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HOW FACTORS AFFECTING SELECTION OF IMPLEMENTATION APPROACH INFLUENCE ERP SYSTEM IMPLEMENTATION COSTS

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Abstract

Different approaches on how to implement or deploy enterprise resource planning (ERPs) systems exist. Although virtually nobody really doubts importance of ERPs for running a business today, there is a sentiment regarding their implementation – both in terms of time and money. In this paper we investigate relationship between factors influencing selection of a specific implementation approach and companies' ability to stay on budget when implementing ERPs. The question is: whether factors influencing implementation approach then affects to what extent ERP system implementation costs exceed planned costs for implementation. The questionnaire research, focused on this issue, was conducted in Denmark, Slovakia and Slovenia. Dependent variables were percentage of actual ERP system implementation costs and staying on budget vis-à-vis the planned costs and budgets. The independent variables were implementation approach, country, company size, information strategy, representation of the IT department on board level, and number of implemented modules. Main conclusions are that number of modules influences selection of implementation approach and companies with information strategy are more likely to stay on budget. However, implementation approach does not significantly influences implementation costs and clear relationships between factors influencing selection of implementation approach and costs for ERP implementation could not be found.

Keywords: Enterprise Resource Planning (ERP), IS Investments, Implementation, Empirical Study.

1   INTRODUCTION

Enterprise resource planning (ERPs) systems consist of an integrated set of programs that provide 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, 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 goes over firms' boundaries. It can be stated that the success of ERPs to a high extent depends on its implementation. It can also be stated that implementation or as often also labelled deployment is a complex and costly endeavour.

So, although virtually nobody really doubts their importance for running business, there is a sentiment regarding ERP implementation – both in terms of time and money. Cunningham (1999) reports from an investigation of 7500 IT projects conducted by Standish Group in 1998 which discovered that 45 % of them were late or over budget. According to the only publicly accessible Standish Group report on ERP implementation projects (Standish Group, 1995) actual cost of projects was, on average, 214 % of what small companies planned, 182 % of what medium companies planned, and 178 % of what large companies planned and took 2,39 times longer than small companies intended, and 2,02 times longer than medium companies intended, and 2,30 times longer than medium companies intended. There are, definitely, several contributing factors to staying on budget and on time. However, in this paper, the question is if different approaches for implementation result in different outcomes when it comes to costs for ERP implementation.

The research question is whether factors influencing implementation approach then affect to what extent ERP system implementation costs exceed planned costs for implementation in European context, which is characterized by, for instance, fixed price policy. It can be stated that cost of implementation is an important part of total cost of ownership (TCO), and therefore it is important to know how large is the disparity between actual and planned total cost of implementation of ERP systems, and how different factors influences costs for ERP implementation. The rest of the paper is as follows: the next section discusses ERP system implementation approaches. The section after that describes the research method and how data were collected and analyzed. The following presents the results of the analysis regarding relationships between the variables and whether the organization stays on budget or not respectively what percentage they spent on implementation related to the budget. The penultimate section then discusses limitations and suggests future research. Finally some conclusions are presented.

2   ERP SYSTEM IMPLEMENTATION APPROACHES

In the paper, implementation is defined as the way how organizations systematically integrate ERPs into the specific organization. This can be done in different ways and that is what we mean with implementation approach. Implementation approach is defined as a systematically structured approach that aims at integrate selected ERP system into the workflow of an organizational structure (http://en.wikipedia.org/wiki/Product_software_implementation_method) One way to distinguish between different implementation approaches is to look into changes in the organization and when these changes take place. This can be described as piecemeal versus concerted implementation (Robey, Ross and Boudreau, 2002). The difference between these two is that in the piecemeal implementation the ERP is implemented first and then changes in the organizations business processes are implemented. The concerted implementation approach means that the ERP and changes in the business processes are implemented at the same time. These different approaches could be related to IT/IS strategy and it could be suggested that if the organization has a formalized information strategy

that probably influences what ERP implementation approach that the organization select. It can also be related to business process reengineering (BPR) (Davenport, 1993; Hammer and Champy, 1993) which has a clear focus on restructuring both the organizational structure as well as the used information system (IS) structure, and it can be stated that this makes the change from the earlier structure of legacy system complex. It is, therefore, interesting to see what influences organizations when they select a specific approach for implementation.

McGillicuddy (2007) states that there is a difference between size of the organization when it comes to the time it takes between the organization starts to implement an ERP to its implemented ERPs go live. The claim is that small businesses have a shorter time than midsized and large organizations. This statement builds on data presented in a report from the Aberdeen Group. In that report it is said that 86 % of small enterprises achieved their first go live milestone within the first year, in midsized enterprises the same happened in 64 % of the implementing enterprises and when it comes to large enterprises just 47 % of them reported that they experienced the first go live milestone within a year. It could be asked if this means that small organizations more often implement ERPs as a big bang approach and that the bigger the organization is, more likely they select a slow phased implementation approach.

In this study, we distinguish between three types of implementation approaches: slow phased, pilot project and big bang implementation. In the literature, there exist two general approaches for how ERPs are implemented, which were popularized in the mid-1990s (Mabert, Soni and Venkataraman, 2003; Markus, Tanis and Van Fenema, 2000b): (1) the "big bang" approach and (2) the phased implementation approach. The "big bang" is an implementation approach that means that the entire organization starts to use the new ERP at the same time. The big bang probably has been planned for a long time and the specific ERP have been adjusted and to some extent tested before the actual big bang, but, what happens is that the organization decides on a specific date for when the ERP should be taken into usage. When that specific day then comes, data are transferred from the old legacy system and all users start to use the new system. This can then be compared to the phased implementation approach. The differences between these are that the phased means that some parts of the organization start to use the new ERP and after a while the next part starts to use it and so on. The phased implementation can be phased in different ways, it could be that, if the organization is situated at different locations, a specific location starts, or it could be that a specific user group starts and so on. The major difference between these two approaches is probably the time it takes. The big bang approach means definitely a shorter time for the roll-out in the entire organization. The phased implementation approach takes longer time, but it is not sure that it takes so much longer time from the first decision on adoption of a new ERP to the time it is in full use. It could be that the big bang implementation approach demands a longer time period for preparing before the big bang. However, it can be stated that although phased implementation is time consuming, it involves less risk compared to the "big bang" approach (Scott and Vessey, 2000). Recent research has also revealed that the phased implementation tends to involve less reengineering efforts

Parr and Shanks (2000) state that there is a need to further describe implementation approaches into a taxonomy if being able to investigate ERP implementation. They suggest a taxonomy describing three different implementation approaches which they label: Comprehensive, Middle Road and Vanilla implementation. However, in our view this categorization is more related to earlier decisions such as deciding on what ERP package to adopt and/or deciding on if going for "best practices". But the taxonomy suggested by Parr and Shanks have an interesting further categorization when they talk about characteristics related to each approach in the framework. The characteristics are: 1) physical scope, which means if implementation is made at several places, 2) BPR scope, which consider to what extent reengineering is considered, 3) technical scope, which is about to what extent the adopted ERP is modified, 4) module implementation strategy, considering two different strategies for implementation of ERPs modules, 5) resource scope, which is about the time and budget scope for the implementation. In this paper, the most interesting characteristic from Parr and Shanks to investigate further is the module implementation strategy. What they state about this is that there exist broadly

two different decision points in the module implementation strategy. The first decision is about whether the ERP should be implemented as a skeleton or with full functionality and the second decision is then if the implementation should be done module by module integration to legacy systems or all ERP modules implemented and then integrated to legacy systems (Parr et al., 2000). The latest described approach – all ERP modules implemented – can be compared to big bang implementation while the other one could be compared with phased implementation. Parr and Shanks state that phased implementation, is less risky, but more resource intensive, while the big bang implementation is precarious but a less time consuming option. According to Basoglu et al. (2007), big bang implementation creates adoption problems in the long run, and the reason they state for this is that organizations, when implementing big bang, spend less effort in adjusting the software and the organization to each other. Because of the advantages of a phased implementation, it was of our interest also to figure out how exactly companies approach this issue and what it is that makes an organization select a specific implementation approach. This and the inspiration from (Bernroider and Leseure, 2005) was the reason for splitting the phased implementation into slow phased-in implementation approach (one module at a time) and a pilot project implementing (one module followed by all other modules in one step). Although one could try to divide big bang implementation into two, as e.g. (Madapusi and D'Souza, 2005) did, it could also confuse respondents.

3   DATA AND METHODOLOGY

This exploratory paper is based on a questionnaire survey, conducted in Denmark, Slovakia and Slovenia in May and June 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, 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 223 responses (21 from Denmark, 112 from Slovakia, and 90 from Slovenia) out of 3600 mailings, i.e. the response rate was 6,2 %.

Respondents were to answer what the actual total cost of ERP system implementation was – whether it was less than planned, as planned, or more than planned. In case that the total implementation cost did not match the planned one, they were asked how many percent less or more they actually spent on implementation. There were 120 responses, which compared actual and planned implementation costs (and provided all required information on independent variables) and 114 provided enough input to calculate the actual percentage. Independent variables were implementation approach, country, company size, representation of the IT department on the board level, information strategy, and number of implemented modules. The questionnaires were sent to companies in Denmark, Slovakia and Slovenia, so therefore one of the independent variables is country. The implementation approaches were big bang, phased-in, and a pilot project implementation. In the analysis, we have analyzed small, medium and large companies. The definition, which we used, stated that companies from 10 to 49 employees are considered to be small, companies from 50 to 249 employees are considers to be medium-sized enterprises, and companies having 250+ employees are considers to be large companies. This definition is consistent with how the European Commission (European Commission, 2003) defines SMEs. Regarding the independent variable information strategy, this should be understood as that the organization has a formal information strategy. Representation of the IT department on the board level means that there is a CIO or alike director for IT on the board level. Therefore, it will be described as CIO in Figure 1-5. Regarding modules, we asked if they implemented modules for (1) finance and controlling, (2) human resources, (3) manufacturing and logistics, (4) sales and distribution. So the figure used for the analysis is not the overall number of modules but the number of the abovementioned groups covered by implemented modules.
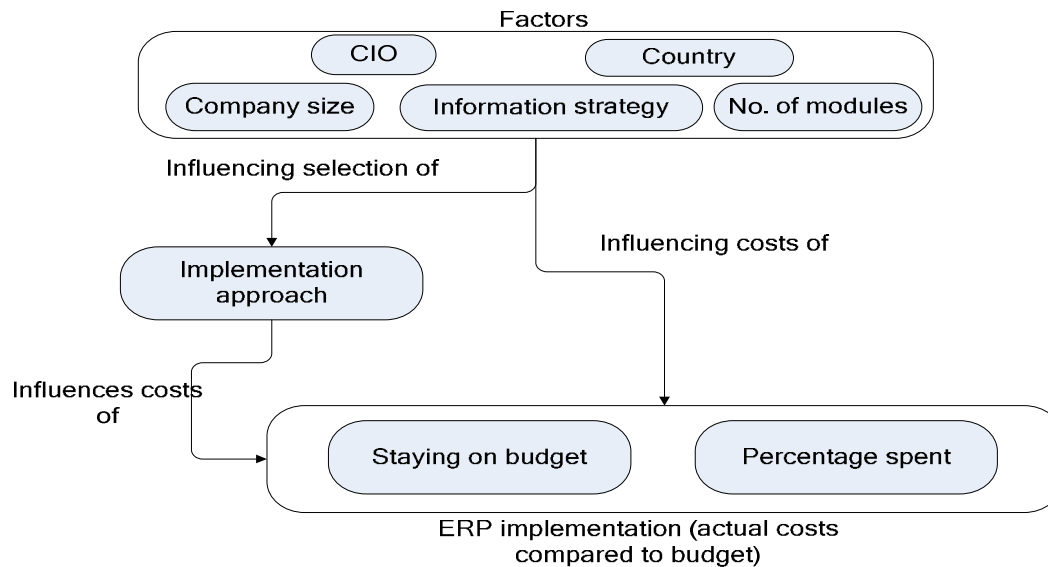
Figure 1 Research model investigate relationship between influencing factors for implementation approach and ERP implementation costs

In this paper, three relationships were investigated with the aim of finding if and how the factors: CIO, country, company size, information strategy, and number of modules influences costs of ERP implementation in the form of actual costs compared to budgeted costs. This is done by first exploring whether the factors influences selection of a specific ERP implementation approach. This is then followed by exploring whether a specific implementation approach influences companies' costs when they implement ERPs. The final relationship investigated is then if the factors have a direct influence on companies' costs en they implement ERPs.

In the first relationship (if factors influences selection of implementation approach) the independent variables: country, company size, CIO, information strategy, and number of modules are investigated with the aim of finding if there exists any relationships between them and the dependent variable implementation approach. In this context, implementation approach is described as being a strategy for implementation that can be done in three different ways: big bang, slow phased, and pilot project. The result of this is shown in figure 2.

The second relationship investigated is then whether a specific ERP implementation approach influences costs of the ERP implementation. This is done from the independent variable implementation approach described as either slow phased, big bang or pilot project implementation. The result of this exploration is shown in Figure 3.

The final relationship is then an investigation whether the independent variables CIO, country, company size, information strategy, and number of modules influence costs of ERP implementation in the form of actual costs compared to budgeted costs. The result of this is presented in Figure 4, which shows the results related to staying on budget, and in Figure 5, which shows the results related to percentage spent. What they both present is how the suggested factors influence actual ERP system implementation cost vis-à-vis planned costs. The first relationship looks into how many companies did not exceed their planned budget. There were only three Slovenian companies, which spent less than planned; they were merged with companies, which spend exactly the amount they planned, since both can be classified as staying on budget. The second relationship investigated focuses on the percentage spent compared to the planned amount.

Regarding the methodology, logistic regression was used for the analysis of the first relationship, analysis of variance (ANOVA) and chi-square test for the second one, and ANOVA and logistic regression for the third one. Multivariate approach was used in both ANOVA and logistic regression.

Additionally, binomial test was used to test if there is 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 there is a significant difference between the average ratio of actual ERP system implementation cost vis-à-vis planned costs and 100 % (i.e. companies spending exactly according to plan). Results of the statistical tests are commented on confidence level $\alpha = 0,05$.

4   RESULTS

In the study, the overall results of the question about selection of implementation approach are the following: 28,5 % said they used a slow phased implementation, 20,8 % used a pilot project for implementation, while 50,7 % used the big bang implementation. The result in our study shows a significant (p-value < 0,001) difference between the percentages and results presented by Palanisamy (2007). The result of our study is as such interesting to compare with statements about the IT productivity paradox (Brynjolfsson, 1993; Brynjolfsson, 2003; Carr, 2004; Hitt and Brynjolfsson, 1996) and statements about the risk of big bang implementation (Parr et al., 2000; Scott et al., 2000). It is also interesting to think about software vendors and distributing partners when analyzing this. It can, definitely, be stated that the way ERPs are implemented, depends on the vendor's suggestion and since they suggest and provide tools for big bang implementation, it is not that strange that 50 % of implementation is done in that way. However, there could also be other factors involved and the idea was to investigate if and how country, company size, CIO, information strategy, and no. of modules influences selection of implementation approach. The results of this are summarized in Figure 2.
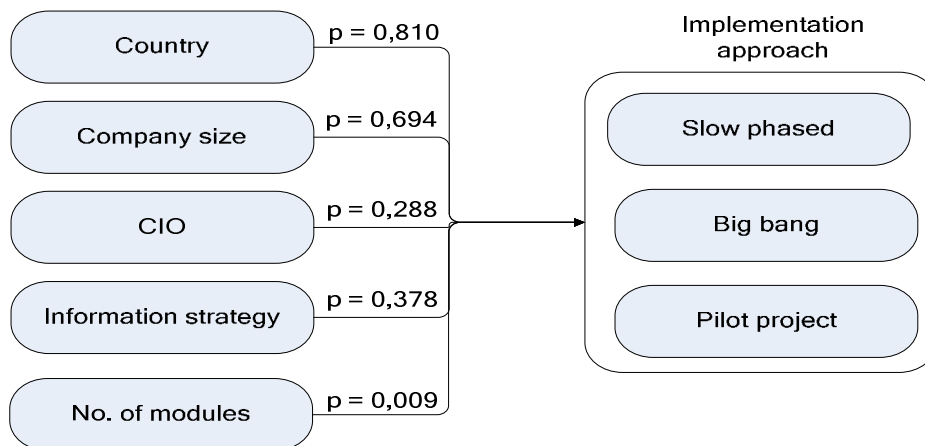

Figure 2 Exploring the relationship of factors influencing selection of ERP implementation approach

The first factor investigated is whether country as such has any influence on selection on ERP implementation approach. The three country investigated are Denmark, Slovakia, and Slovenia. These three countries show definitely some cultural differences and therefore we were interested in whether they differ in what ERP implementation approach that are selected. The result of how country influences selection of implementation approach in shown in Table 1.

Table 1 does not show any significant difference between countries regarding selected implementation approach. There is a small difference when it comes to the percentage of big bang implementation between Denmark and Slovenia, where Denmark shows the highest number of big bang implementation. Otherwise the results are in line with the overall results on ERP implementation approach. It would be interesting to further investigate whether the difference in percentage of big bang implementation is a cultural difference between the three countries. An initial hypothesis on this could be that Slovak and Slovenian companies are more used to work with long time planning and therefore in higher degree go for the slow phased and pilot project implementation in relation to

Danish organizations. It may be assumed that subsidiaries of multinational companies, regardless of location, will have to use the same ERP system and the same implementation approach as selected by headquarters, thus independent from the county, in which a subsidiary is located. On the other hand, the number of multinational companies should be small enough to influence the investigation of relationship between the country and the selected implementation approaches.

Influencing factor	Implementation approach		
Country	Slow phased	Pilot project	Big bang
Denmark	19%	25%	56%
Slovakia	30%	19%	51%
Slovenia	30%	22%	48%

Table 1 Relation between country and selected implementation approach

In the questionnaire, there was no specific question about size of organizations, this information was instead collected from other sources and linked to each response. The organizations were divided into the following size groups: large, midsized, and small using the measure of number of employees. This means that large is when the organization has 250+ employees, midsized 50-249 employees, and small when the organization has less than 50 employees. From the perspective of selection of ERP implementation approach, the size of the organization is of interest. Our basic thoughts about this are that if it is a small organization then it would go for the big bang implementation, and the reverse would then account for large organization. The rationality for this statement would be that a small organization does not have so many users so it would therefore be easier to do a big bang implementation. In the large organization it would be more risky to do a big bang implementation and therefore would it be possible to suggest that slow phased ERP implementation is more often used. The result from the questionnaire related to organizational size is shown in Table 2.

Influencing factor	Implementation approach		
Organizational size	Slow phased	Pilot project	Big bang
Large	27%	17%	55%
Midsized	25%	28%	47%
Small	35%	21%	44%

Table 2 Relation between organizational size and selected implementation approach

There is no difference between large, mid-sized, and small organizations when it comes to which approach is most commonly used, and as shown in Table 2 the most commonly used approach is big bang. However, percentage of big bang as used implementation approach decreases with the increasing size of organization. This means that percentage of slow phased implementation is higher in small organizations than it is in large organizations. In one way it could be said that this is strange since it should be easier to do a big bang implementation in a small organization and less risky than in a large organization. One potential explanation to the result could be that implementation approach depends on implemented ERP system, and this could mean that in for instance large organization SAP is more commonly implemented and it could be that the implementation approach is influenced by what ERP that is implemented. Another possible explanation could be that large organization have resources available to do some kind of test implementation which they after having done decide on roll-out in a big bang implementation. This would then mean that they do a big bang implementation after doing a sort of parallel test implementation. For small organizations it can be suggested that they do not have the resources to do that and since the potential impact of a failure of a big bang implementation is smaller they maybe more often directly goes for big bang ERP implementation.

According to Bernroider et al., (2005), who used the same three types of implementation strategy, in small and medium enterprises (which they merged together), the most often used implementation approach was big bang, the second implementation approach was slow phased, the least used was pilot study. In large companies, the most often used implementation approach was big bang, the second implementation approach was pilot study, and the least used was slow phased. Our results are in line with Bernroider's results but it differs to some extent when it comes to percentage of pilot project and slow phased implementation in large organizations. Unfortunately, although there are several studies conducted in the U.S., such as Madapusi et al. (2005), although investigating only two general implementation strategies – big bang and phased-in, but they cannot be compared to these outcomes, since the definition of a company size differs significantly between the U.S. and European Union.

We aimed to investigate if presence of IT professionals in the board of companies influences the selection of ERP implementation approach. In order to do that we asked if the IS/IT division were represented at board level in the organization. In the paper, we describe representation in the board as having a CIO. The reason for asking about representation at the board level was that this may for instance influence selection of ERP implementation approach. It could be suggested that if there is representation of IT/IS at board level then the risk of implementing ERP as big bang would be considered in more depth and from that it would be possible to state that a higher level of pilot project and slow phased implementation should be the case. The result of this question can be seen in Table 3.

Influencing factor	Implementation approach		
CIO	Slow phased	Pilot project	Big bang
With CIO	23%	26%	51%
Without CIO	33%	16%	51%

Table 3 Relation between presence of CIO and selected implementation approach

The results on representation of the IT department at the board level do not show any significant results regarding relation to selection of implementation approach. There is a small difference between the slow phased and pilot project if the organization have a CIO or not, but if summing up slow phased and pilot project and comparing the sum with the big bang implementation approach no difference is seen. The result is to some extent a surprise since it does not show any difference whether the IT department is represented on board level or not on selected implementation approach. Further research may include a deeper investigation of CIOs – their educational background (field of study), risk adversity, leadership style, possibly also related factors like organizational culture and structure and size of IT department. The latter and cooperation between business and IT staff may be related also to information strategy.

In the questionnaire, it was asked whether the organization has an information strategy or not. The answer on this question is rather complex to interpret since having strategy or not could be seen from the perspective of whether the strategy is formalized or not. However, our intention with this question was to distinguish between if the organization has a written formal strategy or not. From the extent of having a formalized strategy or not the idea is then to investigate if it influences selection of a specific ERP implementation approach. The result of this is shown in Table 4.

Influencing factor	Implementation approach		
Information strategy	Slow phased	Pilot project	Big bang
Yes	23%	24%	51%
No	35%	17%	48%

Table 4 Relation between information strategy and selected implementation approach

The results from the analysis show that there are no big surprises in whether the organizations have a formal information strategy or not in relation to selected implementation approach. There is a higher extent of slow phased implementation in organizations without formal information strategy, which could indicate that these organizations does not have that clear perspective on whether they should fully implement the specific ERP. However, it could also be that they have a clearer perspective of what they aim at and therefore takes longer time for the actual ERP implementation and focus more on adjustment of the specific ERP as well as adjustment of specific business processes.

The numbers of modules used for the analysis are actually numbers of the groups of processes (finance and controlling, human resources, manufacturing and logistics, sales and distribution) covered by implemented modules, not the overall number of modules.

Influencing factor	Implementation approach		
No. of modules	Slow phased	Pilot project	Big bang
1	29%	18%	53%
2	33%	40%	27%
3	27%	8%	65%
4	25%	23%	52%

Table 5 Relation between no. of modules and selected implementation approach

There is a significant difference between companies with 2 and 3 modules. The difference is namely in pilot project and big bang implementations. Both groups use slow phased approach in about the same percentage of cases but companies with two modules much more often go for pilot project implementation and companies with three modules choose much more often big bang implementation.

The model for investigation the relationship between implementation approach and ERP implementation costs is shown in Figure 3.
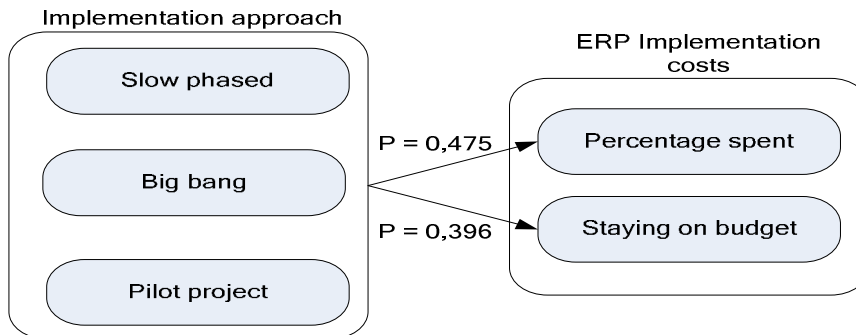

Figure 3 Relationship between implementation approach and ERP implementation costs

In order to test relationship between the actual percentages spent vis-à-vis the planned implementation costs and selected implementation method, ANOVA was used. The averages on percentage spent for each implementation approach are shown in Table 6.

Influencing factor	Implementation approach		
Percentage spent	Slow phased	Pilot project	Big bang
	104,7 %	105,9 %	109,3 %

Table 6 Average percentage spent in relation to implementation approach

There is no significant relationship between the chosen implementation approach and the actual percentage spent. In order to test relationship between staying on budget and selected implementation method, chi-square test was used. The distribution of the observation is shown in Table 7.

Influencing factor	Implementation approach		
Staying on budget	Slow phased	Pilot project	Big bang
Yes	76%	67%	63%
No	24%	33%	37%

Table 7 Relation between staying on budget or not in relation to implementation approach

There is no significant relationship between the chosen implementation approach and staying on budget. Since there is no clear relationship between the chosen implementation approach and implementation costs, we decided to add additional variables into the model.

There is a significant relationship between staying on budget and having a formal information strategy. Companies with formal information strategy seem to be more likely to stay on budget (74,2 %) than companies without information strategy (59,3 %). Overall, 67,5 % of companies stayed on budget; this percentage is significantly different from 50 % (p-value < 0,001), i.e. more than one half on companies actually manages to stay on budget.
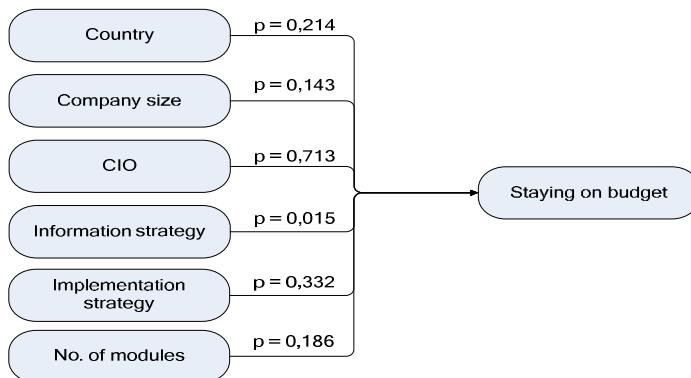

Figure 4 Findings from analyzing the first relationship

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.
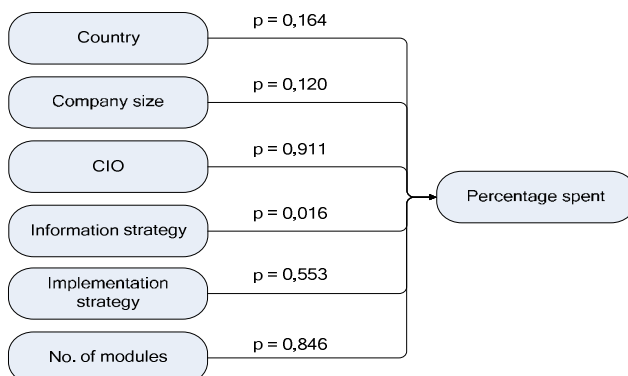

Figure 5 Findings from analyzing the second relationship

ANOVA identified a significant relationship between the percentages of actual spending compared to planned one and information strategy. Companies with a formal information strategy were less over budget (104,2 %) than companies without one (111,3 %).

Overall average was 107,3 %. There is a significant difference between the overall average of 107,3 % and 100% (no disparity between planned and actual costs). P-value is smaller than 0,001 regardless 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 companies with formal information strategy are likely to spend about 7 percentage points less than companies without information strategy. It suggests that ERP system vendors need to be sensitive to companies without information strategy, since these have either wrong expectations of costs or lack technical skills beneficial for ERP system implementation. However, there are also other explanations that are worth mentioning and these are the following. Firstly, it could be that companies with formal strategy are better on making a budget and take more serious in the task of doing that. Secondly, it could also be that they are better in constructing a clearer contract with the implementing partner. Thirdly, it could also be that they have a better control over overall costs and thereby are better in calculating the implementation budget. Fourthly, and finally, most likely have organizations with a formal information strategy a clearer view over what they want and thereby do not so many "surprises" show up during the implementation.

5 KNOWN LIMITATIONS AND FUTURE RESEARCH

There are two known limitations of this paper, which are actually inherent for most of 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 (that is a case of almost all questionnaire surveys) can already lead to biased results. We tried to overcome the problem by sending out 3600 questionnaires and hoped that the autoselection would not depend on the questions asked. In our opinion, we achieved it, since the percentage of companies being over budget (i.e. ones, which would be more likely to complain about their bad experience) is only 32,5 %, i.e. less than 45 % (which included also projects going over time) mentioned in Cunningham (Cunningham, 1999), and surveyed companies were only 7,3 % over budget, i.e. much less than 114 % for small, 82 % for medium, and 78 % for large companies mentioned in the Standish Group (Standish Group, 1995) report. Regarding the reliability, it is not possible to check it without being allowed to look into accounts and to talk to people involved in the implementation, which would provide insight necessary to understand the accounting data.

Regarding the implementation approach, one could also consider additional factors, such as size of the system, its complexity, organizational hierarchy, and extent of the coverage.

The future research should look into what caused additional costs. For example, customization of ERP is a crucial, lengthy, 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 and Paul, 2000a; Swan, 1999). Besides 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., 2000a; Sumner, 2000).

Last but not least, it might be useful to investigate whether additional costs arose because of the misalignment (the gap between the standard version of the ERP system and the organization) or was it spent 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   CONCLUSIONS

To sum up, although not all companies manage to stay on budget when it comes to ERP system implementation, the situation in investigated European companies is not too critical. It can be evaluated from two points of view. Firstly, about two thirds of companies still manage to stay on budget. Secondly, companies exceeded their budgets only by 7,3 % on average. A contributing factor for Danish, Slovak and Slovenian, i.e. European, companies staying more-or-less on budget is the prevalent fixed price policy for ERP implementation projects in Europe. So, the findings might be generalized in European context but definitely not for the U.S., where effort-based pricing policy is prevalent. A formal information strategy implies more comprehensive planning, so there should be also smaller discrepancies between the plan and the reality. It was found out that the chosen implementation approach does not influence the ability of the company to stay on budget with implementation costs. The research also pointed out that selection of the implementation approach depends on number of modules, which are implemented.

References

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

Basoglu, N., Daim, T. and Kerimoglu, O. (2007) *Organizational adoption of enterprise resource planning systems: A conceptual framework,* The Journal of High Technology Management Research*, 18 (1), pp. 73-97.

Bernroider, E. W. N. and Leseure, M. J. (2005) *Enterprise resource planning (ERP) diffusion and characteristics according to the system's lifecycle: A comparative view of small-to-medium sized and large enterprises*, Working Papers on Information Processing and Information Management, pp. 32.

Brynjolfsson, E. (1993) *The productivity paradox of information technology,* Communications of the ACM*, 36 (12), pp. 67.

Brynjolfsson, E. (2003) *The IT productivity gap,* Optimize*, 21 1-6.

Carr, N. G. (2004) *Does IT matter?: information technology and the corrosion of competitive advantage,* Harvard Business School Press, Boston, Mass.

Cunningham, M. (1999) *It's all about the business,* Information & Management*, 13 (3), pp. 83.

Davenport, T. H. (1993) *Process innovation: reengineering work through information technology,* Harvard Business School Press, Boston, Mass.

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

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

Hammer, M. and Champy, J. (1993) *Reengineering the corporation: a manifesto for business revolution,* Harper Business, New York.

Hitt, L. M. and Brynjolfsson, E. (1996) *Productivity, business profitability, and consumer surplus: Three different measures of information technology value,* MIS Quarterly*, 20 (2), pp. 121-142.

Mabert, V. A., Soni, A. and Venkataraman, M. A. (2003) *The Impact of Organization Size on Enterprise Resource Planning Implementation (ERP) in the U.S. Manufacturing Sector,* Omega*, 31 (3), pp. 235–246.

Madapusi, A. and D'Souza, D. (2005) *Aligning ERP systems with international strategies,* Information Systems Management*, 22 (1), pp. 7-17.

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), pp. 245-265.

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

Markus, M. L., Tanis, C. and Van Fenema, P. C. (2000b) *Multi-Site ERP Implementations,* Communications of the ACM Journal*, 43 (4), pp. 42-46.

McGillicuddy, S. (2007) *ERP implementations may fall short for hasty SMBs*, searchCIO-Midmarket.com, Vol. 2007.

Parr, A. N. and Shanks, G. (2000) *A Taxonomy of ERP Implementation Approaches*, 33rd Hawaii International Conference on System Sciences

Robey, D., Ross, J. W. and Boudreau, M.-C. (2002) *Learning to Implement Enterprise Systems: An Exploratory Study of the Dialectics of Change,* Journal of Management Information Systems*, 19 (1), pp. 17-46.

Scott, J. E. and Vessey, I. (2000) *Implementing Enterprise Resource Planning Systems: The Role of Learning from Failure,* Information Systems Frontiers*, 2 (2), pp. 213.

Standish Group (1995) *The Standish Group report: CHAOS.*

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

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), pp. 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), pp. 165-190.