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ERP Implementation System and their Analysis

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Abstract

Effective work requires integrated systems that can share access to a common data set. Integrated workplace organizations in the construction company are requiring enterprise resource planning (ERP)-type systems that, in turn, tie together all relevant logistic, facilities, human resource, financial, and project data into a single, shared database. Unfortunately, many ERP systems make things more complex for construction business. The reality is that few ERP systems are vertically integrated for use in construction, and most of them are very complicate and ultimately difficult to implement. In addition, suppliers of ERP systems, for example SAP, Oracle and etc., must work with consultants and integrators to provide normal systems job after implementation. The purpose of the research is to identify, investigate, analyze and systematize the factors that can influence creation and functioning of the ERP system in a company and create methodology of ERP system implementation. ERP system modules for construction enterprise were evaluated, benefits and risks of ERP system were summarized.

INTRODUCTION

In today's dynamic and unpredictable business environment, companies face the tremendous challenge of expanding markets and rising customer expectations. This compels them to lower total costs in the entire supply chain, shorten throughput times, reduce inventories, expand product choice, provide more reliable delivery dates and better customer service, improve quality, and efficiently coordinate globe demand, supply and production [7, 13]. Over the last decade, many large organizations have been shifting from developing their business application software to licensing and installing large commercial off-the-shelf software known as enterprise resource planning (ERP) systems. ERP systems are fully integrated, enterprise wide business applications with not only a complete set of traditional modules such as accounting, human resources management, sales and distribution, and manufacturing, but they also provide extensions such as supply chain management, data warehouse, and customer relationship management. Organizations require ERP implementation for the purposes of customer-order integration, standardization of production process, reduction of inventory level and order preparation time, standardization human resources information. Today organizations operate in an economic environment where customer demands are continuously changing and increasing.

ERP SYSTEMS

EIS evolved from material requirements planning (MRP) and manufacturing resource planning (MRP II) systems. Therefore, they started as the support for a variety of transaction-based back-office functions and were then called Enterprise Resource Planning (ERP) systems [14]. However, they further evolved to include support for front-office and inter-organizational activities including supply chain management, customer resource management, and sales force automation [10]. They started to offer

solutions in an attempt to seamlessly link front-office (e.g., sales, marketing, customer services) and back-office (e.g., operations, logistics, financials, human resources) applications to enhance competitive advantages [2]. There are many ERP systems currently available in the IT market, like SAP R/3, BANN, Oracle, PeopleSoft etc. Before beginning an analysis of implementing an ERP system, we should give some common terminology. It is difficult to build a case for an ERP system if the terminology is not clearly understood by all parties involved. Key terms include the following: Enterprise resource planning

(ERP) system: Software that provides computer system integration and support to all units and functions across an organization in a single system, thus eliminating the need for individual unit databases or systems.

Hardware and infrastructure: Physical equipment, such as servers, personal computers, cabling, network and clustering switches, backup devices, storage devices, and disaster recovery devices, required for an implementation.

Software: All programs, procedures, and routines associated with a computer system. System software controls the computer's internal functioning. Application software directs the computer to execute commands that complete processes and solve problems.

Licensing fees: The cost of vendor licenses for software required for an ERP implementation. These are usually one-time fees.

Maintenance fees: The cost of vendor support tools such as mailing list servers, help desks, updated documentation, user conferences, consultant support, and application of software patches. These are typically yearly fees and tend to increase on an annual basis.

Customization: Modification of base system software (code) to meet a functional need that the baseline product cannot. Backfill: Additional staff hired or reassigned from other departments to replace key functional and technical staff assigned to the project because of their knowledge, skills, and abilities.

Communication plan: An integrated approach using various media to keep all stakeholders informed during the ERP implementation project.

Consultants: Third-party individuals who have expertise and experience in implementing ERP systems. They are hired to assist the project team in implementing the ERP system in the most efficient and effective way in the shortest amount of time.

ERP Systems Life Cycle

ERP system is specific product their life-cycle is specific too. ERP system life-cycle includes 6 phases: adoption decision phase, acquisition phase, implementation phase, use and maintenance phase, evolution phase, and retirement phase.

- **Adoption decision phase**. In this phase managers examine the needs for a new ERP system. Select the general information system approach: that will best address critical business challenges and that will improve the organization strategy. This decision phase includes: definition of system requirements, its goals and benefits, an

analysis of the impact adoption at a business and organizational level.

- **Acquisition phase**. This phase consists on selection of an ERP product that: best fits the requirements of the organization and minimize the need of customization. A consulting company is also selected to help in the next phases on the ERP life-cycle especially in the implementation phase. Factors such as price, training and maintenance service are analyzed. The contractual agreement is defined. It also important to make an analysis of the return of investment (ROI) of the selected product.
- **Implementation phase**. This phase includes: the customization of parameterization and adaptation of the ERP package to the needs of the organization. Usually this task is made with the help of consultants who provide implementation methodologies, know-how and training.
- **Use and maintenance phase**. This phase covers the personal of time where the ERP product is selected in a way that returns benefits and minimizes disruption. During this phase, one must be aware of the aspects related to functionality, usability and adequacy to the organizational and business processes. Once a system is implemented, it must be maintained, because malfunctions have to be corrected, special optimization requests have to be met, and general systems improvements have to be made.
- **Evolution phase**. This phase corresponds to integration of more capabilities into the ERP system; providing new benefits, such as advanced planning and scheduling, supply-chain management, customer relationship management, workflow and expanding the frontiers to external collaboration with other partners.
- **Retirement phase**. This phase corresponds to the stage when with the appearance of new technologies or the inadequacy of the ERP system or approach to the business needs. Substitute the ERP software with other information system approach more adequate to the organizational needs of the moment.

Costs involved in ERP system life-cycle

There are tangible and intangible costs include in the ERP system life-cycle. Tangible costs are the costs that can be measured in a direct way in monetary terms. Intangible costs are those costs that are difficult to be measured in a direct way, since they refer to vague concepts. All costs are summarized in Table 1.

Costs involved in ERP system life-cycle

Phase	Tangible costs	Intangible costs
Adoption decision		Decision making costs
Acquisition	Consultancy Hardware Software licenses	Decision making costs Opportunity costs
Implementation	Consultancy Training Human resources System	Customization, conversion and data analysis Time dedicated by

Phase	Tangible costs	Intangible costs
	specification	staff Business process re-engineering
Use and maintenance	System reconfiguration System adaption Costs of system failure	Indirect costs of system failure Lost of competitiveness
Evolution	Costs of new applications	
Retirement		Opportunity costs Decision making costs

ERP System Structure

The structure of ERP is composed of four levels which is shown in Figure 1:

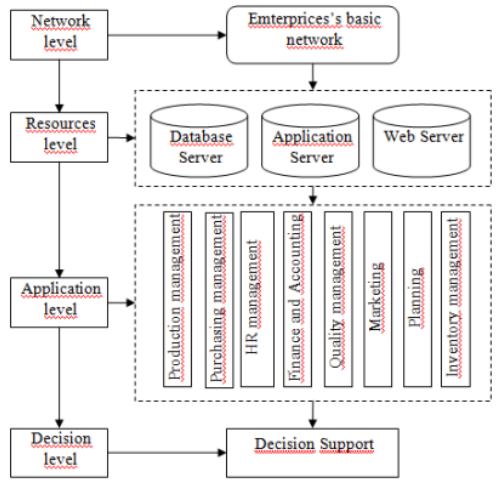

Fig. 1. ERP system structure

1. Network level: it is the infrastructure of the system which makes the information flow both internal and external enterprise flows smoothly through the network;

2. Resources level: it includes hardware, software and data needed by ERP system;

3. Application level: it contains different subsystems used by the personnel in different sections in an enterprise. Through these subsystems, management provides ERP with the data resource or obtains the required information;

4. Decision support level. Employing models and methods, management processes data or information for decision making.

ERP System Implementation Process

The process of implementing ERP begins with planning. After planning is completed, a Project team embarks on and then moves through a number of discrete phases. After the system is up and running, there may be a post-implementation review and later a stabilization phase. ERP implementation process can be divided into six stages: initiation, adoption, adaptation, acceptance, reutilization and infusion (see Figure 2).

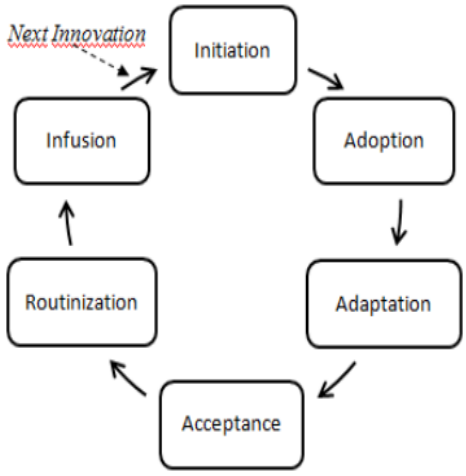

Fig. 2. ERP system implementation process

The first or the initiation is characterized by both internal and external factors that influence the organization to implement an ERP system. At this stage, the organization must carefully define why the ERP system is to be implemented and what critical

business the system will address. Additionally, education is also given to the employees. They will learn some new knowledge about the development history, basic concepts, main functional modules of ERP, and the benefits of implementing an ERP. After ERP education is finished, the implementation process enters the second stage. Organization will carry out investment decision and cost–benefit analysis related to implementing ERP and select appropriate brand or vendor. In the adaptation stage, the organization analyses the details of the various business processes and actualizes business process re-engineering (BPR) to exploit the full potential of ERP. Once the business process is redesigned and system is customized, appropriate training is given to the end-users immediately and resistance may be observed because of the 'inertia' associated with using the previous system. This stage is considered as the most difficult of all the stages. In the acceptance stage, the integration of various functional units is realized and continuous improvements are made to make the system easy to use and to solve various problems. The users feel comfortable with using the ERP system. During the fifth stage, end-users accept the system completely. The ERP system usage becomes a regular day-today activity. Organizational integration and internal function coordination are realized. At the infusion stage, the system is used to enhance the performance of the organization [11]. After years of operation, the company may need new system to cope with business and technology change, so the first stage will be repeated again

ERP Implementation Process in the Construction Enterprises

In introducing ERP systems, in some sense, the implementation processes determine the effect of ERP. Authors analyzed many literatures and abstracts reviews, visited and studied some Latvian construction enterprises, their ERP systems and its implementations phases. The companies producing different type of building products are selected. The companies visited have also different size such as employee numbers, revenue. As a result authors offer to include in ERP system implementation process seven phases. All of them shown in Figure 4.

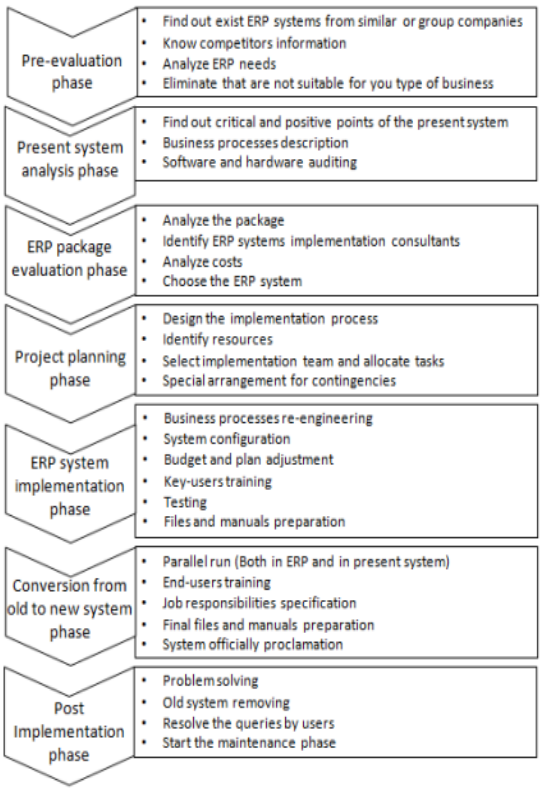

Fig. 4. ERP system implementation process in the construction enterprises

Pre-Evaluation Phase

The pre-evaluation phase involves researching the necessity of the development of the system. In the pre evaluation phase, first and foremost is to understand the strategic objective of the enterprise with considerations to its environment, thus to confirm the overall goal of the system and main function. The objective of the pre evaluation phase is to address conceptual level issues including basic architecture. Enterprise needs to identify reasons for ERP solution. It is necessary to find out exist ERP systems from similar or group companies and get know competitor's information. Then necessary analyze received information and eliminate is it suitable or not for you type of business. Also need to investigate map processes i.e. includes details like time taken, decisions to be taken and decisions point, flow of information, reports and reporting points etc. Then prepare an overall plan, alternatives for systems development and financial planning. Pre-evaluation phase is feasibility study; it will address technological feasibility, economic feasibility, organizational feasibility and social feasibility

Present System Analysis Phase

Find out critical and positive points of the present system. To describe all business processes we need business process documentation, job description documentation, employee roles documentations, organizational chart, actual business needs and supply chain problems. It is necessary to audit software and hardware also to find out strengths and weaknesses of the present system. System investigation involves study team, i.e. senior management and project team members. They evaluating current business process and discussing existing problems, seeking solutions. This analysis is process through which company can create a model where they are standing now and where they want to go. Analysis helps the company to cover the functional gap.

ERP Package Evaluation Phase

This phase based upon the recommendation from the above phases, it confirms the need for a new system. This phase will work on the evaluation of the present system, such as developing system architecture, identifying entities and determining the main techniques to be used. The focus of this stage is on conceptual design. Package of ERP programs is selected on the basis of different parameter. It is necessary to analyze the package based on the presence (global/ local), type of market catering to, modularity, ease of implementation, cost of product, cost of implementation, post implementation support etc. It is necessary to test and certify the package and also check the coordination with different departments. Selected package will determine the success or failure of the project. Package must be user friendly. Regular up gradation should available. Analyzing of all cost also required.

Project Planning Phase

The project planning phase involves integrating knowledge, functions, flows and organization framework at both logical and physical layers. This phase mainly works on the physical design and software development including algorithm design and coding. Additional considerations are given to hardware, institutional framework and staff training, etc. It is necessary to identify recourses and select project team and allocate all tasks. Project organizing provides creation of leading, project implementation group and technical groups. Leading group made up by top managers. They build the right mix of members including the appointment of

project manager and other key staff members. Project implementation group mainly in charge of a large portion of implementation tasks. In general, the project manager leads the group; other members should be made up of the leaders and key staff members of the main business segments of the enterprise. Technical group is responsible for working with the implementation group to work out new working procedures including involving personnel training. They should be able to develop new business process and operation methods through mastering ERP system; and proving that the new approach is viable. The quality of this group determines if the ERP can be implemented at each basic unit of the enterprise. Regular personnel should be assigned to the group for operation and problem-solving.

ERP System Implementation Phase

The implementation phase is to realize physical model and implement the model in practice. This phase involves the completion of the installation and debugging, etc. Before operating ERP system, it is necessary to prepare for inputting a series of basic data that were not defined clearly before using the system. Therefore, a large amount of work is required. The data are related to products, process, inventory, etc. Related parameter setting is also needed. For instance, financial data that is required in system installation and testing. Input of the various data is made in the system to check of functions of the software. Working groups have to be organized. They can offer decisions for those problems which often arise in system. Modeling of separate situations can be spent also. On the basis of the readiness of personnel and basic data, system installation begins. After that key-users testing follow.

Conversion from Old to New System Phase

Before old system removing it is necessary to work on both systems to check out the new system. The work is completed, data conversation is done, databases are up and running, the configuration is completed and testing is done. The employee who is going to use the system are identified and trained. After training weak points are found and job responsibilities are specified. Also final files and manuals are prepared. After necessary customization is completed and before entering systems operations stage, a formal approval by senior management is required in order to ensure the quality of systems implementation. Conversion from old system to new completes all activities from the implementation and ends with new ERP system officially proclamation.

Post Implementation Phase

The implementation task is not over even the new system is implemented. Post implementation phase includes old system removing. Once the system is lived the old system is removed. The following steps are mainly involved with evaluation and maintenance. It is necessary to check whether the implemented system has achieved the initial objective and determine whether to make the required further improvement. Due to the change in business environment, the system should be able to accommodate new requirements and challenges. Employees who are trained enough to handle problems those crops up time to time. The post implementation will need a different set of roles and skills than those with less integrated kind of systems. Post implementation involves minor changes to the systems, problem solving, resolve the queries by users, fine tuning of performance, provide changes for enhancement and incorporate increment changes.

Conclusions

ERP systems have a vital role in today's organizations to realize their vision and strategies. Implementations of ERP systems are one of the most difficult investment projects because of the complexity, high cost and adaptation risks. ERP projects have an abnormal number of problems, particularly related to cost, customization, and integration with existing systems as evidenced by the large number of failed projects, especially in organizations that are structurally complex and geographically dispersed [10]. Implementing ERP systems is a deep revolution in management. In order to achieve the goal, issues in the implementation process must be systematically considered. This study presents findings about ERP system implementation for building companies in Latvia. ERP implementation itself is a project of system engineering or practice of systems science. A thorough analysis of the systems characteristics and factors is considered a necessity as basis for the successful implementation of ERP systems. Guidelines for successful implementation of ERP are: • understand the enterprise's needs and culture, i.e. readiness for changes vs. capability to implement

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