

CRITICAL SUCCESS FACTORS IN ERP INFOR SYSTEM IMPLEMENTATION AT PT. BALRICH LOGISTICS

Aries Susanty, Fernando

Universitas Diponegoro, Association of Supply Chain Indonesia

ariessusanty@gmail.com; Fernando@yahoo.com

Abstract. Enterprise Resource Planning (ERP) systems have become vital strategic tools in today's competitive business environment. This research attempts to identify the most ERP Critical Success Factors (CSF) from some literature which is suitable for PT. Balrich Logistics and to measure impact of each factor in order to have a better understanding and a clearer picture of the factors that are considered to be vital for a successful ERP INFOR implementation at PT. Balrich Logistics. The sample of this research consisted of the user who implemented ERP systems. Data collected through a questionnaire which distribution to 80 people. Research carried out by using Structural Equation Modeling (SEM) which was run by AMOS Program. The results of this research showed that vendor support is the vital variable for supporting the successful implementation of ERP systems, and then followed by other variables sorted by score from highest to lowest, namely: top management support, education and training, suitability of software and hardware with company need, and the last one is effective project management. Theoretical implications and suggestions for the company from this study have been elaborated at the end of this study

Keywords: ERP, Top Management, Project Management, Software and Hardware, Education and Training, Vendor, SEM

INTRODUCTION

Enterprise Resource Planning (ERP), a business integration approach, has been widely deployed in various kinds of organizations since it was first defined by the Gartner Group in 1990 as the next generation of Manufacturing Business System and Manufacturing Resource Planning software. Today, ERP is considered to be "the price of entry for running a business" (Kumar and van Hillegersberg, 2000). ERP systems are expensive, and once ERP systems are implemented successfully, the system has been shown to be able to provide significant improvements in efficiency, productivity and service quality, and to lead to a reduction in service costs as well as to more effective decision-making (Ngai et al, 2008). However, the implementation of ERP is a complex exercise, and many adopters have encountered problems in different phases (Markus et al, 2000 and Xue et al, 2005). The successful implementation rate is low and many firms that have gained some benefits from ERP have yet to exploit the full potential of ERP in their organizations. According to Martin in the year 1998, about 90 percent of ERP implementations are late or over budget and ERP implementation success rate is only about 33% (Zang et al, 2002). In order to reduce the failure rate of ERP implementation, a number of studies have attempted to identify the critical success factors (CSFs) in the implementation of ERP. Bullen and Rockart (1986) have defined CSF as the limited number of areas

in which satisfactory results will ensure successful competitive performance for the individual, department, or organization. CSFs are the few key areas where “things must go right” for the business to flourish and for the manager’s goals to be attained. CSFs for ERP implementation bring a concept that helps an organization identify the critical issues that affect the process of implementation.

Related to implementation of ERP systems, PT Balrich Logistics bought ERP INFOR in June 2011. Preparation process in implementing an ERP system to go live done for four months. The ERP INFOR system successfully live on October 2011 and in the beginning, the ERP INFOR system only used module for five departments. Since INFOR ERP system is implemented, each department in the company and the customer experience significant positive changes, ie.: system quality becomes much easier to be used and the data produced more accurate information; quality information can generate data more quickly and reliably; service quality which is supported by the vendor to be more reliable and the vendor shows his concern for the problems which was raised during implementation. Other advantages are perceived by the company is net profit and productivity increasing as a result of decreasing operating costs and cycle time of the employee's activities.

Under the conditions experienced by PT. Balrich Logistics and previous research which stated that there were a number of critical factors which have contributed to the successful implementation of the ERP system, this research aims to identify the most critical success factors of ERP from some literature which is suitable for PT. Balrich Logistics and to measure impact of each factor. Specifically, based on Yingjie (2005) research and the conditions experienced by PT. Balrich Logistics, there are five key success factors which are estimated to have an influence on the successful implementation of the ERP INFOR system at PT. Balrich Logistics, namely: top management support, effective project management, suitability of software and hardware, education and training, and vendor support. Based on that, this study intends to answer the following four research questions. (1) Does top management support give a significant positive effect on the successful implementation of the ERP INFOR system at PT. Balrich Logistics? (2) Does effective project management give a significant positive effect on the successful implementation of the ERP INFOR system at PT. Balrich Logistics? (3) Does suitability of software and hardware, give a significant positive effect on the successful implementation of the ERP INFOR system at PT. Balrich Logistics? (4) Does education and training give a significant positive effect on the successful implementation of the ERP INFOR system at PT. Balrich Logistics? (5) Does the vendor support give a significant positive effect on the successful implementation of the ERP INFOR system at PT. Balrich Logistics?

LITERATURE REVIEW

The History of ERP System. The history of ERP starts in the 1960’s with a Material Requirements Planning (MRP) system for inventory control. These systems were very large, ungainly and expensive all to the end of the 1970’s. In the beginning of the 1980’s, financial and administrative areas were brought into the MRP systems, which thereby changed to a more corporate financial

accounting system and was renamed to MRP-II. Later in the 80's a Human Resource Management system was developed and the systems were also beginning to be developed for PC (Stjernström, 2003). In the beginning of the 1990's MRP-II was extended to cover areas like Engineering, Finance, Human Resources and Project Management and the term ERP system was created (Umble et al, 2003 and Esteves and Pastor, 2001).

Several research studies have identified various important benefits the ERP systems brings to organizations. O'Leary (2000) stated that an ERP system integrates the majority of the business processes and allows access to the data in real time. Furthermore, ERP improves the performance level of a supply chain by helping to reduce cycle times (Gardiner et al., 2002).

Despite the potential benefits discussed above, however, ERP systems also have a number of drawbacks. For example, most ERP systems tend to be large, complicated, and expensive. Moreover, ERP implementation requires an enormous time commitment from an organization's information technology department or outside professionals. In addition, because ERP systems affected most major departments in a company, they tended to create changes in many business processes (Al-Fawaz, et al, 2008).

CSF for Implementation of ERP. Many ERP research studies have determined several CSF in ERP implementations. Table 1 presents the main CSF in ERP system implementation which revealed from the literature review from 2000 until 2004.

Table 1. The Main CSF in ERP System Implementation 2004

Critical Success Factor	References
Top management support	Al-Mashari et al (2003); Umble et al (2003); Zhang et al (2003)
Business plan and vision	Loh and Koh (2004); Schwalbe (2000); Somers and Nelson (2004); Nah (2003)
Re-engineering business process	Davidson (2002); Hammer and Champy (2001); Somers and Nelson (2004); Nah (2003); Murray and Coffin (2001)
Effective project management	Somer and Nelson (2004); Loh and Koh (2004); Zhang et al (2002)
Team work and composition	Loh and Koh (2004); Nah (2003); Rosano (2000)
ERP system selection	Wei and Wang (2004); Shehab et al., (2004); Everdingen <i>et al.</i> (2000); Sprott (2000)
User involvement	Esteves et al., (2003); Zhang et al (2002)
Education and training	Woo, (2007); Nah et al, (2003); Zhang et al (2002)

Source: Al-Fawaz et al (2008)

In 2005, Yingjie proposed conceptual research model of ERP implementation success in China. Yingjie classified the the CSF factors of ERP implementation success in five categories: organizational environments, person's characteristics, technical problems, ERP vendor commitment, and cultural impact (see Figure 1)

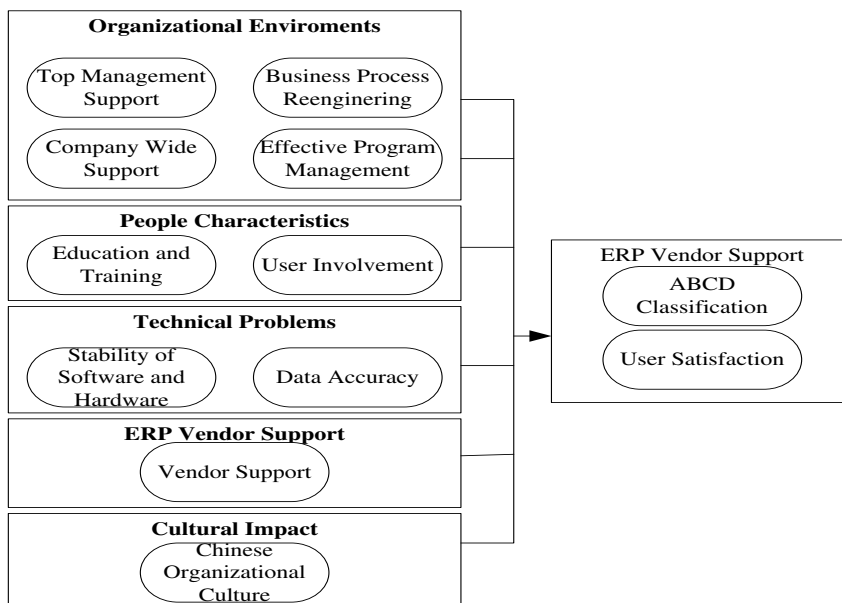


Figure 1. Model of ERP Implementation from Yingjie, 2005

Top management support belongs to strategic factors; effective project management, reengineering business processes, and suitability of software and hardware belong to tactical factors; and educational and training and user involvement belong to operational factor (Yingjie, 2005)

METHODOLOGY

Conceptual model of the research and hypothesis. Related to the conditions experienced by PT. Balrich Logistics, this research proposed the conceptual model which is simpler than a model of ERP implementation from Yingjie (2005). The conceptual model of this research can be seen in **Figure 2**.

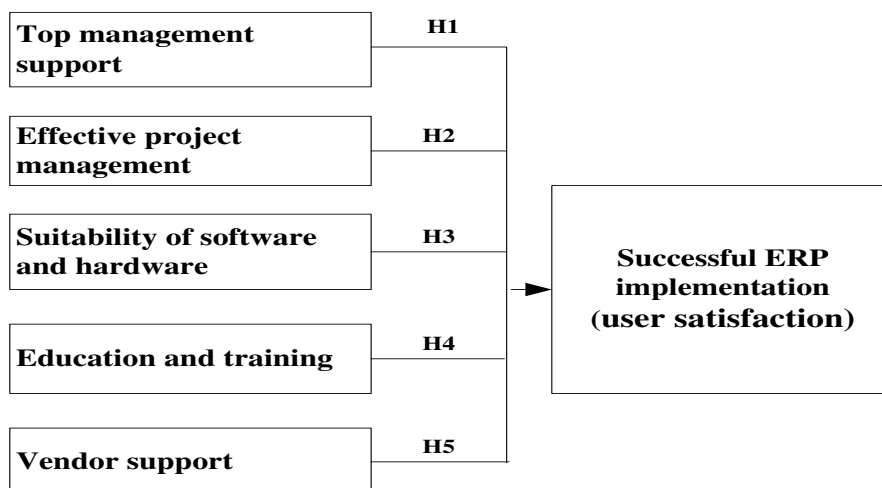


Figure 2. Conceptual Model of the Research

Top management support. The commitment of top management should be emphasized throughout an organization. In particular, no more important factor

than the support of the management is critical in the project's life (Yingjie, 2005). Top management support' has been the most frequently cited CSF for ERP implementation (Ngai et al, 2007). Many studies have stressed the importance of top management support as a necessary ingredient in successful ERP implementation. Top management support in ERP implementation has two main aspects: providing leadership and providing the necessary resources (Zhang et al, 2002). The ERP project must receive approval and support from top management before it can be implemented. Top management must be willing to become involved and to allocate valuable resources to the implementation effort (Holland et al, 1999).

Thus, we get the following hypothesis: **Top management support had a significant positive effect on the successful implementation of the ERP INFOR system**

Effective project management. A project ERP systems implementation is a set of complex activities, involving all business functions and often requiring between 1 and 2 years of effort, thus companies should have an effective project management strategy to control the implementation process, avoiding overrun of budget and ensuring implementation on schedule. At least, there are five major parts of project management, i.e: having a formal implementation plan, having a realistic time frame, having periodic project status meetings, having an effective project leader who is also a champion, and having project team members who are stakeholders (Zang et al, 2005). Based on this condition, we get the following hypothesis: **Effective project management had a significant positive effect on the successful implementation of the ERP INFOR system**

Suitability of software and hardware. There are two aspects should be cared when selecting software and hardware (Zhang et al, 2003), namely compatibility of software/hardware and the company's needs, and ease of customization. This is because ERP vendors use different hardware platforms, databases, and operating systems. Certain ERP packages are only compatible with some companies' databases and operation systems. Thus, companies should conduct requirements analysis first to make sure which problems need to be solved and select the ERP systems that most fit their requirements. The hardware is then selected according to the specific ERP system requirements. Besides that, ERP packages provide generic off-the-shelf business and software solutions to customers. More or less they cannot fully meet the company's needs, especially when the business processes of the company are unique. Thus, customizing the ERP system to fit the company's needs is necessary. It is important for the company to choose those ERP systems that are easy to customize so that the cost and time consumed in the customization can be reduced as much as possible. Moreover, upgrade of the ERP system is necessary caused the technical advance results occur continuously (Zhang, 2005). Based on this condition, we get the following hypothesis: **Suitability of software and hardware had a significant positive effect on the successful implementation of the ERP INFOR system.**

Education and training. When the ERP system is up and running, it is very important that the users are capable to use it, hence they should be aware of the

ERP logic and concepts and should be familiar with the system's features (Yingjie, 2005) Outside consultants/trainers have more experience of implementing ERP systems and they can help users to understand the expertise of specific ERP systems. While in-house training is more effective in combining specific ERP system features with actual operational issues in the company (Zhang et al, 2005). Thus, we get the following hypothesis: **Education and training had a significant positive effect on the successful implementation of the ERP INFOR system**

Vendor support. It is important to get the vendor support. Management needs to ask questions about the vendor, such as its market focus (for example, midsize or large organization), track record with customers, vision for the future, and with whom the vendor is strategically aligned (Zhang et al, 2005). This because, today's vendors can supply very complex software packages like the above SAP R/3 package, while the off-the-shelf systems cannot meet the company's requirements fully, especially when the company's business process itself is unique. Some vendors provide very specific solutions to niche industries based on the characteristics of the operations environment (i.e. process and business) and enterprise size. For instance, an ERP vendor can offer decision support functionality for supply, manufacturing, and distribution planning at all enterprise levels. Most vendors will also offer add-ons. The implementing firm can forego the functionality of standard ERP and change to a new function, one developed either in-house or procured from third party software vendors (Yangjie, 2005). Thus, we get the following hypothesis: **Vendor support had a significant positive effect on the successful implementation of the ERP INFOR system**

Successful ERP implementation. In order to measure ERP implementation success, this research was using one indicator of the dependent variable, namely user satisfaction. User satisfaction was a widely accepted measure until now, since it is more obvious and direct (Yingjie, 2005). According to Delone and McLean in year 1992, user satisfaction describes the receipt response to the use of the product of an Information System (Zhang et al, 2005). Same with study that conduct by Zhang et al (2005), in this study, user satisfaction is adapted as the receipt response to the implementation and use of a certain ERP system.

Data Gathering. Questionnaire survey method was selected following the previous study to evaluate the importance of the CSFs that have been found through literature review. The questionnaire is focused on the importance of critical success factors that clarified from literature review and adjusted by the company condition. The questionnaire is also focused on user satisfaction of the implemented ERP system. It identifies the respondents' perception of the importance of CSFs in the ERP implementation process and their satisfaction of implementation of ERP system. For each of the factors of CSF and user satisfaction of implementation of an ERP system, a number of elements or statements were formulated through the definition and description of each one in the literature. The respondents were asked to rate the degree of importance of each CSFs in ERP implementation and user satisfaction of implementation of ERP system based on a 5-level Likert scale. The target respondent was the chief

information officer (CIO), the director of MIS, IT Manager or any person responsible for ERP INFOR System since they are directly involved in ERP system. Totally, there were 80 respondents.

Research Method. Research carried out by using Structural Equation Modeling (SEM) which was run by AMOS Program. SEM permits complicated variable relationships to be expressed through hierarchical or non-hierarchical, recursive or non-recursive structural equations, to present a more complete picture of the entire model (Bullock et al., 1994). Thus, in SEM, factor analysis and hypotheses are tested in the same analysis. SEM techniques also provide fuller information about the extent to which the research model is supported by the data than in regression techniques (Gefen, 2000).

RESULT AND DISCUSSION

Six criteria in this study were used to test the fit of this model (as summarized in table 2). The first and second criteria were the GFI (goodness-of-fit index) and AGFI (adjusted goodness-of-fit index). The values of those two indices should be greater than 0.9. The third was CFI (comparative fit index), which should be greater than 0.95. The fourth was the RMSEA (root mean square error of approximation). The RMSEA is acceptable when the value is less than 0.08 (Lee, Lee and Wu, 2010). The fifth was the Tucker-Lewis Index (TLI) which was stated by Tucker and Lewin, 1973; better known as the Non-Normed Fit Index or NNFI, and the Normed Fit Index or NFI. If the model fits perfectly, the fit indices should have the value 1. Usually, a value of at least 0.90 is required to accept a model, while a value of at least 0.95 is required to judge the model fit as 'good' (Hox and Bechger, 1998). The last criteria was chi-square fit index divided by degrees of freedom (CMIN/DF). In the range of 2 to 1 or 3 to 1 indicate acceptable fit between the hypothetical model and the sample data (Carmines and McIver, 1981).

Table 2. Result of GOF Measures

Goodness of Fit (GOF) Measure	Criterion	Conceptual Model	Result
GFI	>0.90	0.961	Good
AGFI	>0.90	0.919	Good
CFI	>0.95	0.991	Good
RMSEA	<0.08	0.024	Good
TLI	≥0.95	0.989	Good
CMIN / DF	$1.00 \leq \text{CMIN/DF} \leq 2.00$	1.070	Good

The results of measurements of goodness of fit showed that the conceptual model which formulated in this study was a good model. This conceptual model had a significant level amount to 0.221 and this model also had measurement index TLI, CFI, CMIN/DF, GFI, AGFI and RMSEA within the expected range of values.

The results of analysis about the direct effects between model path coefficients and variables can be seen in Table 3: (i) top management support has a significant positive effect on successful implementation of the ERP INFOR

system ($\beta = 0.241$, $p < 0.05$), so hypothesis 1 was supported; (ii) effective project management had a significant positive effect on the successful implementation of the ERP INFOR system ($\beta = 0.164$, $p < 0.05$), so hypothesis 2 was supported; (iii) suitability of software and hardware had a significant positive effect on the successful implementation of the ERP INFOR system ($\beta = 0.197$, $p < 0.05$), so hypothesis 3 was supported; (iv) education and training had a significant positive influence effect on the successful implementation of the ERP INFOR system ($\beta = 0.204$, $p < 0.05$); so hypothesis 4 was supported; and (v) vendor support had a significant positive effect on the successful implementation of the ERP INFOR system ($\beta = 0.224$, $p < 0.05$); so hypothesis 5 was supported.

Table 3. Regression Weight for SEM Analysis

Hyphothesis	Estimate	Std	S.E.	C.R.	P
Top management support → successful implementation of the ERP INFOR system	0.241	0.212	0.121	2.183	0.047
Effective project management → successful implementation of the ERP INFOR system	0.164	0.160	0.079	2.019	0.037
Suitability of software and hardware → successful implementation of the ERP INFOR system	0.197	0.199	0.097	2.027	0.043
Education and training → successful implementation of the ERP INFOR system	0.204	0.192	0.101	2.031	0.042
Vendor support → successful implementation of the ERP INFOR system	0.224	0.232	0.111	2.018	0.044

These results which showed in Table 3 were consistent with the literature that explains such a positive relationship between top management support, effective project management, suitability of software and hardware, education and training, and vendor support with successful implementation of the ERP system. The empirical data shows that vendor support is the most important factor for successful implementation of the ERP INFOR system, and the followed by another variable sorted by score from highest to lowest, i.e.: top management support, education and training, suitability of software and hardware with company need, and the last one is effective project management. Vendor support had a positive influence on the success of an ERP implementation, especially in relation to the speed of the response given by the vendor when problems occurred during implementation of ERP system. In this case, the vendor is expected to assist in the work of running the ERP system by the company. The vendor is also expected to provide qualified external consultants, who not only mastered the technology of ERP systems but also understand the business processes of the company.

CONCLUSION

Enterprise resource planning systems have experienced a phenomenal growth over the past decade. While some firms declared their ERP implementation success, many others reported negative results with the implementation of ERP systems. Based on this phenomenon, understanding and identifying the CSFs are essential to increasing the chances of a successful implementation of ERP because factors affecting ERP implementation are complex and abundant. This study aims to identify and evaluate the CSFs affecting ERP implementation in PT. Balrich Logistic. A total of 5 critical success factors for ERP implementation have been identified, based on a review of the ERP literature and condition of PT. Balrich Logistics. Based on the survey's empirical data, the two factors of "Vendor support" and "Top management support" have been shown to be the extremely important factors for ERP implementation in PT. Balrich Logistics. However, due to the small sample size and the study only conducted in one company, there are some limitations in the generalizations of the research results. It would be ideal if more company involved in this study from one sector or more. The case study protocol could be used to study different ERP package implementation to examine variations between different ERP systems and vendors

REFERENCES

- Al-Fawaz, K., Al-Salti, Z., and Eldabi, T. (2008). Critical Success Factors in ERP Implementation: a Review. *Proceeding of European and Mediterranean Conference on Information Systems*, Dubai.
- Bullen, C.V. and Rockart, J.F. (1986). "A Primer on Critical Success Factors". In Bullen, C. V. and Rockart, J. F. (ed.). *The Rise of Managerial Computing: The Best of the Center for Information System Research*, Homewood, Illinois: Dow Jones-Irwin, pp. 383-423.
- Bullock, H. E., L. L. Harlow, and S. A. Mulaik. (1994). "Causation Issues in Structural Equation Modeling Research." *Structured Equation Modeling*, Vol. 1, No.3, pp. 253-267.
- Carmines, E., and McIver, J. (1981). "Analyzing Models with Unobserved Variables: Analysis of Covariance Structure." In G. Bohrnstedt & E. Borgatta (Eds.), *Social measurement: Current issues*. Beverly Hill, CA: Sage.
- Esteves, J. and Pastor, J. (2001). "Enterprise Resource Planning Systems Research: an Annotated Bibliography." *Communications of the Association for Information Systems*, Vol 7, Article 8.
- Gardiner, S.C., Hanna, J.B. and LaTour, M.S. (2002). "ERP and the Re-engineering of Industrial Marketing Processes: a Prescriptive Overview for the New-age Marketing Manager". *Industrial Marketing Management*, Vol. 31, pp. 357-365.
- Gefen, D., Straub, D., and Boudreau, M.C. (2000) "Structural Equation Modeling and Regression: Guidelines for Research Practice." *Communications of the Association for Information Systems*, Vol. 4, Article 7.

- Holland, P., Light, B. and Gibson, N. (1999), "A Critical Success Factors Model for Enterprise Resource Planning Implementation." *Proceedings of the 7th European Conference on Information Systems*, Copenhagen, Vol 1, pp. 273-97
- Hox, J.J. and Bechger, T.M. (1998). "An Introduction to Structural Equation Modeling." *Family Science Review*, Vol. 11, No.4, pp. 11:354-373. <http://joophox.net/publist/semfamre.pdf>
- Kumar, K. and van Hillegersberg, J. (2000). "ERP Experiences and Evolution." *Communications of the ACM*, Vol. 43, No. 4, pp. 23 - 26.
- Lee, F., Lee, T., and Wu, W. (2010). "The relationship between Human Resource Management Practices, Business Strategy and Firm Performance: Evidence from Steel Industry in Taiwan." *The International Journal of Human Resource Management*, Vol.21, No.9, pp. 1351–1372
- Markus, M., Axline, S., Petrie, D., and Tanis, C. (2002). "Learning from Adopters' Experiences with ERP: Problems Encountered and Success Achieved." *Journal of Information Technology*, Vol. 15, pp. 245–265.
- Ngai, E.W.T., Law, C.C.H., and Wat, F.K.T. (2008). "Examining the Critical Success Factors in the Adoption of Enterprise Resource Planning." *Computer in Industry*, Vol.59, No. 6, pp 548–564.
- O'Leary, D. (2000). *Enterprise Resource Planning Systems: Systems, Life Cycle, Electronic Commerce, and Risk*, New York: Cambridge University Press.
- Stjernström, L.(2003). "Chaos and Complexity in ERP Implementations- a Literature Review of Critical Success Factors within ERP Implementation or Adoption." *Proceeding of NFF Conference*, Reykiavik.
- Umble, E., J., Haft, R., R., and Umble M., M. (2003). "Enterprise Resource Planning: Implementation Procedures and Critical Success Factors." *European Journal of Operational Research*, Vol. 146, No.2, pp. 241-257.
- Xue, Y., Liang, H., Boulton, W., and Snyder, C. (2005). "ERP Implementation Failures in China: Case Studies with Implications for ERP Vendors." *International Journal of Production Economics*, Vol. 97, pp. 279–295.
- Yingjie, J. (2005). "Critical Success Factors in ERP Implementation in Finland." *M.Sc. Thesis In Accounting*, The Swedish School of Economics and Business Administration, Swedish.
- Zhang, L., Lee, M.K.O., Zhang, Z., and Banerjee, P. (2003). "Critical Success Factors of Enterprise Resource Planning Systems Implementation Success in China." *Proceedings of the 36th Hawaii International Conference on System Sciences (HICSS'03)*, USA.
- Zhang, Z., Lee, M.K.O., Huang, P., Zhang, L. and Huang, X. (2005). "A Framework of ERP Systems Implementation Success in China: an Empirical Study." *Int. J. Production Economics*, Vol. 98, pp. 56–80.