Success Factors Across ERP Implementation Phases: Learning from Practice

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Abstract: This paper analyses how the importance of ERP (Enterprise Resource Planning) implementation success factors changes across project phases. The study is performed on the basis of research conducted among experts working in ERP systems suppliers and dealing with many implementation projects. The findings extract the most important factors and suggest that their significance changes as the project goes through its lifecycle. However, there are factors, such as balanced team composition, with noticeable importance lasting through all project phases. On the basis of the research, conclusions were drawn for the practitioners dealing with ERP implementation projects.

1 Introduction

The implementation of an Enterprise Resource Planning (ERP) system is a process of great complexity strongly involving the whole company which has decided to introduce such a system into its organisation. The observation of ERP market, where there are many projects that did not bring about expected benefits, and, moreover, some projects were abandoned, allows us to state that the achievement of success of an ERP implementation is very difficult (e.g. Holland et al. 1999; McNurlin and Sprague 2002). The implementation projects' duration time and budget significantly exceed estimated amounts and the planned scope of the implementation is limited (e.g. Parr et al. 1999). Hence, it is crucial to determine the factors which are necessary for a successful implementation of an ERP system.

The number of research projects regarding ERP implementations keeps growing; nevertheless, it is still not extensive. There are several works dealing with success factors in ERP implementations (e.g. Brown and Vessey 2003; Holland et al. 1999; Parr et al. 1999; Stefanou 1999); however, the issue of changing factor relevance across ERP implementation phases is very rarely discussed. Meanwhile, an ERP implementation project is a multi stage process which can last for a long time. Naturally, the situation and conditions of such a complicated process change

over time and various issues could be of critical importance within different phases of the project (e.g. Markus et al. 2000a). Therefore, it is valuable to verify how success factors' importance looks like in successive stages of an ERP implementation project. Among the few research works available, there are theoretical frameworks (e.g. Esteves and Pastor 2004) that need empirical verification, as well as studies based on an empirical survey (Somers and Nelson 2001). The latter is based on an empirical study among American enterprises introducing the ERP system into their organisations and provides valuable findings.

However, an ERP implementation project usually involves two parties – a company introducing the ERP system into its organisation, and a supplier of the ERP package. Both parties have their own perception of an implementation project and also have different experiences. The goal of this paper is to investigate the problem of the success factors relevance through the ERP implementation phases from the point of view of experts, who are people involved in many ERP projects from a system supplier site. Hence, they gained an insight into the conditions of various ERP projects in different organisations. This paper employs success factors model defined in (Soja 2004, 2006) and attempts to analyse how the factors importance changes over the ERP implementation phases.

2 ERP Implementation Success Factors

ERP system implementation is a process of great importance for an organisation, with a great many conditions and factors potentially influencing the implementation project. The success factors proposed by the researchers, covering a wide range of aspects, represent various levels of generalization; there are models with only 5 factors (Brown and Vessey 2003), as well as those containing more than 20 elements (Somers and Nelson 2001). Furthermore, the success factors models employ a variety of categorisations without any generally accepted method of factor grouping.

Therefore, since there does not appear to be any single commonly recognised success factors model, this study uses an ERP implementation success factors model described in Table 1 (Soja 2004, 2006). The purpose of this model is to cover the broad range of mechanisms influencing an ERP implementation project. The model was inductively created taking into account the results of previous research and the author's own experience in the business environment. The resulting success factors were validated by several IS researchers and professionals. The factors are divided into groups regarding their broader aspect. The separated groups consist of factors related to implementation participants, top management involvement, project definition and organisation, project status, and information systems (Soja 2004, 2006).

Table 1. The general model of ERP implementation success factors

	Factor	Factor description
		Related to the implementation participants
A	project manager	The project manager is the person from the enterprise who sacrifices most of his working time to implementation duties
B	team composition	The implementation team consists of various people having high qualifications and knowledge about the enterprise
C	team involvement	The project manager and members of the implementation team are strongly involved in the implementation duties
D	motivation system	There is a motivation system rewarding participation in implementation and on-time task delivery
E	co-operation with supplier	Good co-operation with the system supplier who is competent and offers a high level of services
		Related to the top management involvement
F	top management support	The top management support for the project and the management members involvement in implementation duties
G	top management awareness	Top management awareness regarding the project goals and complexity, demanded labour, existing limitations, required capital investment and project inevitability
H	top management participation	Top management participation in the project schedule and goals definition
		Related to the project definition and organisation
I	linking with strategy	The implementation project linking with enterprise strategy (implementation as a method of the enterprise strategic goals achievement)
J	implementation goals	The definition of implementation goals – defined in the economic terms at the whole enterprise level
K	detailed schedule	The definition of detailed implementation scope, plan and schedule with responsibility allocation
L	pre-implementation analysis	The enterprise analysis and diagnosis prior to the start of implementation, and the creation of the enterprise functioning model with the integrated system support
M	organisation change	The change in the enterprise organisation and its business processes
N	monitoring and feedback	The implementation monitoring and feedback – information exchange between the project team and end users
O	implementation promotion	The implementation promotion – the information broadcasting about the project by the implementation team members to other enterprise employees
P	fast effects	The visible fast partial positive results of the implementation
Q	appropriate training	The adequate training program suitable to the enterprise needs

Table 1. continued

	Factor	Factor description
		Related to the project status
R	investment plan	The formal introduction of the implementation project in the enterprise investment plan
S	project team empowerment	The project team members empowerment to decision making and their high position in the enterprise hierarchy
T	financial budget	The financial resources assured for during the implementation
U	work time schedule	The work time assured for the implementation team members (work time schedule)
V	IT infrastructure	The appropriate IT infrastructure assured for the implementation project Related to information systems
W	system reliability	The ERP system reliability, its user friendliness and fit to the enterprise needs
X	minimal customisation	The system minimal customisation – the use of defined patterns and solutions embedded in the system
Y	legacy systems	The legacy systems adaptation for the operation in the ERP integrated system environment
Z	implementation experience	The project team members experience gained during former information systems implementation

3 ERP Implementation Phases

ERP implementation, as a very complex endeavour, can take various shapes depending on particular enterprise and project conditions. ERP implementation projects range from a simple introduction of an ERP system in a single plant to complex multi-national implementation projects covering many branches and requiring many changes in organisation structure (Parr and Shanks 2000b). Furthermore, there is a variety of ERP lifecycle models having various numbers of phases. The proposed models include three (e.g. Parr and Shanks 2000a), four (e.g. Markus and Tanis 2000), five (e.g. Ross and Vitale 2000) up to six (e.g. Somers and Nelson 2001) project stages.

Despite many differences among ERP projects and various terminology used by ERP researchers and system suppliers, the general framework of a model ERP project can be drawn. Below, the main phases of an ERP implementation project are described. Each phase was given a number (in parentheses) in order to ease further references. Some of the stages below may not be present in particular methodologies; other phases may be joined or mixed. Nonetheless, the given framework captures the main steps involved in ERP implementation project.

Project organisation (P1) – at this stage, a Steering Committee and Implementation Team are constituted and implementation works are started. The general plan describing implementation tasks is prepared.

Training how to manage a company with the use of ERP system (P2) – members of the Steering Committee and Implementation Team are training partici-

pants. The goal of the training is to prepare management personnel and ERP system key users to manage a company with the use of the ERP system.

Enterprise analysis (P3) – the goal of the analysis is to assess the enterprise condition and the possibilities of its improvement with the help of the ERP system. The particular subjects of analysis are corporate strategy, company organisational structure, economic indicators illustrating business condition, user needs etc.

Implementation design (P4) – this phase comprises the project definition and elaboration of the project schedule with the concrete steps of the implementation project with the people responsible. The implementation strategy and project goals with appropriate measures are defined.

Training on ERP system use (P5) – this stage is often called "conference room pilot". The implementation team is trained on the use of the ERP package. The training covers the whole ERP functionality being introduced. At this stage, the ERP package parameterisation and customisation are completed.

Detailed project planning (P6) – the project schedule receives details respecting the ERP package specificity and actual company condition. The details comprise project stages, dates and duration times, definition of any additional subprojects, etc.

Pilot implementation (P7) – at this stage, often called "live pilot", the ERP package is being operated with the use of actual data, together with legacy systems. The goal of this stage is to prove that the ERP package is working correctly and is accepted by users.

System start (P8) – in this phase, the ERP package replaces legacy systems and becomes the only system used within the whole company. There are several possible ways to run the system and corresponding names of approaches, e.g. parallel, phased, "big bang", "cold turkey", pilot approach etc. (e.g. Markus et al. 2000b; Parr and Shanks 2000b). Nevertheless, the ultimate goal of this phase is to start the operation of the ERP package on a daily basis.

Post implementation review (P9) – the chosen solutions are being verified as regards their usefulness for the company. The project run is subject to assessment and the completion of implementation goals is estimated. If necessary, some changes in solution and complementary training are completed.

4 Research Data Characteristics

The research of the ERP system implementation projects was conducted from the perspective of ERP systems and services suppliers. The research sample was comprised of the consultants and experts representing various suppliers of ERP systems.

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. Therefore, they provide a broad view of the

projects' conditions. The experts were presented with the collection of success factors together with the list of project stages. For each implementation phase, they were asked to list the most important success factors at any given stage of a project.

Table 2. Respondents and their ERP experience

Position	Work experience	ERP experience	Number of projects	ERP packages
Implementation Department Manager	8	6	12	Platinum for Windows
Project Leader	3	2	5	Platinum for Windows, e by Epicor
Business Development Manager	14	7	5	MAX ICL, SAP R/3
Project Leader	6	6	15	Digitland Enterprise
Consultant	7	6	10	MAX for Windows (Kewill), IFS Applications
Senior Consultant, Training Department Manager	40	9	15	MAX ICL, Oracle Process Manufacturing
Financial Consulting Manager	7	3	9	SAP R/3
Senior Manager	16	8	3	BPCS, SAP R/3

During the research, 8 experts' opinions were gathered. The experts represented 7 firms supplying ERP systems and implementation services. They were involved in a total of 74 ERP implementation projects in Poland which gives an average value equal to 9.3. The ERP systems included internationally known packages such as SAP or IFS, as well as systems developed and known in Poland like Digitland Enterprise. The respondent's experience in dealing with ERP projects ranges from 2 to 9 years with 5.9 average value. The information about the participants and their experience at the time of conducting the research is provided in Table 2.

5 Success Factors Relevance

Table 3 contains the numbers of respondent answers as regards their opinion about the subsequent factors importance in the stages of ERP implementation. The

stages are denoted by the numbers from 1 to 9. For each factor, the sum of all its indications through all phases was calculated and placed in column *Total*. Additionally, column *Rank* contains the ranks of factors calculated on the basis of the decreasing number of figures in column *Total*. Similarly, for each project phase, the answers as regards all indicated factors by respondents within a particular phase were summarised and placed in a row *Total* in Table 3. The success factors' relevance phase by phase is described in the following.

Project organisation (P1) – this is the most demanding phase of an implementation project with the most answers among all phases. At this stage of project run, the most important factors are the project manager (A) and top management awareness (G) – both received 5 answers from 8 experts. Other important factors during the first implementation phase are top management support (F), balanced team composition (B) and their involvement in implementation duties (C). Each of these 3 factors received 4 answers.

Training how to manage a company with the use of ERP system (P2) – at this stage, only two factors are of great importance: balanced team composition (B) and appropriate training (Q), each receiving 5 answers. Apart from them, only 4 other factors received single answers from the respondents.

Enterprise analysis (P3) – in this phase, respondents perceive balanced team composition (B) as an important factor (4 answers). They also recognise the importance of top management awareness (G) and, naturally, appropriate enterprise analysis prior to the start of an implementation (L). Each of these last two factors received 3 answers.

Implementation design (P4) – this stage is very demanding and has many respondent answers. The experts perceive balanced team composition (B) as a very important factor (5 answers) at this stage. In addition, they consider the definition of a detailed schedule (K) as an important factor (4 answers). The respondents notice the importance of the project manager (A), implementation team involvement (C), co-operation with the supplier (E), top management participation (H) and the definition of implementation goals (J) during the process of implementation design (each factor received 3 answers).

Table 3. Success factors importance across ERP implementation phases

	Factor	ERP Implementation phases									Total	Rank
		P1	P2	P3	P4	P5	P6	P7	P8	P9		
A	project manager	5		1	3		3	1	1		14	4
B	team composition	4	5	4	5	2	4	4	3	1	32	1
C	team involvement	4			3	2		1	1		11	6
D	motivation system							1			1	22
E	co-operation with supplier	2	2		3	2	2	3	3	1	18	2
F	top management support	4			1	1	1		1	1	9	9
G	top management awareness	5		3	2		3	1	1	1	16	3
H	top management participation			2	3		1	1	1		8	11
I	linking with strategy			1	1	1					3	18
J	implementation goals	2	1		3		1	2	1		10	7
K	detailed schedule	1		1	4		4	3	1		14	5
L	pre-implementation analysis	1	1	3	1	1	1		1	1	10	8
M	organisation change										0	25
N	monitoring and feedback							1	1	2	4	17
O	implementation promotion	1									1	23
P	fast effects				1		1	2	1	1	6	14
Q	appropriate training		5			3					8	12
R	investment plan				1						1	24
S	project team empowerment	2					1	1	1		5	15
T	financial budget	1						1	1		3	19
U	work time schedule	1	1	1		2		2	2		9	10
V	IT infrastructure	1						3	1		5	16
W	system reliability								2		2	21
X	minimal customisation										0	26
Y	legacy systems					1			2		3	20
Z	implementation experience	1		1	1	1	1		1	2	8	13
	Total	35	15	17	32	16	23	27	26	10		

Training on ERP system use (P5) – during this phase, respondents notice only the importance of an adequate training program (Q), which received 3 answers.

Detailed project planning (P6) – at this stage, respondents consider balanced team composition (B) and definition of a detailed schedule (K) as important factors (4 answers each). They notice the importance of project manager (A) and top management awareness (G) in this phase of the project (3 answers each).

Pilot implementation (P7) – in this phase, balanced team composition (B) is considered to be important (4 answers). Respondents recognise the significance of co-operation with the supplier (E), definition of a detailed schedule (K) and appropriate IT infrastructure (V), giving each factor 3 answers.

System start (P8) – at this stage, respondents indicate many factors to be important, however, most factors received only single answers. Only two factors: balanced team composition (B) and co-operation with the supplier (E) are perceived as quite important (3 answers each) in this phase of the project.

Post implementation review (P9) – in this phase respondents do not distinguish the clear importance of any factors, they indicate only single factors as being important at this stage.

The number of indications of factors within individual phases can be perceived as a measure of particular phase importance. These numbers are present in the row *Total* in Table 3. Thus, taking into consideration the above-mentioned numbers, we can say that the first phase – project organisation – is the most important stage of an implementation project. The second most important phase is implementation design and, what is worth noting, it is also connected with the organisational activities. The next phases in order of importance are: pilot implementation and system start, followed by detailed project planning which is somewhat connected with project definition activities.

Therefore, judging by expert opinions, we can say that the most important stages of an implementation project are those related to project definition and, in the next position, activities connected with the ERP system start. It is worth noting that the planning phase of the project is also considered the most critical by ERP adopters, as Parr and Shanks (2000a) concluded and what could be drawn from Somers and Nelson's (2001) results.

6 The Most Important Success Factors

Similarly to the project phases, the number of indications of a particular factor within all implementation stages can be perceived as a measure of the factor importance through the whole project. These numbers are present in column *Total* in Table 3. Additionally, the ranks were calculated on the basis of decreasing numbers of factor indications and were placed in the column *Rank*. According to the order described above, the most important factors are discussed in the following.

1. *Balanced team composition (B)*. It is considered as very important or important for almost all phases of the implementation project, except for stages related to training on ERP system use and post implementation review. Correspondingly, respondents recognise only moderate importance of this factor during the system run.
2. *Co-operation with supplier (E)*. Having importance to a large extent lower than the first one, this factor is of moderate importance through the majority of project stages. There is no separate phase of special importance of this factor. Respondents perceive it as totally unimportant during enterprise analysis and post implementation review.
3. *Top management awareness (G)*. The respondents perceive its special importance in the first phase of a project, i.e. project organisation. They also notice the moderate importance of this factor within the remaining organisational

phases of the project—enterprise analysis, implementation design and detailed project planning.

4. *Project manager (A)*. It has, similar to factor (G), exceptional importance during the organisational phases of a project. Respondents remark on its special importance in the first stage of a project and also consider it important during implementation design and detailed project planning.
5. *Definition of detailed schedule (K)*. It is important, not surprisingly, during 'planning' phases of the project, i.e. implementation design and detailed project planning. This factor is also perceived as quite important at the pilot implementation stage of a project.

7 Implications and Conclusions

Taking into consideration the results of the research, several conclusions can be drawn regarding success factors relevance through the ERP implementation project run and resulting consequences for the project organisation and management. The findings suggest that practitioners dealing with ERP implementations should pay special attention to particular phases of a project. They should especially consider the organisational and planning stages of an implementation project, when it comes to the creation of a project team and the definition of implementation tasks. In the next order, they should take special care of the stage connected with system rollout and its preparation activities.

On the basis of expert opinions, definitely the most important factor is balanced team composition (B) with high importance through almost all phases of a project. The second most important factor – good co-operation with the supplier (E) – is also significant in almost all phases of a project, but its importance is considerably lower. On the other hand, the third most important factor – top management awareness (G) – is especially significant in the first phase and has also some meaning in other phases connected with project definition.

It is worth noting that the above-mentioned three most important factors are exactly the same as the ones in the ranking made on the basis of opinions of respondents from enterprises introducing the ERP system into their organisations (Soja 2004). Moreover, in the research conducted by Somers and Nelson (2001), the respondents from enterprises considered top management support as the most important factor, and project team competence, which can be treated as an equivalent of balanced team composition, as the second important factor. On the other hand, the Somers and Nelson's factors describing good co-operation with the supplier, i.e. vendor support and partnership with vendor, received generally low ranks in overall ranking of factors importance (9 and 20 among the total of 22 factors).

Therefore, practitioners should particularly assure top management support for the project and their awareness about the importance of the whole endeavour. They should also guarantee the proper composition of the implementation team, which should contain competent people from various departments. The supporting argument is that, on the basis of the research described, both parties involved in an

implementation project agree about the topmost importance of the above-mentioned issues.

People involved in ERP implementations should also be aware of the changing importance of most factors through the implementation project run. They should bear in mind the existence of the most important factors within phases; however, they must not completely overlook other less important factors according to the research described. The practitioners may take into consideration the above mentioned conclusions in planning the implementation tasks, allocating and shifting resources according to particular project stage requirements.

The result of this study should also benefit the academic community, as it shows the need of researching ERP projects taking into account the project lifecycle, in order to fully understand the ERP system implementation. It suggests that the mechanisms governing the ERP implementation tend to change across the project phases. The main limitation of this study is that it is based on the opinions of only 8 ERP suppliers' representatives. However, the experts involved in this research comment on 74 implementations of various ERP systems, which adds credibility to the results.

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