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Success factors in ERP systems implementations: lessons from practice

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Abstract

Purpose – The purpose of this paper is to reveal the mechanisms determining the success of enterprise resource planning (ERP) implementations on the basis of research conducted among practitioners dealing with ERP projects.

Design/methodology/approach – A collection of potential ERP implementation success factors was identified. The respondents expressed their opinions concerning the importance of subsequent factors for the implementation success and about the factors' appearance in their projects. The synthetic measure of implementation success was constructed and the factors' impact on the implementation project success was examined. Then, the most influential factors for the ERP implementation success were selected.

Findings – The paper recognises the factors that have the greatest influence on implementation success, regardless of the project type. Moreover, the leading roles of certain factors appear among specific project groups. The practitioners do not appreciate the significance of particular factors which have an important influence on project success. Nevertheless, some factors, such as project manager presence, are overestimated. Some differences in perceptions and attitudes between parties involved in an implementation project were revealed.

Research limitations/implications – There is need for further research on the success factors verification depending on the project type, with possible introduction of additional criteria such as enterprise industry.

Practical implications – The research outcome is useful for professionals leading implementation projects and those making decisions for the first time on ERP system implementation. The results can be used by practitioners while managing the project and handling people's attitudes.

Originality/value – This paper proves the influence of particular factors on the ERP project's success in certain circumstances, thus giving insight into the genuine mechanisms determining ERP project outcome.

Keywords Manufacturing resource planning, Project management

Paper type Research paper

Introduction

The most advanced group of integrated systems are the ERP class systems that include mechanisms based on planning and forecasting, which support the management of the entire enterprise and integrate all of its activity. The effective implementation of such a system can bring about many benefits, beginning with the most general, such as enterprise management and information flow enhancement. Consequently, improvement of economic indicators is achievable, which finally leads to an increase in enterprise profitability.

However, the achievement of these above-mentioned benefits depends upon the effective implementation of the full functionality of the ERP system, which is quite difficult. There are a great many implementation projects that do not bring about the

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planned effects, or even end up in project abandonment (e.g. Holland *et al.*, 1999; McNurlin and Sprague, 2002). The duration and budget of the implementation projects significantly exceed initial estimates, and the planned scope of the implementation is limited (e.g. Parr and Shanks, 2000). Therefore, conducting research seems crucial in order to explore the conditions having an influence on the project outcome.

The main purpose of this study is to reveal the mechanisms determining the success of ERP implementation projects. In particular, this paper identifies potential ERP implementation success factors and verifies their significance with the help of real implementation project participants. Furthermore, during the next stage of research, the analysis extracts the group of factors that most influence the implementation success. While analysing the factors' influence, the study takes into consideration various types of projects, which differ in duration time, project scope and company size.

The identification of ERP implementation success factors

Overview of the research on ERP implementation success factors

ERP system implementation is a process of great complexity, with a great many conditions and factors potentially influencing the implementation. These conditions could have a positive effect on the outcome of ERP project, while their absence could generate problems during implementation. The results of some major research on ERP implementation success factors have been described below.

Burns *et al.* (1991), researching critical success factors in MRP implementation, suggested dividing potential factors into environmental and methodological. Environmental factors include, apart from those describing enterprise activity, the product technology level and the organisation's willingness to change. The methodological factors are connected with the implementation approach incorporated. On the basis of 504 survey responses, most of the methodological factors were identified as being associated with MRPII success, while only two of the environmental factors were found to be connected with implementation success – product technology and organisation willingness to change.

In other research, Parr *et al.* (1999) turned to experts participating in many implementation projects. The research sample consisted of ten experts who had participated in a total of 42 ERP implementation projects, mainly as project managers. Based on interviews with the experts, ten candidate factors necessary for successful implementation of ERP systems are identified. These factors were divided into groups related with management, personnel, software and project. Of these ten candidate factors, three are of paramount importance. They are management support of the project team and of the implementation process, a project team that has the appropriate balance of business and technical skills, and commitment to change by all the stakeholders.

Holland and Light (1999) presented a number of potential success factors in ERP implementation and suggested their division into strategic and tactical factors. The model was illustrated on a sample of two ERP implementation projects. Among 12 factors, the authors highlighted the critical impact of legacy systems upon the implementation process and the importance of selecting an appropriate ERP strategy. However, they did not formulate conclusions regarding factors' ranking.

Esteves and Pastor (2000) suggested a unified ERP implementation critical success factors model. This model is based on the analysis of considerable research regarding implementation success factors. The authors indicated that factors should be categorised into strategic and tactical factors from organisational and technological perspectives.

Similarly, the research of Nah *et al.* (2001) was based on literature review and yielded a model of 11 critical success factors. This model was next verified on the basis of the opinions of 54 CIOs implementing ERP into their organisations (Nah *et al.*, 2003). The five most critical factors identified by the CIOs were: top management support, project champion, ERP teamwork and composition, project management, and change management program and culture.

Somers and Nelson (2001) described the importance of critical success factors across the stages of ERP implementations using the responses from 86 organisations implementing ERP. From their broad list of 22 critical success factors for ERP implementation, in overall ranking, the most important are: top management support; project team competence; interdepartmental cooperation; clear goals and objectives; project management; and interdepartmental communication.

Al-Mashari *et al.* (2003) presented a taxonomy of ERP critical factors where 12 factors were divided into three dimensions related to the stages of ERP project, which are: setting-up, deployment and evaluation. The taxonomy presented emphasises that a clear vision and business director is fundamental for the success of ERP system implementation. It also highlights the importance of business process management and suggests that the evaluation and performance monitoring of ERP system's implementation can lead to the achievement of all desired business goals and objectives. Finally, the authors conclude that the most essential element of success and the pre-requisite for successful and effective ERP implementation is leadership and commitment.

Brown and Vessey (2003), on the basis of their research, concluded that there are five success factors for ERP projects and illustrated their significance with the use of three successful ERP implementations case studies. The resulting factors are: top management is engaged in the project, not just involved; project leaders are veterans, and team members are decision makers; third parties fill gaps in expertise and transfer their knowledge; change management goes hand-in-hand with project planning; and a "satisficing" mindset prevails.

The results of the above-mentioned research on ERP implementation success factors illustrate the problem complexity and the variety of approaches. Potential success factors and the results of research differ substantially from each other. Except for general agreement regarding the necessity of management support for implementation, it is rather difficult to compare the outcomes achieved by the research. This difficulty is deepened by the difference in research samples, which ranged from hundreds of manufacturing enterprises, through a group of experts, up to a set of only a few implementation cases. The factors proposed by the researchers, covering a wide range of aspects, represent various levels of generalisation; there are models with only five factors, as well as those containing more than 20 elements. The models described employ a variety of categorisations and there does not appear to be any single generally accepted method of factors' grouping. Furthermore, the empirical

verification is lacking in the research, since the authors focus mainly on examining respondents' opinions regarding a factor's importance for the ERP project, but they do not verify the actual influence of the factors on the implementation outcome.

The general model of ERP implementation success factors

Taking into account the results of the research mentioned, literature studies (e.g. Al-Mashari and Zairi, 2000; Markus and Tanis, 2000; Stefanou, 1999; Stewart *et al.*, 2000) and the author's own experience in the business environment, a general model of ERP implementation success factors has been proposed (Soja 2004a, b). The purpose of this model was to cover the broad range of mechanisms influencing an ERP implementation project. The factors existing in other research were carefully analysed, compared and grouped. Resulting success factors are presented in Table I. They are divided into the groups regarding their broader aspect, using this study's own categorisation. The separated groups consist of factors related to implementation participants (factors A1-A5), top management involvement (B1-B3), project definition and organisation (C1-C9), project status (D1-D5) and information systems (E1-E4).

The understanding of a successful implementation is the crucial point in the ERP implementation success factors issue. In the research presented, only Burns *et al.* (1991) defined success, addressing the subjective assessment of implementer's intentions and achieved implementation level on the basis of the ABCD checklist, which is a method of classifying MRPII adopters. In other research, implementation success was not clearly defined or was treated as satisfying the planned time and budget. The proposed model suggests the definition of a successful implementation on the basis of the success understanding in the information systems domain. Implementation success is perceived as the completion of assumed goals and implementation scope within a planned time and budget, while achieving user satisfaction (e.g. Lyytinen, 1988). It is worth noting that all above-mentioned dimensions of a project success, except for user satisfaction, are the criteria used for judging project success most often quoted by respondents dealing with project management in White and Fortune's (2002) study. Similarly, the definition of an ERP implementation success given by Brown and Vessey (2003) captures all aforementioned dimensions, as they define project success as "an up-and-running system with agreed-upon requirements delivered within schedule and budget".

Research methodology

In order to investigate the mechanisms determining ERP implementation success, exploratory research was conducted. A field study was used as a general research approach and a questionnaire was employed as a data-gathering technique (e.g. Boudreau *et al.*, 2001).

The research questions posed in the study are as follows:

(1) How do practitioners perceive success factors' importance in an ERP implementation project?

(2) How do success factors influence an ERP implementation outcome (success)?

The research was designed to be conducted in a twofold manner: first, from the viewpoint of enterprises that had decided on an ERP system implementation, and second, from the perspective of ERP systems and services suppliers. Both groups of

	Factor	Factor description
A		Related to the implementation participants
A1	Project manager	The project manager is the person from the enterprise who sacrifices most of his/her working time to implementation duties
A2	Team composition	The implementation team consists of various people having high qualifications and knowledge about the enterprise
A3	Team involvement	The project manager and members of the implementation team are strongly involved in the implementation duties
A4	Motivation system	There is a motivation system rewarding participation in implementation and on-time task delivery
A5	Co-operation with supplier	Good co-operation with the system supplier who is competent and offers high level of services
B		Related to top management involvement
B1	Top management support	Top management support for the project and the management members' involvement in implementation duties
B2	Top management awareness	Top management awareness regarding the project goals and complexity, labour required, existing limitations, required capital investment and project inevitability
B3	Top management participation	Top management participation in the project schedule and goals definition
C		Related to the project definition and organisation
C1	Linking with strategy	Linking the implementation project with enterprise strategy (implementation as a method of achieving the enterprise's strategic goals)
C2	Implementation goals	The definition of implementation goals – defined in economic terms at the enterprise-wide level
C3	Detailed schedule	The definition of detailed implementation scope, plan and schedule with responsibility allocation
C4	Pre-implementation analysis	Enterprise analysis and diagnosis prior to the start of implementation, and the creation of the enterprise functioning model with the integrated system support
C5	Organisational change	The change in the enterprise organisation and its business processes
C6	Monitoring and feedback	Implementation monitoring and feedback – information exchange between the project team and end-users
C7	Implementation promotion	Implementation promotion – information broadcasting about the project by the implementation team members to other enterprise employees
C8	Fast effects	The visible, fast, partial, positive results of the implementation
C9	Appropriate training	An adequate training program suitable to the enterprise's needs

(*continued*)

Table I.
The general model of ERP implementation success factors

	Factor	Factor description
D		Related to the project status
D1	Investment plan	Formal introduction of the implementation project in the enterprise investment plan
D2	Project team empowerment	The empowerment of the project team members to make decisions and their high position in the enterprise hierarchy
D3	Financial budget	The financial resources assured during the implementation
D4	Work time schedule	The work time assured for the implementation team members (work time schedule)
D5	IT infrastructure	The appropriate IT infrastructure assured for the implementation project
E		Related to information systems
E1	System reliability	The ERP system reliability, its user friendliness and fit to the enterprise's needs
E2	Minimal customisation	Minimal system customisation – the use of defined patterns and solutions embedded in the system
E3	Legacy systems	The legacy systems adaptation for the operation in the ERP integrated system environment
E4	Implementation experience	The project team members' experience gained during former information systems implementation

Table I.

respondents represent two parties involved in an implementation project and it is valuable to know their beliefs regarding ERP success factors.

In order to address the issues described by the research questions, two questionnaires were designed, one for each of the above-mentioned groups of practitioners, and were subsequently distributed among people taking part in the study.

To address the first research question, i.e. factors' importance, the respondents' opinions regarding a success factors' importance were captured with the help of the Likert scale. The respondents were presented with a list of success factors (see Table I) and were asked to express their opinions about the importance of each factor listed using a scale from 0 to 5, where 0 stood for no importance at all and 5 meant the highest importance for the project's success. This part of the questionnaire was common for both groups of respondents, i.e. respondents from the enterprises and the experts. Additionally, the experts were asked to mark the factors whose occurrences, in their opinion, are necessary for a successful implementation.

It must be emphasised that opinions expressed by the respondents regarding a factors' importance reflect their subjective views, based on their own experience and perception. The respondent experience regarding a particular factor could be either positive or negative. For instance, he/she could recognise a paramount importance of top management support either because his/her successful project was greatly supported by top management, or due to the complete lack of interest from top management what resulted in a project disaster. Therefore, the respondent's estimation of a factors' importance does not capture the project conditions and does not say much about factors' influence on an implementation outcome. We still need information on

how the mechanisms captured by the success factors appeared among the projects examined, and, also, we require an assessment of the implementation outcome.

Hence, in order to tackle the second research question, i.e. factors' influence on project success, the questionnaire administered among enterprises contained sections aimed at gathering data concerning the appearance of success factors in the projects under estimation, as well as figures allowing us to estimate the overall implementation success. Namely, the respondents from enterprises estimated the level of occurrence of each factor (on a Likert scale from 0 to 5) in their ERP projects.

In order to assess the overall implementation outcome, a synthetic measure of implementation success was worked out based on five partial measures, which were researched by a questionnaire. The measures, defined in Table II, include:

- the actual scope of an implementation with respect to the planned implementation;
- the actual duration with respect to the assumed duration;
- financial budget with regard to the planned budget;
- users' level of satisfaction from the system introduced; and
- the existence and achievement of project goals.

The partial measures were next normalised and added up in order to calculate the synthetic measure of implementation success.

After the calculation of implementation success measure, for each success factor, the correlation coefficients between the level of factor occurrence and the success measure were calculated for projects researched. This computation was performed in order to determine the impact of a factor's occurrence on the successfulness of an

Measure	Measure definition
Scope[a]	The actual scope of an implementation with respect to the planned implementation (%)
Duration[b]	Actual duration/planned duration
Financial budget[b]	Financial budget with regard to the planned budget (%)
User satisfaction[a]	Number from 0 to 5 depending on declared user satisfaction level: • 0 – extremely low • 1 – very low • 2 – low • 3 – average • 4 – high • 5 – very high
Goals achievement[a]	Number from 0 to 5 estimated on the basis of questionnaire data regarding: • number of declared implementation goals • goals measurability • level of goals completion • declaration of goals as implementation effects

Table II.
Definition of partial measures of an ERP implementation success

Notes: [a] Stimulant – measure growth increases success level; [b] destimulant – measure growth decreases success level

implementation project. Therefore, given these correlation coefficients, the factors determining ERP implementation success can be extracted.

The research questionnaires, apart from data regarding a factors' importance and occurrence, also comprised questions with a mixture of scale, multiple choice and open questions. The purpose of these questions was to provide demographic data and details necessary to calculate partial measures of an implementation success (see Table II).

Research data

Research sample

A pilot survey was conducted with questionnaires presented in person to eight people representing enterprises introducing ERP into their organisations and to five experts working at companies delivering ERP systems and implementation services. The pilot study resulted in some revisions and modifications of research questionnaires. Additionally, the questionnaires were validated as regards their content by several IT/IS researchers and professionals.

The revised versions of questionnaires were next distributed to a broad range of respondents. There were two versions of questionnaires: a paper version, distributed by post, and an electronic version distributed by e-mail. Where it was applicable, telephone calls were made in order to encourage respondents to fill out the questionnaire. The research was carried out in Poland for the years 2001 and 2002.

In the case of respondents from enterprises, the research questionnaire was directed toward the people playing leading roles in the implementation (the project leader, if possible). They had insight into their projects and were able to answer the survey questions and to assess the measures included in the questionnaires. During the research, 223 enterprises were contacted and 68 (30 per cent response rate) answers were obtained from enterprises representing the whole country and various industries.

In order to examine the experts' opinions, the appropriate 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 broader view of the projects' conditions and their opinions, representing another party of project participants, could be compared with the viewpoint of people from within the companies introducing an ERP system. During the research, 45 people were questioned and in the end 31 (69 per cent) experts' opinions were gathered. The experts represented 22 firms supplying ERP systems and implementation services.

The arrangement of data from enterprises

The researched enterprises represent a broad range of ERP initiatives. 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. Therefore, the analysis of data from respondents from enterprises was performed from three perspectives. Among the criteria defining division into perspectives are enterprise size, implementation scope and implementation duration.

The criterion defining enterprise size was the number of employees. For the needs of analysis, enterprises have been 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 was made by taking into consideration the modules implemented in the ERP system. The following modules were taken into consideration: Finance, Purchasing, Inventory, Sales, Shop Floor Control and MRP Explosion. Full-scope implementations were defined as the projects where the modules Shop Floor Control and MRP Explosion were implemented and also satisfying the condition that at least four modules were introduced. Given such a definition, the group of full-scope implementations comprised 31 projects, while the rest of the projects (37) created the group of partial implementations.

In the division taking into account project duration, short implementations were defined as projects lasting up to one year, and those lasting more than one year were marked as long implementations. The group of short implementations comprised 33 enterprises; similarly 33 projects were recognised as long implementations. In the case of two implementations, the projects were not finished when the research was conducted.

Discussion of findings

Factors' importance

In order to illustrate the respondents' opinions regarding the importance of proposed factors, an average was calculated for each factor. These calculations have been made for all experts, all researched enterprises, as well as for defined project groups using mentioned criteria (i.e. SIZE, SCOPE and TIME). For each set defined, the factors' ranking was calculated on the basis of decreasing average importance evaluated within a given group. Next, the Spearman rank correlation coefficients r_s (e.g. Walpole *et al.*, 1998) were calculated in order to explore the relationship between the factors' ranks in defined groups. The r_s coefficients were calculated for pairs of separated groups created by the analysis perspectives, and, also, between all respondents from enterprises and the experts (see Table III).

Judging from the high values of r_s coefficients calculated for groups of respondents from enterprises (all above 0.84); we can conclude that respondents from enterprises were unanimous in their judgement of the factors' importance for the project outcome, regardless of established division into groups. Therefore, in the further discussion of factors' importance, we take into consideration the group of all respondents. A more detailed discussion of factors' importance is available in Soja (2004a).

Table IV contains data as regards factors' average importance and ranks in the opinion of both groups of respondents. In order to verify the reliability of scale, the Cronbach's alphas were calculated for factors' importance and reached the level of

Table III.
Spearman ranks correlation coefficients r_s regarding factors' importance

	Pairs of respondent groups				r_s
Projects	Small	–	Large		0.90
	Full scope	–	Partial scope		0.84
	Short	–	Long		0.89
	All enterprises	–	Experts		0.77

Factor		Enterprises Importance Rank	Enterprises Importance Average	Experts Importance Rank	Experts Importance Average	Necessity Rank	Necessity Number
A1	Project manager	12	4.23	2	4.61	1	23
A2	Team composition	1	4.60	4	4.58	3	20
A3	Team involvement	5	4.46	8	4.35	7	17
A4	Motivation system	21	3.77	24	3.06	20	4
A5	Co-operation with supplier	2	4.54	11	4.14	9	16
B1	Top management support	8	4.40	1	4.65	5	18
B2	Top management awareness	3	4.51	10	4.26	10	14
B3	Top management participation	22	3.66	22	3.26	17	6
C1	Linking with strategy	17	4.00	13	3.97	13	9
C2	Implementation goals	19	3.90	14	3.90	16	7
C3	Detailed schedule	7	4.44	5	4.55	2	21
C4	Pre-implementation analysis	15	4.09	12	4.00	12	11
C5	Organisation change	20	3.84	23	3.08	23	2
C6	Monitoring and feedback	11	4.31	15	3.88	14	9
C7	Implementation promotion	23	3.54	21	3.27	22	3
C8	Fast effects	25	3.31	20	3.32	24	1
C9	Appropriate training	16	4.02	17	3.54	21	4
D1	Investment plan	14	4.13	18	3.35	15	8
D2	Project team empowerment	10	4.40	6	4.42	6	18
D3	Financial budget	9	4.40	3	4.61	4	20
D4	Work time schedule	13	4.22	7	4.39	8	17
D5	IT infrastructure	6	4.46	9	4.29	11	14
E1	System reliability	4	4.51	16	3.56	18	6
E2	Minimal customisation	24	3.48	26	2.04	26	0
E3	Legacy systems	26	3.17	25	2.29	25	1
E4	Implementation experience	18	3.93	19	3.35	19	5
	Cronbach's alpha		0.90		0.89		

Table IV.
The factors' importance in the opinions of respondents

0.90 and 0.89 in the case of respondents from enterprises and experts, respectively. Moreover, for each factor, Table IV includes data concerning the number of experts indicating particular factor as necessary for project success and related rank calculated on the basis of decreasing number of reporting experts (column Experts/Necessity).

The respondents from enterprises quite agree with experts as regards factor importance, what can be judged by the reasonably high value of r_s coefficient, which is equal to 0.77 (see Table III). In particular, both groups indicate factors Team composition (A2), Team involvement (A3) and Detailed schedule (C3) as the most important and necessary elements for project success (see Table IV). Additionally, experts suggest factors Project manager (A1), Financial budget (D3), Top management support (B1) and Project team empowerment (D2) to be of paramount importance. These factors, however, are somewhat underestimated by respondents from enterprises. The latter, on the other hand, indicate the importance of factors Co-operation with supplier (A5), Top management awareness (B2) and System reliability (E1). These factors, in turn, are underrated by experts, which is exceptionally evident in the case of factor System reliability (E1).

Factors' influence on implementation outcome

Table V contains data as regards correlation of factors' occurrence and implementation success. The correlation coefficients and related ranks were calculated for all factors within the group of all enterprises and within each subset extracted by analysis perspective. Additionally, the correlation coefficients with statistical significance were marked with asterisks.

Taking into account all researched enterprises, the influence of a factor's occurrence on project success is not great, because the highest correlation value is equal to 0.42. In particular, factors with the greatest influence on implementation success, regardless of the project type, are: Team involvement (A3), System reliability (E1), Team composition (A2), Detailed schedule (C3), IT infrastructure (D5) and Top management support (B1). However, when we take into consideration the division of projects, the influence of factors is significantly higher.

Within the group of small enterprises, factor Implementation experience (E4) definitely has the strongest influence on implementation successfulness (with correlation at level 0.6). The influence of the remaining factors is significantly weaker – correlation coefficients are below 0.4, and, what is interesting, the only statistically significant influence appeared in the case of the factor Investment plan (D1). Within the group of large enterprises, factors Detailed schedule (C3) (correlation 0.68) and Top management awareness (B2) (0.62) clearly have the strongest influence. The remaining factors with the highest influence are: Top management support (B1), System reliability (E1) and Implementation goals (C2). It is worth noting that factor Implementation experience (E4), which has the largest influence on project success among small enterprises, in the case of large enterprises is placed on the last position, having a small negative influence on implementation success.

For full-scope implementation projects, four factors have a clear, strong influence on project success, with correlations from 0.53 to 0.47. These factors are: System reliability (E1), Project team empowerment (D2), Team composition (A2) and Linking with strategy (C1). In the case of partial implementation scope, six factors have the greatest influence on implementation success. This influence has a correlation from 0.58 to 0.49. These factors are: Financial budget (D3), Top management support (B1), Investment plan (D1), Detailed schedule (C3), IT infrastructure (D5) and Team involvement (A3). The interesting fact is that the most important factor among the projects with restricted scope, i.e. assuring the financial resources needed during the implementation, does not have any influence on full-scope implementation projects. Worth noting is also the fact that there are as many as three factors connected with implementation project status in the group of most influential factors.

For short projects, factor Linking with strategy (C1) has the greatest influence (0.54) on project success. The other most important factors are: Co-operation with supplier (A5), Team involvement (A3), System reliability (E1) and Implementation experience (E4). For long projects, factor IT infrastructure (D5) has a strong influence, which reaches the level of 0.68. Factor detailed schedule (C3) also has a strong influence (level 0.57). Next, factors Implementation goals (C2), System reliability (E1), Team composition (A2) and Work time schedule (D4) have great influence (from 0.49 to 0.43) on project success.

Judging from the factors' influence on particular type of project, we can state that the wider the implementation project (i.e. the longer its duration and the larger the

		Enterprise size						Implementation scope				Duration time			
		All		Small		Large		Full		Partial		Short		Long	
	Factor	Rank	Correlation	Rank	Correlation	Rank	Correlation	Rank	Correlation	Rank	Correlation	Rank	Correlation	Rank	Correlation
A1	Project manager	23	0.17	11	0.20	23	0.14	14	0.28	23	0.15	22	0.20	22	0.19
A2	Team composition	3	0.40*	4	0.32	12	0.48*	3	0.48*	9	0.37**	15	0.34	5	0.45*
A3	Team involvement	1	0.42*	3	0.33	10	0.50*	12	0.31	6	0.49*	3	0.46**	9	0.38**
A4	Motivation system	15	0.30**	23	0.00	11	0.49*	5	0.38**	17	0.24	11	0.36	13	0.32
A5	Co-operation with supplier	7	0.36*	16	0.15	9	0.53*	11	0.32	7	0.40**	2	0.48*	15	0.28
B1	Top management support	6	0.38*	17	0.13	3	0.57*	21	0.16	2	0.54*	13	0.34	7	0.40**
B2	Top management awareness	8	0.36*	22	0.00	2	0.62*	8	0.35	8	0.39**	17	0.33	8	0.39**
B3	Top management participation	17	0.24**	26	−0.16	7	0.55*	20	0.20	14	0.29	21	0.26	12	0.32
C1	Linking with strategy	13	0.34*	6	0.25	15	0.42*	4	0.47*	16	0.26	1	0.54*	17	0.27
C2	Implementation goals	14	0.31**	25	−0.07	5	0.57*	9	0.35	13	0.30	8	0.37	3	0.49*
C3	Detailed schedule	4	0.39*	20	0.04	1	0.69*	19	0.21	4	0.52*	18	0.30	2	0.57*
C4	Pre-implementation analysis	21	0.19	19	0.07	20	0.27	25	0.01	11	0.33**	23	0.15	21	0.25
C5	Organisation change	18	0.24**	14	0.17	18	0.31	16	0.26	18	0.23	12	0.34	18	0.26
C6	Monitoring and feedback	16	0.27**	5	0.29	21	0.26	17	0.26	15	0.28	20	0.27	11	0.34
C7	Implementation promotion	24	0.13	21	0.03	22	0.20	7	0.36**	25	−0.04	25	0.10	16	0.28
C8	Fast effects	19	0.23	12	0.18	19	0.29	6	0.36**	24	0.14	14	0.34	23	0.08
C9	Appropriate training	20	0.22	24	−0.04	16	0.37**	13	0.29	22	0.17	19	0.29	10	0.35**
D1	Investment plan	9	0.36*	2	0.38**	17	0.34**	23	0.13	3	0.54*	7	0.38**	19	0.26
D2	Project team empowerment	12	0.34*	7	0.23	13	0.43	2	0.50*	19	0.22	9	0.36	20	0.25
D3	Financial budget	10	0.35*	18	0.07	6	0.55*	24	0.03	1	0.58*	10	0.36	14	0.32
D4	Work time schedule	11	0.34*	8	0.22	14	0.43*	10	0.35	10	0.35**	6	0.39**	6	0.43**
D5	IT infrastructure	5	0.39*	15	0.15	8	0.55*	15	0.26	5	0.51*	24	0.11	1	0.68*
E1	System reliability	2	0.41*	9	0.22	4	0.57*	1	0.53*	12	0.31	4	0.43**	4	0.48*
E2	Minimal customisation	26	0.03	10	0.21	25	−0.07	18	0.25	26	−0.18	16	0.33	26	−0.26
E3	Legacy systems	25	0.04	13	0.17	24	−0.02	26	−0.15	21	0.20	26	0.04	24	−0.05
E4	Implementation experience	22	0.19	1	0.60*	26	−0.15	22	0.15	20	0.21	5	0.42**	25	−0.11

Notes: * $p < 0.01$; ** $p < 0.05$

Table V.
Correlation coefficients between factors' occurrence and success level

enterprise), the greater influence on the project success has the definition of detailed schedule and setting the implementation goals. Furthermore, in the case of extensive projects, one has to pay special attention to the reliability of the system introduced. On the other hand, for the implementation projects introducing partial system functionality, the factors describing project status play the most influential role.

Factors influencing specific projects

The majority of factors strongly influencing implementation projects of particular types also have greatest influence on project success when we take into consideration all the researched enterprises. However, there are some factors whose influence on project success is apparent in the case of particular type of project, while, in general ranking taking into account all examined projects, they are not highly positioned or even do not have any influence on project prosperity. These factors are:

- *Linking with strategy (C1)*. This has the greatest influence on short implementations; is also of great importance for full ERP scope projects,
- *Financial budget (D3)*. This is of greatest significance for partial scope projects; has also big influence on implementation projects in large enterprises.
- *Implementation experience (E4)*. This has the greatest influence on projects in small enterprises; has also big influence on short projects. For other types of projects, this factor practically does not have any influence on project success.

Incorrectly perceived factors

Participants of the implementation projects do not appreciate the significance of particular factors which have an important influence on project success. The factors which are underestimated by experts are System reliability and Co-operation with supplier. The first factor plays the most important role among full scope projects and has a strong influence on implementation success in the case of large enterprises. This factor received very good notes from the respondents from enterprises as regards its importance for the implementation project, but is completely underestimated by experts regarding its importance, as well as occurrence necessity for project prosperity. The second factor, i.e. Co-operation with supplier, plays a very important role in the case of projects with short duration, has essential significance for full scope implementations and for those taking place in large enterprises. This factor is underestimated by experts; however, enterprise representatives regard it as an important factor.

At the same time, the respondents from the enterprises underestimate Work time schedule, which plays very important role in the case of projects in smaller enterprises and with shorter duration time. The experts recognise this to a certain extent, but they do not perceive it as the most important and necessary factor for implementation success.

All respondents underrate Implementation experience and Linking with strategy, which are the most deciding factors in the case of implementations taking place in small companies and those with short duration time, respectively.

On the other hand, there are also factors that are overestimated by respondents. This is especially evident in the case of the factor Project manager, which is considered to be one of the most important factors by the experts and reached a very high level of

occurrence in the projects researched, but does not have any influence on the implementation success.

Conclusions

This study examines the ERP implementation projects using a proposed success factors model. The model was defined on the basis of thorough literature review and feedback from ERP adopters, and the factors were grouped using this study's own novel categorisation. Furthermore, this research employs its own proposal of the synthetic measure of implementation success.

The core contribution of this paper is that it proves the influence of particular factors on the ERP projects success in certain circumstances, thus giving insight into the genuine mechanisms determining ERP project outcome. This research goes far beyond the simple reporting of subjective opinions of respondents and illustrates the actual impact of factors on project success, recognising those of greatest influence.

The findings suggest that the factors' influence on the implementation success should be examined taking into account the division of the projects into groups regarding the project duration, the scope being implemented and the size of an enterprise. The leading roles of certain factors appear in divided groups and imply that the implementations' conditions are diverse depending on project type.

The results demonstrate practitioners' misunderstanding of particular factors' significance for the project outcome. Namely, the findings suggest that practitioners do not appreciate the significance of particular factors which have an important influence on project success. On the other hand, some factors, such as project manager presence, are overestimated.

The research reveals also some differences in perceptions and attitudes between two main parties involved in an implementation project, i.e. people from enterprises introducing ERP into their organisations and experts representing system supplier site.

The research outcome should be useful for professionals leading implementation projects. The knowledge of the illustrated role of particular factors in an implementation process should be beneficial to the project leaders and help them to manage the whole endeavour better. Also, those making decisions for the first time on ERP system implementation in a particular enterprise should take advantage of this study's results and better anticipate possible problems, as well as better assess the chance to succeed. Similarly, the awareness of a diversity of implementers' attitudes could be useful for practitioners in order to manage the change of negative stances and make use of the positive ones.

Moreover, this study should benefit the academic community as it shows how it is possible to investigate the issues influencing ERP project outcome and encourages researchers to develop the mechanism described. Specifically, the researchers studying ERP projects are suggested that while doing research they should take into consideration project type and be aware of a respondent role in the project. Nevertheless, the author hopes that the conclusions drawn in this paper will be at least an inspiration for project enhancement.

The problems demonstrated in this article portray the need for further research on the verification of success factors depending on the project type, with the possible introduction of additional criteria such as enterprise industry. The presence of more

criteria, together with a substantial sample of respondents, should make the analysis more complete and could lead to better categorisation of projects researched, and, also, to the recognition of benchmark projects within each extracted category.

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