

2<sup>nd</sup> World Conference On Business, Economics And Management - WCBEM 2013

## Business information systems: research study and methodological proposals for ERP implementation process improvement

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### Abstract

Enterprise resource planning (ERP) systems are highly complex business information systems. The implementation of these systems requires a high cost, corporate time and resources. This article identifies implementation procedures that are critical for a successful implementation. An empirical and research study of a ERP implementation process is presented and discussed in terms of the key factors. How it results from the presented research paper, the main aim of our study is to increase the effectiveness of the ERP systems implementation in industrial companies and to reduce the risks associated with a failure of the ERP system implementation. To create a suitable methodology of ERP systems implementation within industrial companies was analysed known theoretical approaches for ERP systems implementation. Based on the theoretical analyses and practical research realised by questionnaire survey, were identified the deficiencies. In our opinion, these deficiencies should be eliminated by the proposed methodology for ERP systems implementation in industrial company. Our attention is focused on the most critical areas of ERP systems implementation.

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Selection and peer review under responsibility of Organizing Committee of BEM 2013.

**Keywords:** Business information system, enterprise resource planning (ERP), company resource planning, implementation process;

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### 1. Introduction

Enterprise resource planning systems (ERP) are highly complex business information systems. The implementation of these systems requires a high cost, corporate time and resources (Umble, Haft, & Umble, 2003).

At present, information is becoming one of the factors of production enterprises, and therefore the enterprise's information system is a key factor in business competitiveness (Frankovský, Štefko, & Baumgartner, 2006). As we know, Enterprise Resource Planning information systems automate and integrate the core functionality of an organization.

A major problem with ERP implementation process is that very few threat and risk of implementation failures are recorded in the literature, perhaps because few companies wish to publicize their implementation failures (Hakim & Hakim, 2010).

This paper deals with ERP systems in middle and large industrial companies. Based on the results of the empirical analysis we also present the optimal process for their implementation. An empirical and research study of

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## 2. Literature review and methodological framework of the issue

Since the mid-1990s, ERP systems have been installed in thousands of companies worldwide. ERP systems are enterprise-wide on-line interactive systems that support cross-functional processes using a common database. ERP systems are designed to provide, at least in theory, seamless integration of processes across functional areas with improved workflow, standardization of various business practices, and access to real-time up-to-date data (Mabert, Ashok, & Venkataramanan, 2003).

Nowadays, Information systems knowledge is essential for creating successful, competitive firms, managing global corporations, adding business value and providing useful products and service to customers (Laudon & Laudon, 2007). Information technology and systems have tremendous impact on the productivity of both manufacturing and service organizations (Mandal & Gunasekaran, 2003). Company managers utilize a number of methodological concepts for the integrated Business Performance Management including Balanced Scorecard, Lean manufacturing, etc. (Knápková, Pavelková, & Jirčíková, 2010). Implementing the Balanced Scorecard, however, cannot be successful without the support of a high-quality business information system as, especially within a larger business, this concept will not function if not working with large amounts of data and information (Pivnička, 2011). Lean manufacturing, team working, continuous process improvement, knowledge management and e-business are just a few of the practices that organizations are using in their search for effectiveness (Chromjaková & Rajnoha, 2012).

Enterprise resource planning systems appear to be a dream come true. The commercially available software packages promise seamless integration of all information flows in the company - financial and accounting information, human resource information, supply chain information, and customer information (Tuček, Tučková, & Zámečník, 2009). For managers who have struggled, at great expense and with great frustration, with incompatible information systems and inconsistent operating practices, the promise of a quasi “off-the-shelf” solution to the problem of business integration is enticing (Umble, Haft, & Umble, 2003). Also, several authors emphasize that ERP is a key ingredient for gaining competitive advantage, streamlining operations, and having “lean” manufacturing (Aláč, Demoč & Barcik, 2010). As a testimonial for this viewpoint, they point to tens of thousands of companies around the world who have implemented or are planning to implement ERP systems (Mabert, Ashok, & Venkataramanan, 2003).

Planning for ERP systems and their implementations requires an integrated approach to meet the requirements of various functional areas (Mandal & Gunasekaran, 2003). Implementing a new information system is not always to the benefit of a company. The success of system implementation is dependent on many factors (Ferenčíková, 2011). When a business implements ERP in its drive to become more efficiently interconnected, risks arise from the new technology, which is loaded with uncertainties that evolve over time and cannot be fully known when making decisions (Wu, Ong, & Hsu, 2008). Much of the initial scientific literature in ERP consists of articles or case studies either in the business press or in practitioner focused journals. Many of these articles provide anecdotal information based on a few successes or failures (Mabert, Ashok, & Venkataramanan, 2003). A major problem with ERP implementation process is that very few threat and risk of implementation failures are recorded in the literature, perhaps because few companies wish to publicize their implementation failures (Hakim & Hakim, 2010). Several major ERP implementation risks have exogenous and endogenous character. Exogenous risk factors are connected with the uncertain environment outside the organization's control, in which the technical risks include uncertainties related to hardware, software, telecommunication cost uncertainty, system reconfiguration costs, and the risks of specification changes; the second type of exogenous risks include the costs of outside training and consulting costs. Endogenous risks arise from within the organization, e.g., unforeseeable user resistance, the risk of commitment escalation, uncertainty involving the costs of personnel turnover, maintenance costs in the long implementation process, and whether the management has the competence to implement ERP successfully (Wu, Ong, & Hsu, 2008). In ERP implementation process we have to take into account the risks surrounding the ERP implementation at an

organizational level to evaluate the ERP success rate (Bobák, 2003). As the financial and resource investment is quite considerable for implementation of such system, it is important to analyse the risks involved and to be able to minimize them during the implementation process, if deciding to proceed (Hakim & Hakim, 2010). The literature indicates that three key social enablers—strong and committed leadership, open and honest communication, and a balanced and empowered implementation team are necessary conditions/precursors for successful enterprise resource planning (ERP) implementation. Surprisingly, few studies have attempted to examine the role of these human factors through detailed analysis in an empirical setting. (Sarker & Lee, 2003).

Company represents an open, dynamic and goal-oriented system that constantly interacts with its internal and external environment (Oblak, Lipušček, Jelačič, & Motik, 2004). Constantly changing environment significantly affects the overall efficiency and so also the competitiveness of enterprises. One of the conditions to maintain the competitiveness and performance of the company is the ability to work properly and timely with information not only about past and present but also especially about the future. ERP information system is a powerful tool that influences awareness, flexibility and performance of the company. Management of "today's" company is constantly forced to look for additional useful information especially about the future development. This task is currently being performed by ERP systems of II. Development type (Basl & Blažiček, 2008). Their crucial role is to plan and simulate different scenarios for the future development of the enterprise based on BI - Business Intelligence information systems (Figure 1).

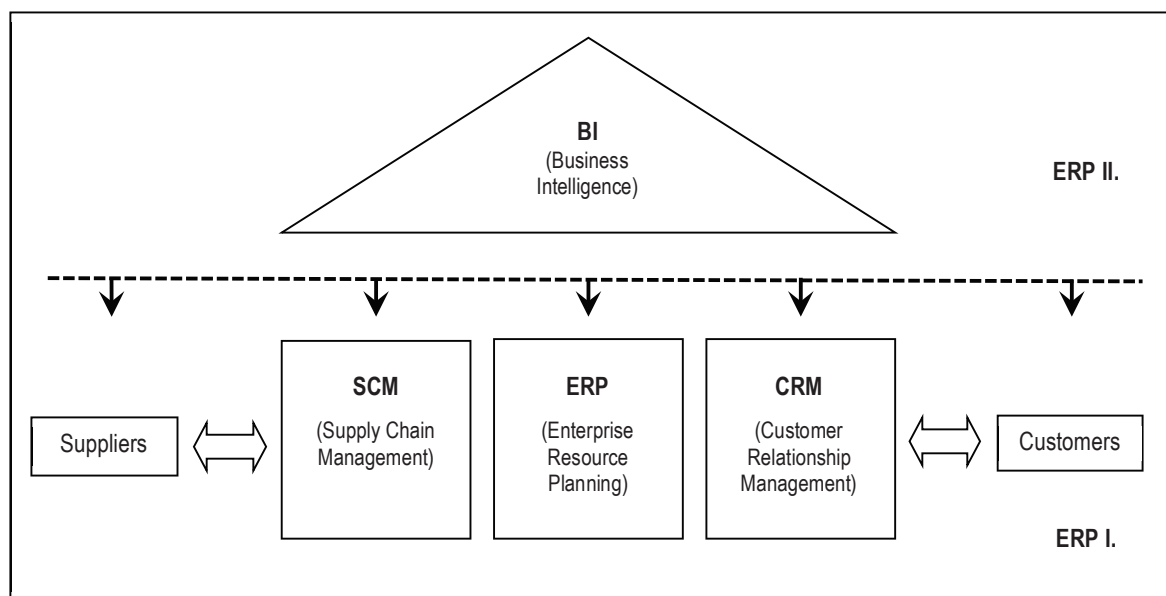


Figure 1. Advanced business information systems – ERP II

## 2.1. Research goals and methodology

As mentioned above, the main objective of our research was to increase the effectiveness of the ERP system implementation in middle and large industrial companies and to reduce the risks associated with a failure of the ERP system implementation.

To achieve this goal, the theoretical part of our scientific research builds the knowledge and information base on the industrial companies competitiveness and on existing ERP systems available to industrial companies, in terms of their functionality and suitability based on the size of the enterprises. To determine the availability and utilization of ERP systems within enterprises, the market of ERP systems was analysed. To create a methodology of ERP systems implementation within industrial companies, the implementation of ERP systems in selected middle and large

industrial companies was analysed, as well as the theoretical approaches to the implementation of ERP systems based on the standardized methods were analysed. Based on the analyses the deficiencies were identified. These deficiencies are eliminated by the proposed methodology for ERP systems implementation within the enterprise.

The next part of our scientific research focuses on establishing of methodology for ERP systems implementation within middle and large industrial companies. The proposed methodology represents a procedure that consists of pre-project phase and six project phases. The content of each phase is described in terms of actions to be taken to eliminate the risk of failure of implementation. Attention is focused on the most critical area of ERP systems implementation, which clearly is the pre-project phase, the identification of the information needs of the company, the impact of human factor on the course and results of implementation, the ability to continuously assess the time and money balance during ERP system implementation.

### 3. Selected results

ERP implementation in middle and large companies always takes several years and the whole process requires human, financial, material and other resources. Therefore, it is advisable to use project-based management approach when implementing ERP systems in companies. Based on our research we can summarize the specifics of ERP implementation projects into following points:

- Uniqueness
- Complexity
- Human factor
- Enterprise-wide nature of the project
- Corporate culture change
- Employees risk aversion
- Lack of expertise
- Low level of experience

The ERP system implementation was in 88.3% of surveyed companies considered to be a significant change that substantially affects the present and especially the future competitiveness of the company. The importance of the new ERP system implementation was perceived by 94.7% of the managers who were at the same time aware of the consequences of ERP system implementation for the company. They perceive the changes by acquiring a new tool for standard users, in new opportunities and possibilities that ERP system brings. The implementation of the new ERP system was perceived positively by IT staff (100%) who were also aware of the significance of the changes, application of new technologies, but also problems with stabilization of the ERP system in a corporate IT environment. Key users evaluated the significance of the change to 81.4%, which is a good sign for the management how the future users understand the importance of this change. This is also a prerequisite for a responsible approach to these changes from users.

Based on the data gathered through questionnaire survey conducted in selected medium size and large companies the following conclusions were formulated:

- ERP system improves the company's competitiveness and supports the dynamics of the company development.
- The new ERP system represents a significant change for the company, and all participating parties are aware of these changes.
- Implementation methodology is an important factor influencing the quality of the ERP system implementation.
- Companies are able to describe business processes and establish a list of requirements for the implemented ERP system.
- Businesses are able to identify and quantify the benefits of the implemented ERP system.
- Return on investment into ERP system is important especially for the corporate executives and employees believe that it is possible to find a way to quantify the return on investment into ERP system.

Changes and uncertainty during ERP system implementations can be successfully addressed with a risk management that also significantly affects the project's success. Risks of ERP systems implementation projects have been analysed with regard to different phases of the project life cycle. Records on past ERP implementation projects were subject to the analyses with an aim to identify the most common risks in terms of their likelihood and potential consequences. The following figure describes the most common risks of ERP implementation projects in industrial

companies, which need to be addressed by risk management for specific phases of the project life cycle - design, implementation, maintenance and operation (Figure 2). A responsible person who will hold the position of Manager for risk management should manage the risk management. The risks for the project are to be identified by the external project manager (appointed by supplier) and internal project manager (appointed by implementing company) together with members of sub implementation teams.

Project phase	Possible risk for the specific project phase
ERP system design	<ul style="list-style-type: none"> <li>▪ schedule is too aggressive</li> <li>▪ the supplier underestimated the complexity of the system</li> <li>▪ high turnover rate within the implementation team</li> <li>▪ implementer inefficiently manages suppliers</li> <li>▪ too many changes in the procedures and requirements</li> <li>▪ future legislation change can affect the design and development of the system</li> <li>▪ testing is insufficient or is not performed by the implementer</li> <li>▪ system configuration is not well controlled by the implementer</li> <li>▪ insufficient detail in the system documentation</li> <li>▪ lack of quality at output documentation</li> <li>▪ architecture of the system does not meet the current load and nature of the transactions</li> <li>▪ insufficient system compatibility</li> </ul>
ERP system implementation	<ul style="list-style-type: none"> <li>▪ conflicting priorities that cause delays</li> <li>▪ degree data conversion complexity has been underestimated</li> <li>▪ complexity of interfaces has been underestimated</li> <li>▪ financing of implementation the implementation phase has been underestimated</li> <li>▪ insufficient user training on the new ERP system</li> <li>▪ too many changes in the procedures and requirements</li> <li>▪ resistance from stakeholders and users, they feel that the ERP system does not meet their needs, or they were not actively engage in the development phase</li> <li>▪ performance and system capacity is insufficient for current operations</li> </ul>
ERP system operation & maintenance	<ul style="list-style-type: none"> <li>▪ lack of adequate financing to restore operations and technology</li> <li>▪ lack of adequate financing to support legislative changes and user requests</li> <li>▪ lack of adequate financing to the project</li> <li>▪ insufficient involvement of executives on managing</li> <li>▪ strategic plan for the ERP system is missing</li> <li>▪ inadequate or inaccurate documentation and procedures</li> <li>▪ insufficient transfer of knowledge from vendor to maintenance and operational personnel</li> <li>▪ discontinuing of compliance with project procedures and controls</li> <li>▪ difficulties while transitioning from a developmental phase to operational phase</li> </ul>

Figure 2. Most common risk of ERP project implementation by project life cycle

#### 4. Conclusion

How it results from the presented research paper, the main aim of our study is to increase the effectiveness of the ERP systems implementation in industrial companies and to reduce the risks associated with a failure of the ERP system implementation. To create a suitable methodology of ERP systems implementation within industrial companies was analysed known theoretical approaches for ERP systems implementation. Based on the theoretical analyses and practical research realised by questionnaire survey, were identified the deficiencies. Based on the data gathered through questionnaire survey conducted in selected medium size and large companies the more important risks were formulated. Risks of ERP systems implementation projects have been analysed with regard to different

phases of the project life cycle. Changes and uncertainty during ERP system implementations can be successfully addressed with a risk management that also significantly affects the project's success.

## Acknowledgements

This paper is the partial result of the Ministry of Education of Slovak Republic grant project VEGA Nr. 1/0089/11 - Performance measurement and managing of Slovak woodprocessing companies.

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