Actual vs. Planned ERP Systems Implementation Costs in European SMEs

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Abstract: Enterprise resource planning (ERP) systems have become more and more common in enterprises, not only in large enterprises but also in small and medium-sized enterprises (SMEs). Although virtually nobody really doubts their importance for running a business, some even consider ERP systems to be a de facto price of entry for running a business, as there is sentiment regarding their implementation – both in terms of time and money. The question asked in this paper is to what extent ERP system implementation costs exceed planned costs in SMEs within a European context that is characterized by, for instance, fixed price policy. Our literature review suggests lack of empirical research in this field as such, and especially in SMEs in the European context (as opposed to the North American). The questionnaire research which focused on this issue was conducted in Denmark, Slovakia and Slovenia. The dependent variable was a percentage of actual ERP system implementation costs vis-à-vis the planned ones. The independent variables were country, company size, information strategy, and representation of the IT department on board level. According to the collected data, companies with information strategy were more likely to stay on budget. It seems that SMEs in all countries did not have extra resources for unplanned ERP system-related expenditures, as it might have been the case in large enterprises. Although surprising that representation of the IT department on board level did not automatically result in fewer overruns, it may be argued that, for example, CIOs were likely not only to manage implementation projects better, but were also able to request additional funds for unplanned customizations or training. Overall, 74.2% of companies stayed on budget, and on average, companies spent 104.3% of what they originally planned to spend. These results suggest a higher success rate in European SMEs than in American ones surveyed by Standish Group.

Keywords: Enterprise resource planning (ERP) system, implementation costs, empirical research

1. Introduction

Enterprise resource planning (ERP) systems are an integrated set of programs that provides support for core business processes, such as production, input and output logistics, finance and accounting, sales and marketing, and human resources. An ERP system helps different parts of an organization to share data and information to reduce costs and to improve management of business processes (Aladwani, 2001). Wier, Hunton, and HassabElnaby (2007) argue that ERP systems aim to integrate business processes and ICT into a synchronized suite of procedures, applications and metrics which transcends firms' boundaries.

ERP systems used to be the domain of large companies, but there is an increasing number of small and medium-sized enterprises (SMEs) adopting them as well. There are some reasons for this trend, including a saturation of the market, as most large organizations have already implemented an ERP system, increasing the possibility and need for the integration of systems between organizations and the availability of relatively inexpensive hardware (Gable, 1999).

Although virtually no really doubts their importance for running a business, there is sentiment regarding ERP implementation – both in terms of time and money. According to the current Standish Group report on ERP implementation projects (Standish Group, 2005), the actual cost of projects was, on average, 214% of what small companies planned, and 182% of what medium companies planned; it took 2.39 times longer than what small companies intended, and 2.02 times longer than what medium companies intended. Although, for example, Standish Group focuses on both factors – time and money, we focus only on the latter in this paper.

Our research question is to what extent the actual costs for the ERP system implementation exceed planned costs for the ERP systems implementation in SMEs. It can be stated that cost of implementation is a major part of total cost of ownership (TCO) for ERP systems, and therefore it is important to know how large the disparity is between actual and planned total cost of implementation of ERP systems. It is also of interest to explore what influences actual costs for implementation. This paper aims at investigating the four factors: country, company size, CIO, and information strategy and from that investigation build up a foundation for future studies on the question of what influences implementation costs for ERP systems. The study in this paper can be seen as an explanatory study, conducted

as a questionnaire study among organizations that had implemented ERP systems. The study further aims to extend existing research by investigating some contextual factors in relation to ERP systems implementation costs.

The rest of the paper is organized as follows. The next section reports a literature study on ERP implementation with a specific focus on ERP implementation costs. This is followed by a description of the research method and how data were collected and analyzed. The fourth section then presents the results of the analysis regarding relationships between the variables, whether the organizations stayed on budget or not, and what percentage they spent on implementation related to the budget. The paper ends with a discussion of limitations, and offers suggestions for future research and conclusions drawn from this explanatory research.

2. ERP systems implementation

Seewald (2002) states that ERP systems have been and will remain the biggest segment of organizational IT budget allocation. This statement builds on an investigation made by AMR research in which organizations cite improved productivity, customer demands, increased speed, competitive advantage, and cost reduction as primary reasons for implementing ERP systems. There is at least one interesting remark that can be made from these reported reasons which is that organizations expect cost reduction when implementing ERP systems. This can be related to the total cost of ownership (TCO) and the interesting fact that TCO for ERP systems can be huge. We also know that a major party of TCO is related to implementation costs. ERP systems implementation costs can be related to overall IT project failures; for instance, Cunningham (1999) refers to the Standish Group International study from 1998 which indicates that only about 25 percent of the projects were completed on time and on budget. The same study shows that 45 percent were late or over budget and 30 percent were abandoned, scaled back, or modified (Cunningham, 1999). The author claims that there are four behavioral reasons for why IT projects fail: the Candy Store, the Crusader, Death by analysis, and Do it Now. According to Cunningham, IT projects most often start with identifying available options, such as find out “what the candy store offers,” and then when that is done the crusader becomes enamored with a specific technology and starts the “battle of convincing others.” Another starting point is problem oriented, and according to Cunningham, what happens is that problems get analyzed and reanalyzed to the extent that nothing is clear at the end. Finally, management issues an edict, “Do it Now,” which then creates an emergent decision that produces emergency results, which are seldom satisfactory.

The suggestion that Cunningham gives for solving the IT project failure case is to a large extent related to management issues. Management issues in IT projects have been investigated by Sumner, Bock and Giamartino (2006) who purport that characteristics between IT project leaders and project success show a significant relationship. They found a relationship between actual/planned project duration and the five leadership practices that the project leaders observed. They also reported a relationship between project time and project cost, expressed as “the longer a project takes, the more will it cost.”

Mabert et al. (2003) state that organizations have found that complex software implementations, such as ERP systems implementations, are just the tip of the iceberg, and that a successful implementation involves more than having sophisticated software and advanced computing technologies. They also claim that although the relationship between structural variables, such as size of organization, industry type and organizational structure, have been studied extensively in many areas, they have not been considered from the perspective of ERP systems implementation. From the results of their study, Mabert et al. claim that cost breakdowns show differences across organizations of various sizes, that is, cost of software in smaller organizations was higher as a percentage of overall costs than in medium and large organizations. They also purport that implementation costs differ among different sizes of organizations because, at least in their study, all large organizations had specific ERP implementation teams.

There is a lot of research on critical success factors and failures in ERP implementations (Kumar, Maheshwari, & Kumar, 2003; Markus, 2000), a dominant factor of which is described as support from top management (Willcocks & Sykes, 2000); another is organizational culture described by Scott and Vessey (2002) as a need for having an open culture which promotes communication. Mabert et al. (2003) suggest that large organizations to a higher extent implement ERP systems as an incremental approach by phasing in the system, while smaller organizations more often use a big-bang approach.

ERP systems implementation is alleged by Huang and Palvia (2001) to be affected by two broad factors: national/environmental and organizational/internal factors. What they suggest is that there are five variables in each one of the factors. The variables they suggest are the following: economy and economic growth, infrastructure, IT maturity, computer culture, business size, business process reengineering (BPR) experience, manufacturing strengths, government regulations, management commitment, and regional environment. We, however, would suggest that some of the variables belong to both factors of national/environmental and organizational/internal. It can be concluded that some of these are more or less related to country, which we have as one factor when analyzing whether ERP systems implementation costs exceed planned costs.

3. Methodology and data

This explanatory paper is based on a questionnaire survey conducted in Denmark, Slovakia and Slovenia in May and June of 2007. Questionnaire forms accompanied by cover letters were mailed to randomly selected companies. Lists of addresses and information about the number of employees were retrieved from CD-Direct in Denmark, and from respective Statistical Bureaus in Slovakia and Slovenia. In each country, 600 questionnaires were sent to small, and 300 to medium enterprises. The number of questionnaires mailed to small companies was double that sent to medium companies because, in general, small companies constitute the highest proportion of companies, and based on our personal experience, they are less likely to respond. In total, there were 121 responses (11 from Denmark, 61 from Slovakia, and 49 from Slovenia) out of 2700 mailings, i.e., the response rate was 4.5%.

Respondents were asked to answer what the actual total cost of ERP system implementation was – whether it was less than planned, as planned, or more than they had planned. If the total implementation cost did not match the planned one, they were asked the approximate percentage that they actually spent on implementation. There were 62 responses, which compared actual and planned implementation costs, 59 of which provided enough input to calculate the actual percentage. The distribution of the answers provided is presented in Figure 1.

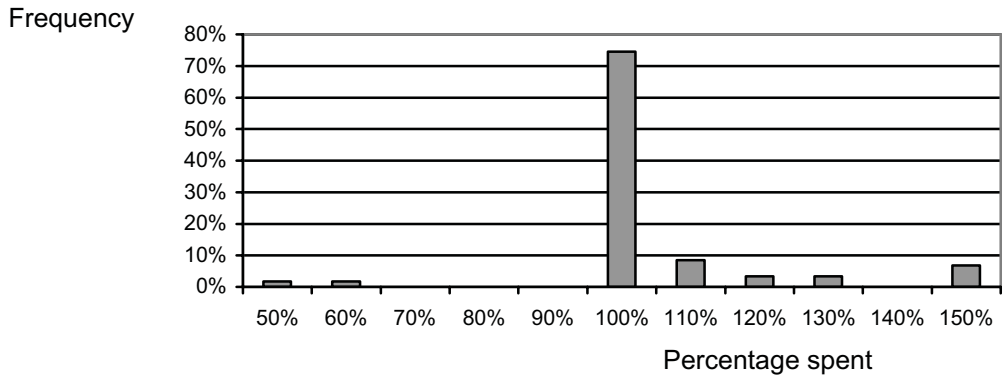

Figure 1: Distribution of actual ERP system implementation cost vis-à-vis planned costs

Independent variables were the country, company size, representation of the IT department on the board level, and information strategy. As the questionnaires were submitted to companies in Denmark, Slovakia and Slovenia, one of the independent variables obviously involved these three countries. In the analysis, we analyzed small and medium sized companies. The definition which we used designated companies with 10 to 49 employees as being small, and companies with 50 to 249 employees as medium-sized enterprises. This definition is consistent with how the European Commission (European Commission, 2003) defines SMEs. Regarding the independent variable, information strategy, it should be understood that the organization has a formal information strategy. Representation of the IT department on the board level indicates that there is a CIO or similar director for IT on the board level, and will therefore be described as CIO in Figures 2-5.

This paper investigates two relationships with the aim of finding if and how the independent variables: country, company size, CIO, and information strategy influence actual ERP system implementation costs, vis-à-vis planned costs. The first relationship looks into how many companies did not exceed their planned budget. As there were only two Slovenian SMEs that spent less than planned, they were

merged with companies which spent exactly the amount that they had planned, since both could be classified as staying on budget. The research model is presented in Figure 2.

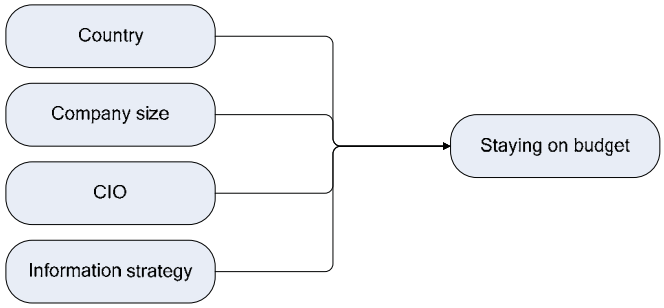

Figure 2: Research model for analyzing relationship regarding staying on budget

The second relationship we investigated focuses on the percentage spent compared to the planned amount. The research model is presented in Figure 3.

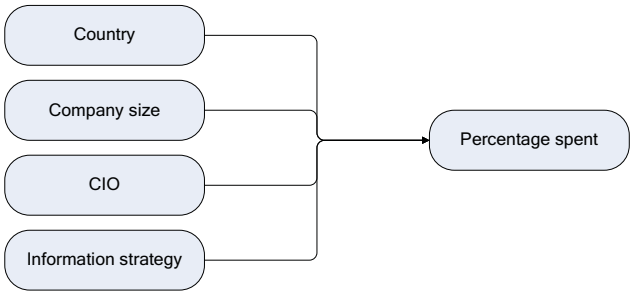

Figure 3: Research model for analyzing relationship regarding percentage spent

Further, logistic regression was used for analysis of the relationship regarding staying on budget, and analysis of variance (ANOVA) for analysis of the relationship regarding percentage spent. The multivariate approach was also used in both cases. Additionally, binomial test was used to test if there was a significant difference between the percentage of companies that stayed on budget and 50%. Tukey-Kramer multiple-comparison test was used to identify differences between individual instances of independent variables. T-test and Wilcoxon signed-rank test were used to test if companies spending exactly according to plan (i.e., if there was a significant difference between the average ratio of actual ERP system implementation cost vis-à-vis planned costs and 100%). Results of the statistical tests are reported on confidence level $\alpha = 0.05$.

4. Results

Findings about the first relationship are summarized in Figure 4. There is a significant relationship between staying on budget and having a formal information strategy. Companies with a formal information strategy seem to be more likely to stay on budget (88.0%) than companies without an information strategy (64.9 %). Overall, 74.2 % of companies stayed on budget; this percentage is significantly different from 50% (p-value < 0.001), i.e., more than one half of the companies actually managed to stay on budget.

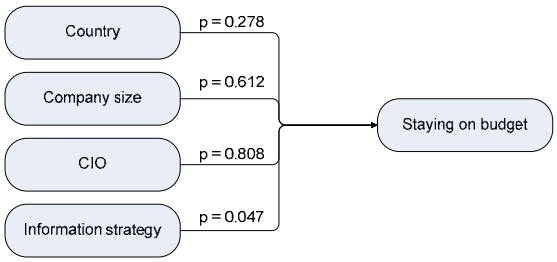

Figure 4: Findings from analyzing the first relationship

When analyzing the second relationship, data were transformed into percentages and these percentages were then analyzed. Findings about the second relationship are summarized in Figure 5.

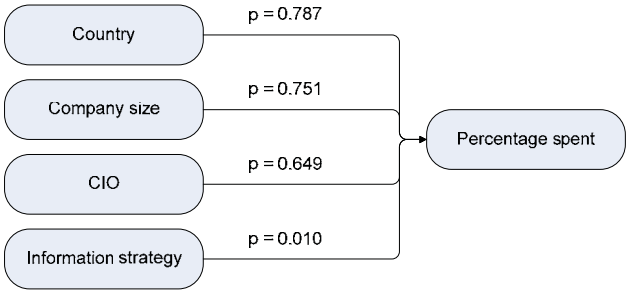

Figure 5: Findings from analyzing the second relationship

ANOVA identified a significant relationship between the percentages of actual spending compared to planned ones and information strategy. Companies with a formal information strategy were less over budget (97.6%) than were companies without one (109.3%). The overall average was 104.3%, indicating a significant difference between the overall average of 104.3% and 100% (no disparity between planned and actual costs). P-value is smaller than 0.001 regardless of whether t-test for difference between mean and value, or Wilcoxon signed-rank test for difference in medians is used.

Based on the results, it can be summarized that SMEs with formal information strategy are likely to spend about 12 percentage points less than companies without information strategy. This suggests that ERP system vendors need to be sensitive to companies without information strategy, since these either have wrong expectations of costs or lack the technical skills that are beneficial for ERP system implementation. However, there are also other explanations that are worth mentioning. First, it is possible that companies with a formal strategy are better at creating budgets. Second, it could also be that they are better at constructing a clearer contract with the implementing partner. Third, it could also be that they have better control over overall costs and thereby are better at calculating the implementation budget. Finally, it is most likely that organizations with a formal information strategy have a clearer view of what they want and therefore do not have so many “surprises” showing up during the implementation.

5. Known limitations and future research

There are two known limitations to this paper, which, for the major part, are inherent in questionnaire surveys – response rate and reliability of data. Usually, there is an average response rate of 10% expected in questionnaire surveys. But a response rate of 80% and less (this is the case in almost all questionnaire surveys) can also lead to biased results. We tried to overcome the problem by sending out 2,700 questionnaires and hoped that the auto selection would not depend on the questions asked. In our opinion, we achieved this since the percentage of companies that were over budget (i.e., ones, which would be more likely to complain about their bad experience) was only 25.8%, i.e., less than 34% (which also included projects going over time) as mentioned in Cunningham (1999); further, surveyed companies were only 4.3% over budget, i.e., much less than 114% for small, and 82% for medium companies, as mentioned in the Standish Group (Standish Group, 2005) report. Regarding the reliability, it was not possible to check this without being allowed to look into accounts and to talk to people who were involved in the implementation and who could provide insights necessary for understanding the accounting data.

Future research should look into what causes additional costs. For example, customization of ERP is a crucial, lengthy, and costly aspect of the implementation of ERP systems (Gefen, 2002). Studies have shown that many organizations exceed their budgets due to the need for more customization than they originally planned (Markus, 2000; Markus, Cornelis, & Paul, 2000; Swan, 1999). Apart from customization, companies often run into higher than expected costs for temporary and overtime labor, re-skilling, and training during the implementation process (Markus, 2000; Markus et al., 2000; Sumner, 2000).

Last but not least, it might be useful to investigate whether additional costs arise because of the misalignment (the gap between the standard version of the ERP system and the organization) or whether costs arise due to spending in order to increase benefits. Investigation of both total costs of ownership and total benefits of ownership might provide a different angle for looking at expenditures.

6. Discussion and conclusions

This section provides a short discussion on each of the factors: country, company size, representation of the IT department on the board level, and information strategy; from this, suggestions are made and conclusions drawn from the research.

When we analyzed the results from the country perspective, we did not discover any significant relationships. One reason for this could be that there definitely were no differences between the three countries from which we took our sample. To some extent, this is surprising, at least when we take into consideration some of the variables that Huang and Palvia (2001) state as influencing ERP implementation. In our view, there is probably a difference between the three countries when it comes to, for instance, government regulations, the economy and economic growth, and management commitment. However, the reasons for not finding any significant influence from the country factor could be that either our sample was too small or that different variables in the country factor overrode each other. From this, we conclude that further research which focuses on a more operational level on cultural differences would be of interest. This could definitely be related to an investigation of cultural differences when it comes to, for instance, leadership styles.

Regarding the relationship between organizational size and exceeding costs for ERP systems implementation, it is surprising that we did not find any significant relationship. Organizational size is described as influencing both complexity and time when it comes to ERP systems implementation. The connection is thus that the bigger the organization, the more complex and more difficult the ERP system implementation will be; it also means that it will be more costly. However, one reason for not finding any significant relationship between organizational size and implementation costs could be that since ERP implementation costs are lower in small organizations, it is possible that the difference between planned and actual costs is also smaller. Another possibility is the fact that it is easier to budget when a project is small. A final possibility is that a large ERP system implementation would be harder to budget and more unexpected circumstances would have the possibility of showing up.

When it comes to the question of the influence of having a CIO or not, Scott and Vessey (2002) opine that an open culture promoting communication is important for ERP systems implementation success. One suggestion for having support from top management in the implementation would be to have representation of the IT department on the board level, described earlier as having a CIO. Surprisingly, we did not find any significant result for having a CIO when it comes to staying on budget or percentage spent in ERP implementation. To some extent, this results confirms what Willcocks and Sykes (2000) describe when they claim that the CIO and the IT function have the responsibility for ERP systems, without having a strong relationship between the two. We would beg to differ. From our result of not finding a significant relationship between the CIO and staying on budget or percentage spent, we conclude that a focus on strengthening the relationship between the CIO, the IT function and business executives is needed.

Finally, when it comes to information strategy and whether the organization has a formalized strategy or not, our results showed that this factor was the only one with a significant relationship between organizations' budgeted costs for ERP system implementation and what they actually spent on the implementation. The findings showed that organizations with a formal IT strategy spent less than did organizations without a formal IT strategy, and that organizations with a formal IT strategy were more likely to stay on budget compared to those that did not have a formal IT strategy. From this we conclude that organizations with a formal IT strategy have a clearer view of their needs when implementing an ERP system, and that their clearer view helps them both in budgeting and controlling the costs in an ERP system implementation project. However, the actual content of such a strategy has not been investigated in this study, an area which would definitely be of interest for future research.

To sum up, although not all companies manage to stay on budget when it comes to ERP system implementation, the situation in the investigated European SMEs is not too critical. It can be evaluated from two points of view. First, about three fourths of the companies still managed to stay on budget. Second, companies exceeded their budgets by only 4.3% on average. A contributing factor for Danish, Slovak and Slovenian companies staying more-or-less on budget is the prevalent fixed price policy for ERP implementation projects in Europe. Thus, the findings might be generalized to the European context, but definitely not to the U.S., where an effort-based pricing policy is prevalent. A formal

information strategy implies more comprehensive planning; accordingly, there should also be smaller discrepancies between plans and reality.

References

Aladwani, A. M. 2001. Change management strategies for successful ERP implementation. *Business Process Management Journal*, 7(3): 266-275.

Cunningham, M. 1999. It's all about the business. *Inform*, 13(3): 84.

European Commission. 2003. SME Definition: Recommendation 2003/361/EC Regarding the SME Definition.

Gable, G. a. S., G. 1999. SAP R/3 implementation issues for small to medium enterprises, *Proceedings of the Fifth America's Conference on Information Systems*: 779-781. Milwaukee, WI, USA.

Gefen, D. 2002. Nurturing clients' trust to encourage engagement success during the customization of ERP systems. *Omega-International Journal of Management Science*, 30(4): 287-299.

Huang, Z., & Palvia, P. 2001. ERP implementation issues in advanced and developing countries. *Business Process Management Journal*, 7(3): 276.

Kumar, V., Maheshwari, B., & Kumar, U. 2003. An investigation of critical management issues in ERP implementation: emperical evidence from Canadian organizations. *Technovation*, 23(10): 793-807.

Mabert, V. A., Soni, A., & Venkataramanan, M. A. 2003. The impact of organization size on enterprise resource planning (ERP) implementations in the US manufacturing sector. *Omega*, 31(3): 235-246.

Markus, M. L., Axline, S., Petrie D. and Tanis, C. 2000. Learning from adopters' experiences with ERP: problems encountered and success achieved. *Journal of Information Technology*, 15(4): 245-265.

Markus, M. L., Cornelis, T., & Paul, C. v. F. 2000. Enterprise resource planning: multisite ERP implementations. *Commun. ACM*, 43(4): 42-46.

Scott, J. E., & Vessey, I. 2002. Managing Risks in Enterprise Systems Implementations. *Communications of the ACM*, 45(4): 74-81.

Seewald, N. 2002. Enterprise resource planning tops manufacturers' IT budgets. *Chemical Week*, 164(35): 34.

Standish Group. 2005. Chaos.

Sumner, M. 2000. Risk factors in enterprise-wide/ERP projects. *Journal of Information Technology*, 15(4): 317-327.

Sumner, M., Bock, D., & Giamartino, G. 2006. Exploring the Linkage between the Characteristics of IT Project Leaders and Project Success. *Information Systems Management*, 23(4): 43.

Swan, J., Newell S. and Robertson, M. 1999. The illusion of 'best practice' in information systems for operations management. *European Journal of Information Systems*, 8(4): 284-293.

Wier, B., Hunton, J. and HassabElnaby, H. R. 2007. Enterprise resource planning systems and non-financial performance incentives: The joint impact on corporate performance. *International Journal of Accounting Information Systems*, 8(3): 165-190.

Willcocks, L. P., & Sykes, R. 2000. Enterprise resource planning: the role of the CIO and it function in ERP. *Commun. ACM*, 43(4): 32-38.