledge, and education. This case study only describes some aspects of factors that influenced ERP implementation in the construction enterprise in Latvia.

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