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The Conditions of ERP Implementation Projects: Evidence from Practice

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ABSTRACT
This paper analyses the conditions of Enterprise Resource Planning (ERP) system implementations on the basis of research conducted among practitioners dealing with ERP projects. The study discusses how the researched projects were linked with enterprise strategy, how their efficiency was measured and in what extent they defined implementation goals. The investigated projects were divided into groups on the basis of their duration, scope, company size and success level achieved. The results demonstrate the real need for improvement as regards investigated conditions of ERP projects. The practitioners should be more focused on the business benefits during implementation project, elaborate the mechanisms in order to measure the implementation effectiveness and pay more attention to the definition of measurable implementation goals. The research outcome also reveals that practitioners from most complicated projects are most aware of the overwhelming implementation challenge, while, on the other hand, the relatively simpler projects seem to be underestimated.

Keywords
Enterprise Resource Planning (ERP), project conditions, linking with strategy, project efficiency measurement, project goals

INTRODUCTION
The introduction of an ERP system into an organisation can bring about many benefits; however, their achievement depends upon the effective implementation of the ERP system within its full functionality. Meanwhile, as the observation of ERP market shows, it is quite difficult. There are too many implementation projects that do not bring about the desired effects or even end up in project abandonment (e.g. Holland et al. 1999). The implementation projects’ duration time and budget significantly exceed estimated amounts and the planned scope of the implementation is limited (Parr & Shanks 2000). Hence, obviously, the ERP projects yield diverse outcome and experience various project conditions.

There are a great many potential factors influencing the success of ERP implementation, often captured in success factors models (e.g. Brown & Vessey 2003, Parr et al. 1999, Soja 2004a, Somers & Nelson 2001). The suggested models deal with the various aspects of ERP implementation projects, and, usually, contain a large number of mechanisms potentially affecting the outcome of the project. Among numerous factors influencing the result of an ERP project, those connected with projects conditions appear to be very important for ultimate project success.

One of the major factors describing ERP project conditions is its linking with enterprise strategy, since ERP implementation is a critical initiative deeply “penetrating” the affected enterprise. Therefore, some way of incorporation of corporate strategy into an ERP project seems to be necessary for ultimate positive project outcome. Leading an ERP project is a fairly complex and challenging task. Among numerous responsibilities that are expected to be taken on by a leader, one is to continuously monitor the implementation performance and to verify whether the project is on track. In order to do this effectively, there is a need to incorporate some kind of project efficiency measurement during the project run. Additionally, for the need of leading the project knowingly, the implementers should define some implementation project goals and head towards their completion.

The above mentioned conditions of an ERP project are of special interest for this research. Its goal is to thoroughly investigate how the actual implementation projects were linked with enterprise strategy, how their efficiency was measured, and to what extent they defined implementation goals. Moreover, this paper attempts to examine the project conditions taking into consideration various types of projects, which differ in duration time, project scope and company size. Furthermore, the analysis also takes into account the achieved success level of investigated projects and explores what the described conditions looked liked in successful implementations.
RESEARCH SAMPLE

The research of the ERP system implementation projects was conducted twofold: firstly from the viewpoint of enterprises which had decided on ERP system implementation, and secondly from the perspective of ERP systems and services suppliers. In the first case, the research sample consisted of Polish enterprises implementing the ERP system in their organisations. In the second case, the research sample comprised the consultants and experts representing various suppliers of ERP systems. The research was carried out in the years of 2001 and 2002.

The research done on the enterprises implementing the ERP system into their organisations was conducted with the use of a questionnaire, which was directed to the people playing leading roles in the implementation (the project leader if it was possible). 223 enterprises were contacted during the research and 68 (30%) answers were obtained from enterprises representing the whole country and various industries.

In order to examine the experts’ opinions, the research questionnaire was directed to specialists with experience in implementing various ERP systems – those who were leading implementation projects from the supplier perspective and taking part in many implementations. During the research, 45 people were inquired of and in the end 31 (69%) experts’ opinions were gathered. The experts represented 22 firms supplying ERP systems and implementation services.

ENTERPRISE STRATEGY IN ERP IMPLEMENTATION

One of the elements strongly influencing the ERP implementation is the linking of the project with enterprise strategy. In a model understanding, ERP implementation is perceived as a means for completion of enterprise strategic goals. These goals should be a basis for defining the ERP implementation strategy, project scope and its detailed goals. The developed solution should be consistent with enterprise strategy, in order to avoid the discrepancy between the result achieved and actual company strategy, after the completion of the implementation project, which is usually a fairly long process.

The respondents were asked to describe how the enterprise strategy was incorporated into their ERP implementation projects. The highlighted ways of incorporating enterprise strategy in ERP implementation, given by respondents, are depicted in Table 1 together with the amount of responses given by enterprise representatives (column Firms) and experts (column Experts). The discovered issues are listed in descending order of the sum of responses (column Overall). The numbers of
answers presented in the table can also be treated as the numbers of enterprises or experts, since each respondent gave at the most one answer.

The largest group of people states that they did not incorporate enterprise strategy in an implementation project. This group consists of 25% of responses from enterprises and almost 20% of experts’ opinions. Identical distribution of responses of both enterprise representatives and experts applies to answers declaring the support of enterprise strategy through ERP system implementation. In the following position, respondents from enterprises indicate the incorporation of enterprise strategy by the completion of enterprise goals (17%) and the ERP implementation placement as a part of enterprise strategy (10%). On the other hand, experts declared that they referred to enterprise strategy during the implementation project definition and while setting its goals and schedule (20%), and referred to enterprise strategy in the process of enterprise analysis prior to the start of the implementation project (15%).

It is worth noting that none of experts indicated the ERP implementation as a part of enterprise strategy, and that only 2 experts’ answers related to implementation as a completion of enterprise goals. On the other hand, the enterprise representatives practically did not perceive the incorporation of enterprise strategy in the phase of company analysis (only 1 response) and to a small degree they saw the role of the enterprise strategy as a starting point in implementation project definition (4 answers).

The various aspects of ERP implementation linked with the enterprise strategy, declared by the respondents, are consistent with the model understanding, where the ERP implementation serves as a mean for completion of enterprise strategic goals. This correct understanding is included in 60% of the responses from enterprise representatives and in 60% of the responses from the experts. However, the situation is worse when we take into account all researched people, including also those who did not answer the question. It turns out that in less than half of the researched enterprises corporate strategy was incorporated in an ERP implementation project. Similarly, not much more than half of the experts declared a connection of ERP implementation projects with the strategy of a company introducing an ERP system. Therefore, we can conclude that enterprise strategy was to a moderate extent incorporated into ERP implementations.

MEASURING THE EFFICIENCY OF IMPLEMENTATION

The measurement of the implementation efficiency is the mechanism that allows implementers to verify whether their project runs correctly, and, for instance, remains within the planned scope, does not exceed estimated budget and time, yields expected results etc. The researched people were asked a question regarding the employed methods of measuring implementation projects efficiency during the project run. Table 2 contains responses given by both enterprise representatives (column Firms) and experts (column Experts). The methods of measuring the efficiency of implementation are presented with a short description and are listed according to the decreasing number of responses (column Overall).

In the case of enterprises, the responses declaring a lack of using efficiency measurement mechanisms definitely form the largest group of answers (50%). On the other hand, experts more often declare the employment of economic indicators in order to measure implementation (20%), which, in turn, is placed in the second position according to the opinions from enterprises (12%). In the next order, enterprise representatives point to the execution of measurements by the use of schedule control and by the investigation of company operations improvement. Experts, on the other hand, declared in a general way the use of economic indicators and state that the problem of project efficiency measurements is within the competence of the enterprise introducing the ERP system into its organisation. In some cases, respondents claim that implementing efficiency measurements can be performed only after finishing the implementation project, unfortunately, not providing concrete examples. Single responses of queried people referred to project measurement through budget controlling, performing project quality audit or risk analysis, and using mechanisms included in the implementation methodology of a particular system.

It is worth noting that some experts expressed doubts regarding implementation efficiency measurement by the use of economic indicators. As an argument, they state that the ERP implementation project is such a complicated process that it can only be roughly planned, which makes its efficiency measurement practically impossible. Another given argument is that micro and macro economic factors have far more greater influence on an enterprise than ERP implementation has, which brings about the conclusion that trusting qualitative economic indicators is rather risky. Some respondents raised the issue of the feasibility of implementation efficiency measurement. They stressed the management’s concern and reluctance to being objectively evaluated, which could make performing a measurement impossible. Looking at the results of the research regarding implementation efficiency measurement, it seems that a good summary could be an opinion of one expert, who states that „lack of orientation on business profits is undoubtedly a common shortcoming of ERP implementation projects”.

Proceedings of the Eleventh Americas Conference on Information Systems, Omaha, NE, USA August 11th-14th 2005 2046
Table 2. Implementation efficiency measurement

<table>
<thead>
<tr>
<th>Implementation efficiency measurement</th>
<th>Commentary / Respondents’ answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall (110 ans.)</td>
<td>Firms (69 ans.)</td>
</tr>
<tr>
<td>41</td>
<td>35</td>
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<td>8</td>
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<td>10</td>
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</table>

IMPLEMENTATION GOALS

The setting of implementation goals indicate general directions of the project and can strongly influence the overall project outcome. Therefore, suspecting the paramount importance of implementation goals presence, enterprise representatives were asked a question regarding their implementation projects goals. They were allowed to give answers in an open form in order to recognise a broad range of opinions, and to investigate the understanding of implementation project goals issue. The project goals, when they are finally achieved, form part of the overall project effects. Thus, they can be treated as project effects which are intended to be achieved. Hence, the project goals can be divided according to the same rules as the project effects.

The broad range of project effects can be divided into “hard returns” which contain tangible benefits from ERP implementation and into the group of intangible benefits from ERP implementation (Poston & Grabski 2000). Moreover, Parker & Benson (1988) introduce the group of quasi-tangible benefits, focusing most often on improving the efficiency of the already existing organization. They state that only tangible benefits have a known impact on cash flow, however, difficult- (or impossible-) to-measure values may override the tangible benefits or costs. In any case, the distinction between tangible and intangible effects is rather too coarse to be of practical value and to be useful to thoroughly explore the issue. A more detailed categorization is proposed by Shang & Seddon (2002), who classified potential ERP benefits into five main categories: operational, managerial, strategic, IT infrastructure, and organisational benefits.
### Table 3. Implementation projects goals in enterprises representatives’ opinions

Nevertheless, in order to capture the holistic view of ERP impact on an organisation, this study uses its own classification of ERP implementation results, which were divided into groups of technical, economic, organisational and social effects (Soja 2005). Technical effects refer to computer infrastructure and they are connected with problems of information processing.
Economic effects concern supporting tasks that improve business activity. Organisational effects consist of improving organisational structure or easing its change towards centralisation or decentralisation. Social effects cover, generally speaking, implementation project influence on enterprise workers and their attitudes. The division of effects into categories, as the one concerning tangible benefits, is “blurred” - the groups’ boundaries are unclear and there are results of ERP project that can fall in more than one category.

The collected respondents’ opinions regarding project goals are presented in Table 3 with respect to the division defined above and are sorted according to the descending number of responses within each category (column Number). Among 226 answers gathered from respondents regarding implementation goals, the most numerous group were technical goals (38%), followed by economic goals (35%), and in the next order by organisational goals (23%). Effects of social notion practically do not occur among respondents opinions.

In the group of technical goals, first of all respondents point to system integration, improvement of information quality and availability, and also to reporting enhancement. It is worth noting that they point next to goals described as an implementation of ERP system, which rather proves their misunderstanding of the proper definition of project goals. In the economic goals group, respondents definitely point to supporting enterprise financial activity, which is the most common implementation goal among all responses (12%). In the following order, respondents list enterprise control and inventory reduction. As regards to organisational goals, respondents list first of all logistic processes support, which makes up 10% of all responses. Next, the respondents declare the intention of the company ordering and its activity improvement as implementation project goals.

<table>
<thead>
<tr>
<th>Goal type</th>
<th>Number of enterprises reporting goals (N=68)</th>
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<tbody>
<tr>
<td></td>
<td>0  1  2  3  4  5  6+</td>
</tr>
<tr>
<td>Overall</td>
<td>5  4 11 15 15 15 3</td>
</tr>
<tr>
<td>Measurable</td>
<td>50 11 6 1</td>
</tr>
</tbody>
</table>

Table 4. Distribution of goals reported by enterprise respondents

During implementation project definition, it is of great significance for further project course to define goals that can be measured in some way. These measurable goals make up a good point of reference and their measurement can be a basis for the assessment of implementation project efficiency. Among the listed measurable goals, we can first of all classify several economic goals: inventory reduction, economic indicators improvement, and cost reduction. Taking into consideration the responses from all categories, we can classify as measurable less than 12% of all declared goals. The economic goals that can be measured illustrate concrete profit from system implementation expressed with the use of adequate indicators. However, those goals group is very sparse and consists of only 8% of all declared goals.

Distribution of declared implementation goals is presented in Table 4. The number of enterprises that reported respectively from 0 to 6 and more goals of a given type is placed in columns named, respectively, from 0 to 6+. Subsequent goal types are placed in adequate rows, which are: any goals (row Overall) and measurable goals (row Measurable). As could be seen in Table 4, the vast majority of enterprises declare having some goal of implementation project. Most frequently, 3 to 5 various goals are reported. Only in the case of 5 projects were no goals reported, and in 5 cases only 1 goal was declared. Nevertheless, the situation of measurable goals is completely different. The vast majority of respondents did not report any measurable goal, in 11 cases 1 measurable goal was pointed at, and only in 7 cases were 2 or 3 measurable goals reported.

CONDITIONS DEPENDING ON PROJECT TYPE

The researched enterprises represent a broad range of ERP projects. The examined projects include both relatively simple installations of few system modules and full-fledged implementations of a whole ERP system. Correspondingly, there are projects lasting not more than a couple of months, and implementations with a duration time of longer than a year. Similarly, the investigated companies differ in their size as regards the number of employees. Furthermore, the research projects achieved various levels of success. Therefore, it is very valuable to examine what researched conditions look like for the particular type of projects.

The researched projects where analysed form three perspectives – the criteria defining division into perspectives are enterprise size, implementation scope and implementation duration (Soja 2004a, 2004b). For the needs of analysis, enterprises were divided into small and large companies. The small firms comprised enterprises employing less than 300 people (29 companies); the remaining companies formed the group of large enterprises (39 companies). The division regarding implementation scope took into consideration the modules implemented of the ERP system, and yielded the group
of full-scope implementations (31 projects) and the group of partial implementations (37). In the division taking into account project duration, short implementations were defined as projects lasting up to one year (33 projects), and those lasting more than one year were marked as long implementations (35 projects).

<table>
<thead>
<tr>
<th>Project / company type</th>
<th>all</th>
<th>long</th>
<th>short</th>
<th>large</th>
<th>small</th>
<th>full</th>
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<th>success</th>
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<tr>
<td>linking with strategy</td>
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</table>

Table 5. Respondent answers depending on project type

The investigated projects, naturally, reached various levels of success, which were calculated on the basis of data collected from enterprises (Soja 2004b). The normalized values of success measure fall within the range between 0.36 and 0.92, with median value equal to 0.77. Given this success measure and its median value, the projects were divided into two groups of equal cardinality (34): highly successful projects (“success”) and unsuccessful projects (“failure”).

Next, the project conditions were investigated taking into account the established criteria of division into groups. The respondent answers were analysed for pairs of separate groups, extracted on the basis of dividing criteria, i.e. long and short projects, large and small companies, full-scope and partial-scope implementations, and, finally, success and failure projects. Since the respondents were allowed to give multiple answers as regards measurement methods and implementation goals, the number of respondents who declared at least one method or goal was calculated, in order to enable the comparison between groups. For each calculated number of respondents, the percentage of the group cardinality was estimated. The calculation effect is visible in Table 5, where in subsequent columns there are calculation results for all extracted project groups. The row N contains group cardinalities, while the next rows contain data connected with project conditions.

As can be seen in Table 5, most respondents from successful projects declared some kind of ERP project linking with corporate strategy (71%), in contrast to unsuccessful implementations, where 44% representatives claimed to have incorporated company strategy into the ERP project. A similar situation takes place in the case of division on the basis of project scope and company size. Large companies more often declared linking with strategy than small enterprises, and full-scope implementations more frequently than partial-scope projects. On the other hand, the level of corporate strategy linking with an ERP project did not depend on project duration – both long and short projects representatives declared strategy presence with a similar rate (60%).

In the case of implementation measurement, the distribution of responses somewhat resembles the rates calculated for strategy. However, the percentages are considerably lower, and, on the contrary, differences among groups are significantly higher. Namely, on average, only 35% of respondents declared using some type of implementation measurement. This rate does not change depending on project duration time, but for other divisions, major differences are visible. In successful projects, implementation measurement was two times more frequently used than in unsuccessful implementations, and, in the same way, among full-scope projects in comparison to partial implementations, and in large companies compared with small enterprises.

Definitely, the situation of implementation goals looks the best among all investigated conditions. For almost each type of implementation project, except for unsuccessful projects, more than 90% of respondents declared that they established some projects goals. Moreover, in the case of successful projects, each respondent declared having some goal, while 85% of unsuccessful implementations set up project goals. Additionally, some difference between small and large enterprises is visible, where the latter less frequently defined implementation goals. On the other hand, the situation dramatically changes...
when only measurable goals are taken into account. In that case, all rates become three times lower, and, on average, only one fourth of respondents claim that they used some measurable project goals. The respondents equally employed measurable goals regardless of project duration time and, somewhat surprisingly, success level achieved. Nevertheless, there are significant differences when we take into account division on the basis of company size and implementation scope. It turns out that small companies employed measurable goals two times more often than large firms, and, similarly, full-scope projects almost two times more frequently used this kind of goals than partial-scope implementations.

CONCLUSIONS

Upon analysing the results of the research, we can conclude that there is plenty of room for improvement as regards investigated conditions of ERP projects. Generally speaking, the practitioners should be more focused on the business benefits during implementation project. They should pay more attention to the alignment of the ERP project with corporate strategy, especially in the case of projects taking place in small companies and, also, in the case of partial-scope implementations. In particular, the implementers leading short projects should take special care of project linking with enterprise strategy, especially because this factor most influenced the project success in the case of short implementations (Soja 2004b).

The implementers should also elaborate on the mechanisms in order to measure the implementation effectiveness. This conclusion confirms the findings of Ross & Vitale (2000), who perceive the lack of performance metrics as one of the pitfalls during the ERP implementation process. Furthermore, this study outcome partially supports the results of Markus et al. (2000), who emphasise the need of broad definitions and multiple measures of success. The recommendation as regards measuring the implementation effectiveness, again, as in the case of linking with strategy, is mainly directed to the practitioners dealing with projects in small companies and with partial scope being introduced.

The practitioners should definitely pay more attention to the definition of measurable implementation goals. This suggestion applies to all kinds of projects; however, in particular, it should be directed to the participants of projects in large companies and with partial scope being introduced. Goal definition is especially important for large enterprises, since it has a greater influence on project success the longer the duration and the larger the enterprise (Soja 2004b).

Looking at the implementation projects from defined perspectives, we can conclude that in full-scope projects the investigated conditions occurred with the best state among all types of projects. Only the definition of measurable project goals should be clearly improved for this kind of projects. A similar rule applies to large companies, and, for this kind of projects, the last advice should be treated even more seriously. Hence, we can conclude that practitioners from the most complicated implementation projects, i.e. those taking place in large companies and dealing with full ERP scope, are most aware of the overwhelming implementation challenge and do not disregard the importance of the ERP project. On the other hand, the relatively simpler projects, i.e. those taking place in small companies and dealing with partial ERP scope, seem to be underestimated. For these kinds of projects, practically all investigated conditions should be significantly improved. As regards projects division on the basis of duration, project duration time practically does not cause different investigated project conditions.

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*Proceedings of the Eleventh Americas Conference on Information Systems, Omaha, NE, USA August 11th-14th 2005*