

*Mediterranean Conference on Information Systems
(MCIS)*

MCIS 2008 Proceedings

Association for Information Systems

Year 2008

IMPORTANCE OF IMPROVED
INNOVATION CAPABILITIES AS AN
ERP SYSTEM SELECTION
CRITERION: A COMPARATIVE
ANALYSIS OF SLOVAKIA AND
SLOVENIA

Frantisek Sudzina*

Andreja Pucihar[†]

Gregor Lenart[‡]

*Copenhagen Business School, Denmark, fs.caict@cbs.dk

[†]University of Maribor, Slovenia, Andreja.Pucihar@fov.uni-mb.si

[‡]University of Maribor, Slovenia, Gregor.Lenart@fov.uni-mb.si

This paper is posted at AIS Electronic Library (AISeL).

<http://aisel.aisnet.org/mcis2008/3>

IMPORTANCE OF IMPROVED INNOVATION CAPABILITIES AS AN ERP SYSTEM SELECTION CRITERION: A COMPARATIVE ANALYSIS OF SLOVAKIA AND SLOVENIA

Sudzina, Frantisek, Copenhagen Business School, Howitzvej 60, 2000 Frederiksberg,
Denmark, fs.caict@cbs.dk

Pucihar, Andreja, University of Maribor, Kidriceva 55a, 4000 Kranj, Slovenia,
Andreja.Pucihar@fov.uni-mb.si

Lenart, Gregor, University of Maribor, Kidriceva 55a, 4000 Kranj, Slovenia,
Gregor.Lenart@fov.uni-mb.si

Abstract

Enterprise resource planning (ERP) systems have become the de facto standard for large and medium companies to run all their major functional and process operations. Some even describe ERP systems as the price of entry for running a business. ERP system per se cannot be perceived as a source of competitive advantage anymore, since a significant percentage of companies already implemented them. On the other hand, innovation plays an increasingly important role in sustaining competitiveness. Although ERP systems could be perceived as constraining and inflexible, i.e. ERP systems may seem incommensurate with the notion of innovation, this is not the case in real life. It may be argued that innovation capabilities can be improved by ERP systems because of improved transparency and better information flow. The paper addresses two research questions: 1) What does academic literature say about the combination of ERP systems and innovations? 2) How important are improved innovation capabilities in the ERP system selection process?

The first research question is answered based on literature review of relevant articles from Web of Science journals. The main findings are that the articles discuss (1) ERP system (implementation) as innovation (implementation), (2) ERP system driven innovation (impact of ERP systems in the post-implementation phase on innovation), and (3) ERP system innovation (i.e. innovation of ERP system). A large part of (2) perceives ERP system also as innovation.

The second research question is rather practical and it cannot be approached from a strictly theoretical point of view. We try to answer this question using the results of the questionnaire research conducted in Slovak and Slovenian companies in May and June 2007. The main finding is that the importance of improved innovation capabilities is significantly higher in Slovakia than in Slovenia.

Keywords: Enterprise Resource Planning (ERP) Systems, Innovation, Empirical Research.

1 INTRODUCTION

The enterprise resource planning (ERP) system is an integrated set of programs that provides support for core business processes. Functions of an ERP system generally cover elements of the value chain from raw material purchases, inventory management, production, goods, shipments, invoicing, accounting, and human resource management (Peslak, Subramanian, and Clayton, 2007). An ERP system helps different parts of an organization to share data, information, to reduce costs, and to improve management of business processes (Aladwani, 2001). According to Peslak (2006), ERP systems have become the de facto standard for large and medium companies to run all their major functional and process operations. Kumar et al. (2000) go even further and describe ERP systems as the price of entry for running a business.

ERP system *per se* cannot be perceived as a source of competitive advantage anymore, since a significant percentage of companies already implemented them. But according to McAdam et al. (2005), innovation and change management play an increasingly important role in sustaining “leading edge” competitiveness for organizations in times of rapid change and increased competition. Although innovation capabilities are probably not covered by any ERP system definition, but since information technology is so diffused nowadays, end-users expect from ERP systems much more than in the past.

Even though some may perceive ERP systems as constraining and inflexible, i.e. ERP systems may seem incommensurate with the notion of innovation, e.g. Srivardhana et al. (2007) show that it is not the case. The idea of investigating the importance of improved innovation capabilities as an ERP system selection criterion stems from Bernroider et al. (2001). It may be argued that innovation capabilities can be improved by ERP systems because of improved transparency and better information flow. Therefore, our first research question is - what does academic literature say about the combination of ERP systems and innovations? We try to answer this in the second chapter based on literature review of relevant articles from Web of Science journals.

The second research question is - How important are improved innovation capabilities in the ERP system selection process? This is rather a practical question, which cannot be approached from a strictly theoretical point of view. We try to answer this question using the results of the questionnaire research conducted in Slovak and Slovenian companies in May and June 2007.

The paper is organized in the following way: the second chapter discusses Web of Science articles on ERP systems and innovation, the third chapter describes data and methodology used in the empirical research, the fourth chapter provides results of this survey, and the fifth chapter concludes findings of this paper.

2 ERP SYSTEMS AND INNOVATION

Our literature survey shows that as of 16 September 2008, there are 56 articles on “enterprise resource planning” and select* in journals covered in Web of Science. (The query was not “enterprise resource planning systems” because it is quite common that the first occurrence in the text is “enterprise resource planning (ERP) systems”, and from then on, it is addressed only as “ERP”. It is not possible to search for “ERP” because the search engine would find each word with a substring of “erp”.) But only four of them (Bendoly, Bachrach et al., 2006; Kumar, Maheshwari et al., 2003; Carnicky, 2003; Kumar, Maheshwari et al., 2002a) mention “innovation”. There are 41 Web of Science articles, which mention “enterprise resource planning” and “innovation”. We looked into 38 of them published in the period of 2000-2007. There are two reasons for not including three articles from 2008. The more scientific one is that it would not cover the whole year 2008. The more practical one is that neither Copenhagen Business School nor University of Maribor have access to the latest three articles. But in some of them (Bendoly, Bachrach et al., 2006; Park, Suh et al., 2007) “innovation” appears only in an article title in references, in a few others (Kimms, 2003; Bajwa, Garcia et al., 2004; Somers and Nelson, 2004; Shepherd, 2006; Gunasekaran and Ngai, 2007) is “innovation” mentioned rather by a coincidence.

The remaining articles discuss ERP systems or their implementation as innovation or innovation implementation *per se* (Hislop, Newell et al., 2000; Legare, 2002; Kumar, Maheshwari et al., 2002a; Kumar, Maheshwari et al., 2002b; Stratman and Roth, 2002; Rajagopal, 2002; Waarts, van Everdingen et al., 2002; Abdinnour-Helm, Lengnick-Hall et al., 2003; Kumar, Maheshwari et al., 2003; Siau and Messersmith, 2003; Van Everdingen and Waarts, 2003; Watanabe and Hobo, 2004a; Watanabe and Hobo, 2004b; Ettl, Perotti et al., 2005; Falk, 2005; Hwang, 2005; Ko, Kirsch et al., 2005; McAdam and Galloway, 2005; Liang, Saraf et al., 2007), (also) focus on the impact of ERP system implementation on organizational innovation capabilities (Carnicky, 2003; Lengnick-Hall, Lengnick-Hall et al., 2004; Trott and Hoecht, 2004; Barki and Pinsonneault, 2005; Swanson and Wang, 2005; Wu, Wang et al., 2005; Wang, Ying et al., 2006; Karimi, Somers et al., 2007; Ma and Loeh, 2007; Srivardhana and Pawlowski, 2007; Wang, Lin et al., 2007) or discuss innovation of an ERP system (King and Burgess, 2006).

3 DATA AND METHODOLOGY

The questionnaire research was conducted in May and June 2007. Questionnaire forms accompanied by cover letters were mailed to randomly selected companies in Slovakia and Slovenia. Lists of addresses and information about the number of employees were retrieved from respective Statistical Bureaus in Slovakia and Slovenia. In each country, 600 questionnaires were sent to small, 300 to medium enterprises, and 300 to large companies. The number of questionnaires mailed to small companies was double the number of medium and large companies because small companies constitute the highest proportion of companies and based on our personal experience, they are less likely to respond. In total, there were 202 responses (112 from Slovakia, and 90 from Slovenia); 178 of them (97 from Slovakia, and 81 from Slovenia) replied to all questions needed for the analysis presented in this paper.

The dependent variable is importance of improved innovation capabilities measured on Likert scale 1-5, where 1 means that it is of very little importance and 5 that it is of very high importance

Independent variables are country, company size, representation of the IT department on the board level and implementation stage. The questionnaire research was conducted in Slovakia and Slovenia. Analyzed are small, middle and large companies, where companies from 10 to 49 employees are considered to be small enterprises, companies from 50 to 249 employees are considered to be middle enterprises, and companies with 250+ employees are considered to be large enterprises. This classification is compatible with European Commission (2008). Representation of the IT department on the board level means that there is a chief information officer (CIO) or alike director for IT. The possible implementation stages are “ERP system is being considered”, “ERP system is being evaluated for the selection of a specific solution”, “ERP system is being configured and implemented”, “an ERP system was recently implemented and is now being stabilised”, “an ERP system is being used and maintained”, “we have now substituted our first ERP system with a new one”.

The research model is presented in Figure 1.

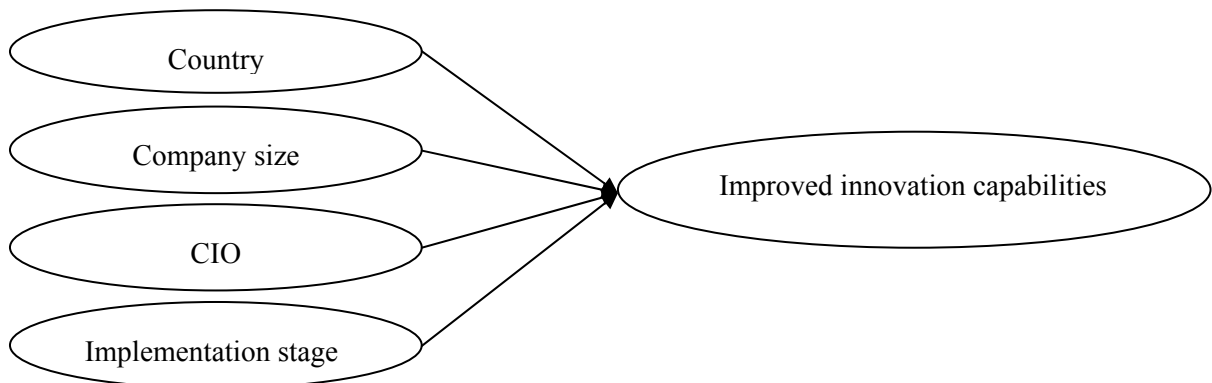


Figure 1. Research model.

Analysis of variance (ANOVA) is used to test impact of independent variables on the dependent variable; a multivariate approach is used. Results are commented on confidence level $\alpha = 0,05$.

4 RESULTS

ANOVA was used to test impact of the country, company size, representation of the IT department on the board level (CIO), and implementation stage on perceived importance of improved innovation capabilities. Research results, based on data from a sample of 97 Slovak and 81 Slovenian companies, are presented in Figure 2. P-values are used to evaluate significance of the relationships.

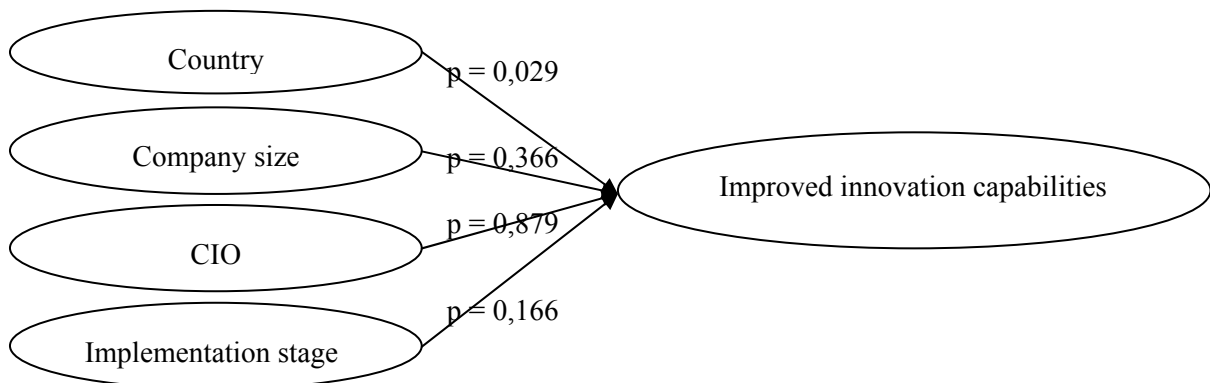


Figure 2. Research results.

It can be concluded that there are significant differences in importance of improved innovation capabilities as an ERP system selection criterion between the countries, it is higher in Slovakia. Impact of the remaining factors was not found significant. The average importance of improved innovation capabilities was 3,28 in Slovenia and 3,57 in Slovakia (on a 1-5 Likert scale, where 1 stands for no importance whatsoever and 5 for high importance) gives a hint that the reason why innovation is so rarely mentioned in articles on ERP system selection, i.e. only in four out of 56 Web of Science articles, is the fact that companies do not think of it as of a too important selection criterion. The results cannot be directly compared to findings of Bernroider and Koch (2001) because of different anchoring used in the questionnaire.

5 CONCLUSIONS

One of the most widely recognized means of achieving competitive advantage are innovations. The first research question, which the article aimed to answer, is what Web of Science articles say about ERP systems in relation to innovations. Based on the analysis of 31 relevant Web of Science articles published till 2007, it was found that majority of them (19) perceived an ERP system or its implementation as an innovation or innovation implementation, a smaller percentage (11) actually discussed the impact of ERP systems usage on organizational innovation and one article investigated the innovation process of ERP systems. (The remaining seven out of 38 retrieved articles mentioned innovations only in references or received only cursory mention.) It is slightly surprising that only one third of the articles focused on ways how can ERP systems improve innovation capabilities of companies. Further research will involve looking into a larger database for relevant articles and identifying ways how ERP systems exactly impact/improve innovation capabilities.

The second research question involved importance of improved innovation capabilities in the ERP system selection process. The quantitative analysis of 97 Slovak and 81 Slovenian companies uncovered that improved innovation capabilities as an ERP system selection factor are of greater concern to Slovak (3,57) than to Slovenian companies (3,28). Impact of the remaining investigated factors, i.e. of company size, representation of the IT department on the board level (CIO), and ERP

system implementation stage was not found significant. The importance of improved innovation capabilities as an ERP system selection criterion is significantly higher than average (i.e. 3) in both countries. Further research will involve investigation how satisfied are companies, which already implemented ERP systems, with improvement of their innovation capabilities, inclusion of additional independent variables, and further qualitative investigation of uncovered significant relationships.

References

- Abdinnour-Helm, S., Lengnick-Hall, M.L. et al. (2003). Pre-implementation attitudes and organizational readiness for implementing an Enterprise Resource Planning system. *European Journal of Operational Research*, 146 (2), 258-273.
- Aladwani, A.M. (2001). Change management strategies for successful ERP implementation. *Business Process Management Journal*, 7 (3), 266-275.
- Bajwa, D. S., Garcia, J.E. et al. (2004). An integrative framework for the assimilation of enterprise resource planning systems: Phases, antecedents, and outcomes. *Journal of Computer Information Systems*, 44 (3), 81-90.
- Barki, H. and Pinsonneault, A. (2005). A model of organizational integration, implementation effort, and performance. *Organization Science*, 16 (2), 165-179.
- Bendoly, E., Bachrach, D.G. et al. (2006). ERP in the minds of supervisors - Joint roles of task interdependence and cultural norms. *International Journal of Operations & Production Management*, 26 (5-6), 558-578.
- Bernroider, E. and Koch, S. (2001). ERP selection process in midsized and large organizations. *Business Process Management Journal*, 7 (3), 251-257.
- Carnicky, S. (2003). New position and tasks of management information systems of enterprises. *Ekonomicky Casopis*, 51 (5), 570-591.
- Ettlie, J.E., Perotti, V.J. et al. (2005). Strategic predictors of successful enterprise system deployment. *International Journal of Operations & Production Management*, 25 (9-10), 953-972.
- European Commission (2008). SME definition: Recommendation 2003/361/EC regarding the SME definition, accessed on 10 June 2008, available at http://ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm
- Falk, M. (2005). ICT-linked firm reorganisation and productivity gains. *Technovation*, 25 (11), 1229-1250.
- Gunasekaran, A. and Ngai, E.W.T. (2007). Knowledge management in 21st century manufacturing. *International Journal of Production Research*, 45 (11), 2391-2418.
- Hislop, D., Newell, S. et al. (2000). Networks, knowledge and power: Decision making, politics and the process of innovation. *Technology Analysis & Strategic Management*, 12 (3), 399-411.
- Hwang, Y.J. (2005). Investigating enterprise systems adoption: uncertainty avoidance, intrinsic motivation, and the technology acceptance model. *European Journal of Information Systems*, 14 (2), 150-161.
- Karimi, J., Somers, T.M. et al. (2007). The impact of ERP implementation on business process outcomes: A factor-based study. *Journal of Management Information Systems*, 24 (1), 101-134.
- Kimms, A. (2003). Costing communication standards in information systems using a minimum cut approach. *Journal of the Operational Research Society*, 54 (4), 426-431.
- King, S.F. and Burgess, T.F. (2006). Beyond critical success factors: A dynamic model of enterprise system innovation. *International Journal of Information Management*, 26 (1), 59-69.
- Ko, D.G., Kirsch, L.J. et al. (2005). Antecedents of knowledge transfer from consultants to clients in enterprise system implementations. *MIS Quarterly*, 29 (1), 59-85.
- Kumar, K. and van Hillegersberg, J. (2000). ERP experiences and evolution. *Communications of the ACM*, 43 (4), 22-26.
- Kumar, V., Maheshwari, B. et al. (2002a). Enterprise resource planning systems adoption process: a survey of Canadian organizations. *International Journal of Production Research*, 40 (3), 509-523.
- Kumar, V., Maheshwari, B. et al. (2002b). ERP systems implementation: Best practices in Canadian government organizations. *Government Information Quarterly*, 19 (2), 147-172.

- Kumar, V., Maheshwari, B. et al. (2003). An investigation of critical management issues in ERP implementation: empirical evidence from Canadian organizations. *Technovation*, 23 (10), 793-807.
- Legare, T.L. (2002). The role of organizational factors in realizing ERP benefits. *Information Systems Management*, 19 (4), 21-42.
- Lengnick-Hall, C.A., Lengnick-Hall, M.L. et al. (2004). The role of social and intellectual capital in achieving competitive advantage through enterprise resource planning (ERP) systems. *Journal of Engineering and Technology Management*, 21 (4), 307-330.
- Liang, H.G., Saraf, N. et al. (2007). Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management. *MIS Quarterly*, 31 (1), 59-87.
- Ma, X.F. and Loeh, H. (2007). Closing the gap: How should Chinese companies build the capabilities to implement ERP-driven process innovation? *International Journal of Technology Management*, 39 (3-4), 380-395.
- McAdam, R. and Galloway, A. (2005). Enterprise resource planning and organisational innovation: a management perspective. *Industrial Management & Data Systems*, 105 (3-4), 280-290.
- Park, J.H., Suh, H.J. et al. (2007). Perceived absorptive capacity of individual users in performance of Enterprise Resource Planning (ERP) usage: The case for Korean firms. *Information & Management*, 44 (3), 300-312.
- Peslak, A.R. (2006). Enterprise resource planning success: An exploratory study of the financial executive perspective. *Industrial Management & Data Systems*, 106 (9), 1288-1303.
- Peslak, A.R. and Subramanian, G.H. et al (2007). The phases of ERP software implementation and maintenance: A model for predicting preferred ERP use. *Journal of Computer Information Systems*, 48 (2), 25-33.
- Rajagopal, P. (2002). An innovation-diffusion view of implementation of enterprise resource planning (ERP) systems and development of a research model. *Information & Management*, 40 (2), 87-114.
- Shepherd, C. (2006). Constructing enterprise resource planning: A thoroughgoing interpretivist perspective on technological change. *Journal of Occupational and Organizational Psychology*, 79, 357-376.
- Siau, K. and Messersmith, J. (2003). Analyzing ERP implementation at a public university using the innovation strategy model. *International Journal of Human-Computer Interaction*, 16 (1), 57-80.
- Somers, T.M. and Nelson, K.G. (2004). A taxonomy of players and activities across the ERP project life cycle. *Information & Management*, 41 (3), 257-278.
- Srivardhana, T. and Pawlowski, S.D. (2007). ERP systems as an enabler of sustained business process innovation: A knowledge-based view. *Journal of Strategic Information Systems*, 16 (1), 51-69.
- Stratman, J.K. and Roth, A.V. (2002). Enterprise resource planning (ERP) competence constructs: Two-stage multi-item scale development and validation. *Decision Sciences*, 33 (4), 601-628.
- Swanson, E.B. and Wang, P. (2005). Knowing why and how to innovate with packaged business software. *Journal of Information Technology*, 20 (1), 20-31.
- Trott, P. and Hoecht, A. (2004). Enterprise resource planning and the price of efficiency: The trade off between business efficiency and the innovative capability of firms. *Technology Analysis & Strategic Management*, 16 (3), 367-379.
- Van Everdingen, Y.M. and Waarts, E. (2003). The effect of national culture on the adoption of innovations. *Marketing Letters*, 14 (3), 217-232.
- Wang, E.T.G., Lin, C.C.L. et al. (2007). Improving enterprise resource planning (ERP) fit to organizational process through knowledge transfer. *International Journal of Information Management*, 27 (3), 200-212.
- Wang, E.T.G., Ying, T.C. et al. (2006). Group cohesion in organizational innovation: An empirical examination of ERP implementation. *Information and Software Technology*, 48 (4), 235-244.
- Watanabe, C. and Hobo, M. (2004a). Co-evolution between internal motivation and external expectation as a source of firm self-propagating function creation. *Technovation*, 24 (2), 109-120.
- Watanabe, C. and Hobo, M. (2004b). Creating a firm self-propagating function for advanced innovation-oriented projects: lessons from ERP. *Technovation*, 24 (6), 467-481.
- Wu, J.H., Wang, Y.M. et al. (2005). An empirical study on ERP-driven innovation in Taiwan. *International Journal of Technology Management*, 30 (1-2), 32-48.
- Waarts, E., van Everdingen, Y.M. et al. (2002). The dynamics of factors affecting the adoption of innovations. *Journal of Product Innovation Management*, 19 (6), 412-423.