

# The Impact of Managers on Successful ERP Implementation

Franc Ravnikar

JZ RTV Slovenija, Kolodvorska 2, 1550 Ljubljana, Slovenija, franci.ravnikar@rtvslo.si

Lately, Enterprise Resource Planning (ERP) has been implemented in public organizations and organizations without competition in the marketplace. It is the ERP system that is almost as badly needed for the competitiveness and success of those organizations in the marketplace. The main reason lies in the fact that operating costs have to be reduced and the optimization of business processes is an option which nowadays is normally implemented together with new ERP. The success rate of ERP implementation remains very low with up to a 90% failure rate, as it is quoted in a lot of researches. Critical success factors (CSF) which influence successful ERP implementation are identical in all organizations. The main goal of this research is to find out the managers' impact on the critical success factors and thus their impact on the successful ERP implementation. Top management support is the most important critical success factor for successful ERP implementation, regardless of the fact whether the organization is on the market or not.

**Keywords:** enterprise resource planning - ERP, critical success factors, business process reengineering, the success rate of ERP implementation.

## 1 Introduction

Organizations in the public sector have to be constrained more and more in reducing its operating costs by increasing restricting financial resources from the state budget. They try to reduce them by business process reengineering (BPR), optimization and implementation of information technology (IT), which nowadays is normally implemented together with the new information system (IS). The information system, which nowadays is implemented, is mostly of ERP solutions (Enterprise Resource Planning – ERP). Classical information systems resulting from a functional departmental orientation while ERP solutions from process-oriented information solutions (Kovacic, 1997:9-10).

The implemented ERP reduce operating costs in terms of integration of departments and operations, optimization of business processes and increased efficiency (Bingi et al., 1999:8 – 10). Qualified personnel and appropriate financial resources are required while the ERP system is implemented. Huge problems for the organization in public sector are, besides adequate sufficient human resources, to acquire appropriate financial resources which have to be appropriately planned in the annual financing plan. Findings of this research are managers' impact on the critical success factors and thus their impact on the successful ERP implementation.

Rao (2000:81) describes an ERP system as a software solution which facilitates the manufacturing of the right pro-

duct, at the right place, at the right time and for the right price. The ERP systems are adjustable modular integrated computer-based systems, developed to operate transactions in the organization. They provide a platform that enables effective real-time production planning and customer responses that integrate the function based processes across all functional areas of the organization. (Hossain et al., 2002:16). Consequently, the management decision support is improved, which in turn is reflected in various forms, such as minimal stock inventory, less unnecessary staff and a more rapid process. ERP implementation brings additional benefits to the organization by changing its organizational structure (O'Leary, 2002:7).

In the past ten years an enormous amount of financial resources has been invested in implementing ERP systems, however, many have been unsuccessful (Magnusson et al. 2004; Mauldin and Richtermeyer, 2004, Parr and Shanks, 2000, Ward et al., 2005, Umble et al., 2003). Foreign and domestic literature indicates that these projects are regarded as high risk with a relatively low success rate ranging from 50 to 90 percent (Zabjek et al., 2009:590). Therefore, it is more than necessary to further investigate these low success rates of the implemented ERP systems. There is a lack of research on unsuccessful projects in practice, since organizations are reluctant to expose their failed projects in public (Zabjek et al., 2009:590).

Statistics of one of the leading manufacturers of ERP systems (SAP - Systems Applications and Products) indi-

cate that only 20% of all projects are completed on time, with all planned features and functions, and without exceeding the financial plan. On average, projects, implementation costs and timelines are overrun a few times, by over 200 percent, installations of the system are incomplete, and only 2/3 of the planned functionality has been accomplished (Schmidt, 2003). Incomplete implementation of ERP system modules consequently reduces the expected benefits. Underestimating the complexity of such projects (and control business process) is one of the main reasons for unsuccessful ERP implementation (Al-Mashari, 2003).

Many authors (Bing et al., 1999, Holland et al., 1999, Kovacic, 2000; O'Leary, 2002, Somers and Nelson, 2001) suggest that with ERP, best practices are implemented in organizations and the majority of support processes are optimized. Many processes have become comparable with other organizations which can lead to further optimizations. Duplication of data entry is reduced; greater optimization and control of the business are enabled (Kovacic and Indihar Stemberger, 2007). Most organizations in the public sector have similar requirements, but each country has its own unique differences. For this reason, it is very difficult to identify the "best business practices" for the public sector. In basis the organizations in the public sector are similar to the private sector, with some specific requirements (Blick et al., 2000). The main reasons for implementing ERP, as indicated by the organizations, is the need to integrate processes and data, follow trends, change the information technology and policy of management organizations (Sternad and Bobek, 2007:22, Kovacic, Bosilj-Vuksic, 2005:282)

The major difference between public and private sector is in organizational culture, which in the public sector is far more complex – consisting of a number of departments, each with their own leaders, and their own business rules and processes (Wanger and Antonucci, 2004). Another key difference between private and public sector is that the public sector does not have the same conception of "customer" that they should compete with others to attract. Vast differences also exist in the financial resources, which in the public sector are complex and fragmented (donors, government ...) (Watson et al., 2003).

Numerous studies have already been carried out to examine the impact of critical success factors (CSF) on successful ERP implementation, primarily from the top managers' and the project managers' point of view. This study, however, also attempts to examine CSF from employees', i.e. the end user's points of view and identify opportunities to reduce their impact, thereby increasing the success of ERP implementation.

The sample of this study examines organizations within the public sector in Slovenia. However, due to the complexity of the topic, all public organizations cannot be treated equally since they differ greatly in structure, business activity, complexity of their business processes and their size (number of employees). BPR project and new IS are usually implemented in larger and more complex organizations to reduce operational costs and increase their efficiency. The survey is therefore limited to medium and

large organizations within the "extended" public sector (excluding public and state administration), so that we are able to compare it to the similar studies that address the organizations on the market.

This article intends to demonstrate, that the importance of CSF already identified by a number of studies, is also applicable to our case study as well as other organizations within the public sector in Slovenia. In addition, we aim to determine the impact of managers on the CSF and to validate that a capable management is paramount to a successful ERP implementation. The article first reviews the available literature then presents the hypothesis, the next section describes the methodology and finally the results are reported. The last section of the article contains a summary of the main conclusions and offers suggestions for further research.

## 2 Critical success factors in ERP implementation

Nowadays, BPR cannot be done without the support of information technology and vice versa. ERP implementation is not possible without all the necessary changes in business processes. CSF in fact represents a deciding factor in the success or failure of the ERP implementation. The more prominent the CSF, the higher is the success rate of ERP implementation.

The implementation of ERP system in the organization means a radical rethinking of existing business processes and requires both new IT and BPR (Holland et al., 1999:273). With regards to a number of failed and successful projects of the ERP implementation, many implementation models have been developed and several CSF and methods have been identified to ensure successful ERP implementation.

Literature indicates that ERP is a very high risk project with relatively low success rate (60 to 80 percent are unsuccessful or do not achieve the specified project goals.). The authors allege a variety of information about successful implementation: Estimates of ERP failure rate vary widely between the authors; Magnuson et al. (2004) 90 percent, Kovacic and Bosilj-Vuksic (2005) 89 to 91 percent, Umble and Umble (2002) 50 to 75 percent failure rate.

Many studies of CSF on BPR and ERP implementation have been done. A review of literature (Holland and Light, 1999, Somers and Nelson, 2001; Sternad and Bobek, 2008; Sumner, 1999, Willcocks and Sykes, 2000) indicates that similar CSF have been identified by several researchers. Top management support, project team competence, and change management are quoted as the most important CSF (Ngai et al., 2008, Akkermans and Helden, 2002). The technical risk isn't very high in ERP implementation, because the software is technically sophisticated and provides the necessary functionality (Bakar, 2001). Business processes change, effective communication, users' expectations and quality of the information systems as well as avoiding customization of Information Technology are important factors in ERP implementation (Somers and Nelson,

2001). Nah et al. (2001) show that the top management support is needed throughout the ERP implementation. The management must align the ERP implementation project with the strategic business goals and assign the project as top priority as well as allocate all the necessary resources.

### 3 Research hypothesis

The purpose of this article is to determine the impact of managers on the critical success factors in the implementation of ERP. Based on the study of several cases the following hypothesis is assumed:

**H1:** The managers have a decisive impact on the critical success factors and thus a direct impact on the successful business process reengineering and ERP implementation.

The success of the ERP implementation is dependent on critical success factors. If the top management support has a major impact on these factors, they inevitably have a decisive impact on the overall success of ERP project. Therefore, those CSF the managers have the greatest impact on have to be identified. More convenient management and other changes in the organization have to be implemented based on these findings, which improves the progress of the project of ERP implementation and thus the overall performance of the organization and its effectiveness.

### 4 The managers' impact on critical success factors of ERP implementation study

The survey took place in the wider public sector in Slovenia (excluding state and government administration), and it has been responded to by managers or members of the project team for ERP implementation. The data of one of the organizations (discussed organization), where users of the new ERP applications have responded to the survey, has been analyzed in more detail. With the survey's results and the analysis of the project we verify the hypothesis in the discussed organization. We then further establish whether these results also hold true for other public sector organizations.

In the organization under detailed examination 63 respondents have been included, representing approximately 20% of all users of ERP applications. Estimated time for the completion of the project was 2 years. However, from the initial analysis to the implementation of the last few modules and the final acceptance more than 3 and a-half years passed. In addition, some of the planned links to the existing applications have not been made. The project consisted of all support processes; Human Resources, Finance and Accounting, Purchasing and Warehousing, Controlling, Sales and Marketing, and connection to dedicated applications for production planning (the main production processes). The heads of these departments were also members of the project team. Other members of the project team were employees responsible for the specific processes supported

by the new ERP. The users of ERP application and other professionals were invited to cooperate on the project as needed.

The wider public sector, (excluding public and state administration and non-education areas), consists of the 614 organizations with at least one employee (the education sector is not included due to a lower complexity, a large number of organizations and, because the average number of employees is fairly low - about 50, higher education however, remains in the survey population). In the present population more than 250 organizations have at least 50 employees and only 81 have more than 150 employees. 42 organizations had been invited to participate in the survey, (all selected had more than 100 employees), which constitute a representative sample of organizations, covering a variety of interest areas (agencies, institutes, public institutions, hospitals, pharmacies, etc.).

A total of 27 organizations or 64% of the selected sample replied to the survey. Only 12 surveys or 28% were fully completed, as only the organizations that are implementing or have implemented the new IS in the last year have taken part. Although the number of participating organizations was low, the sample is appropriate since the renovation of business processes and new IS in the organizations are implemented rarely (once in 10 years). The present sample represents more than 10% of medium and large size organizations. These facts and limitations should be considered when examining the survey results.

In the first part of the survey, the respondents were asked to rank the listed CSF, (shown in Table 1), on the ERP implementation by their importance, from most to least important according to their personal opinion. The second part of the survey was intended to determine the potential and the actual commitment of the managers to the project. The respondents were asked, based on their own experience, to indicate (on the scale of 1 ("completely disagree"), to 5 ("completely agree")) to what extent they agreed with a statement concerning managers' commitment to the project and their efforts for its success.

#### 4.1 Critical success factors in ERP implementation

Table 1 shows the results of CSF ranking, and comparison with similar research (Somers and Nelson, 2001; Sternad and Bobek, 2008), where CSF have been studied in organizations that have implemented ERP. The third column shows factors as ranked by ERP users in the discussed organization, the fourth column as ranked by managers (or project managers) in organizations within the public sector, in the fifth column the factors are shown as ranked by managers from companies (non public organization) in Slovenia and the sixth column shows CSF as ranked by managers of companies in the world.

In all available research, the most important CSF for the successful ERP implementation is top management support, excluding the research done among Slovenian companies (Table 1, column 4), which identifies this factor

as the second most important and the first as clear goals and objectives of the project. In the discussed organization interdepartmental communication is seen as the second most important CSF, and the project team competence is only eighth, whilst other organizations rank it as the second most important CSF. Those differences can be explained by the fact that CSF have been ranked by different groups of employees, in the discussed organization by the end-users

of the applications, whilst in other organizations mostly by project managers. Therefore, project management is not as important for the end-user as are the interdepartmental communication and cooperation which are ranked as the second and the third most important CSF. A similar explanation can be given for the user training and education which are ranked as the fourth most important CSF, whereas in other organizations are on the seventh or fourteenth place.

Table 1: Critical success factors in ERP implementation (Source: Own survey, 2009; Sternad in Bobek, 2008; Somers in Nelson, 2001)

	Critical success factors - comparison	DISCUSSED ORG.	PUBLIC SEKTOR	SLO	WORLD
1	Top management support	1	1	2	1
2	Project team competence	8	2	3	2
3	Interdepartmental cooperation	3	3	4	3
4	Clear goals and objectives	6	5	1	4
5	Project management	10	7	13	5
6	Interdepartmental communication	2	4	5-6*	6
7	Management of expectation	12	10	14	7
8	Project champion	11	9	10	8
9	Ongoing vendor support (updates)	5	11	**	9
10	Careful selection of the appropriate package ERP	7	6	15*	10
11	Data analysis and conversion	15	16	11	11
12	Dedicated resources	9	8	**	12
13	Steering committee	16	12	**	13
14	User training and education	4	13	7*	14
15	Education on new business processes	14	15	7*	15
16	Business process reengineering	21	14	8	16
17	Minimal customization	17	17	12	17
18	Defining the architecture IS	18	18	15	18
19	Change management	19	19	**	19
20	Vendor/customer partnerships	13	20	**	20
21	Use of vendors' development tools	22	21	**	21
22	Use of consultants	20	22	9	22

Note: \* The survey had only comparable arguments (some of the CSF in the survey were combined, the others divided into a number of CSF).

\*\* CSF is not present in the survey, so the comparison is not possible.

Interdepartmental cooperation is a very important critical factor, ranked mostly in third, (once in fourth) place in these (mentioned) studies. Projects such as the ERP implementation can't be successful without the participation of employees, interdepartmental cooperation and effective communication. This is understood by the end-user as well as the project managers and the top managers.

The project team competence is the second most important CSF for organizations in the world as well as organizations within the public sector in Slovenia, and the third most important factor for other companies. The

competence of the individual project team members has to be significant, because of the enormity of such projects; otherwise problems can develop in the coordination and delegation of tasks. The project team competence is not such an important CSF for the end-user in the discussed organization, because they are given instructions by their immediate supervisors, whereas, the project team manager and the project team are responsible for the overall project progress.

We assume that the ERP implementation in smaller companies was predominantly managed by the software

vendors and other outside consultants, consequently the differences in ranking CSF were much smaller since the research (Sternad and Bobek, 2008) investigates medium size organizations (over 50 employees) and large size enterprises in Slovenia with an average of fewer than 1,000 employees.

User training and education is in fourteenth place for organizations in the world. It seems that the appropriate management of the project and resources are far more an important CSF for successful ERP implementation, which is understandable, as the respondents were managers and project managers. Similarly, in organizations within the public sector in Slovenia user training occupies only thirteenth place.

Thus, the findings of many studies (Al-Mashari et al., 2003, Holland and Light, 1999, Somers and Nelson, 2001, Somers and Nelson, 2004; Sternad and Bobek, 2008, Umbel et al. 2003; Zabjek et al., 2009) are confirmed; the most crucial factor of successful ERP implementation is top management support (regardless of the structure of organization).

Interdepartmental cooperation is the third (or the fourth) most critical success factor in the ERP implementation in all organizations. The high degree of importance of this factor, which in essence means the interaction between employees, suggests that great attention has to be given to it throughout the project, if we are to achieve a successful ERP implementation. Cooperation of employees as an important critical factor for success was already identified by McAdam and Donaghy (1999).

## 4.2 The managers impact on the critical success factors

Table 2 shows the actual commitment of managers in ERP system implementation project as observed by the employees (ERP users), in the discussed organization (column 3), and (observed by project managers) in other organizations within the public sector in Slovenia (column 5).

The managers in the discussed organization had the most significant problem (as observed by the employees) in delegating tasks among employees (2.37) and ensuring a better distribution of the workload when they were overloaded (2.76). Inefficient delegation and coordination of tasks between employees are a result of inadequate management, which is further shown by the ineffective scheduling of time and insufficient allocation of the human resources to the project. Interdepartmental communication is also poorly handled by the management (2.75). It is encouraged by the management (3.32) but the conflicts between departments are not resolved efficiently (2.54).

Organization changes aren't well managed (2.57) and neither are the projects at the time of change (2.51).

Employees in the organization haven't been motivated enough to work on the project of ERP implementation and to cooperate with the software vendor (2.60), neither have they been inspired enough about the ERP software solutions (2.68). The managers haven't had enough information

about employee's tasks (2.65) and that the information was inadequate (2.67). They haven't paid enough attention to allocating the necessary resources (2.78), management did not understand user expectations (2.87) and did not provide adequate user training (especially on new IS) (2.94). Managers only partially collaborated with external consultants (3.11) and their participation in the selection of ERP is relatively small according to their role and position in the organization (3.16).

The managers show moderately good commitment to the business process change and optimization (3.17) and great support is offered to the implementation of the new ERP (4.37). Sufficient authority has been given to the project team (3.76), which indicates that the project of implementing the new ERP is the responsibility of the whole project team and all involved employees. The resistance to change is much smaller when employees take this project as their own.

The survey results indicate that the vertical communication from the top-down and bottom-up is very weak and inappropriate. Managers communicate incomplete information to their employees, and they in turn receive inappropriate feedback. As a result of this inadequate communication the managers are unable to provide good project leadership and guidance; they understate the demands of the project and do not fully understand user requirements. The interdepartmental (horizontal) communication between departments is also unsatisfactory and therefore the flow of information is insufficient.

Analysis of the results of other organizations in the public sector in Table 2 (column 5) shows that those managers fully support the projects of changing business processes and implementing ERP solutions (4.42), they are totally committed to the projects, and appropriately lead and motivate, in view of the fact that all their characteristics are assessed as positive (more than 3). Only when it comes to the distribution of tasks between employees managers are still not efficient enough (2.83).

When comparing the results with the discussed organization it should be noted that in other organizations project managers (or members of the project team) have participated in the study and their view could be biased. In the future, the research in these organizations should be extended to also include the ERP users and not just the management.

We assume that if the managers in both, the discussed and in other organizations—within the wider public sector, would pay a great deal more attention to the project they would thus insure a greater success of the ERP implementation project, the assumption which we intend to prove.

A number of statistical connections have been identified between the commitment of managers to the project and the CSF of the ERP implementation. The impact of managers' characteristics on the individual CSF value is shown by correlation, by which we intend to confirm the hypothesis that managers' impact on the CSF of the ERP implementation also determines its success. The correlation coefficients between the characteristics of managers and CSF in implementing ERP indicate, how strong the statistical connection is, or how strongly the characteri-

Table 2: Characteristics and integration of the project managers in the introduction of ERP solutions (Source: Own research, 2009)

	Cooperation managers on the project ERP implementation	Discussed org.	Deviat.	Public sector Org.	Deviat.
1	Manager supports the ERP implementation.	4.37	0.77	4.42	0.67
2	Project team is given sufficient power by managers.	3.76	0.73	3.75	0.75
3	Manager motivates (encourage) employees to cooperate with other departments.	3.32	1.03	3.42	0.90
4	Manager knows the purpose and objectives of the ERP implementation project.	3.16	0.97	3.50	0.90
5	Manager support project management.	3.19	0.95	3.75	0.75
6	Manager encourages interdepartmental communication.	2.75	1.00	3.33	0.98
7	Manager understands user's expectations.	2.87	1.02	3.00	0.85
8	Manager has participated in selection of the ERP solution.	3.16	0.77	3.17	1.03
9	Manager takes care of resources (human and financial).	2.78	1.05	3.75	0.87
10	Manager ensures employees are educated on the new ERP solution.	2.94	1.05	3.58	1.08
11	Manager strives to adjust processes to the new ERP solution.	3.37	0.96	4.08	0.79
12	Manager effectively manages the changes within the organization.	2.57	1.01	3.17	0.58
13	Manager uses external (and internal) consultants.	3.11	0.84	3.67	0.78
14	Managers motivate employees in implementing new ERP.	2.68	1.09	3.33	1.07
15	Manager motivates employees to become involved with the ERP project and cooperate with the vendor.	2.60	1.11	3.50	1.31
16	Manager understands business process across the whole organization (links between processes).	3.32	0.98	3.50	0.52
17	Manager is committed to optimize business processes with new ERP solution.	3.17	1.02	3.58	0.79
18	Manager has sufficient information about employees.	2.65	1.03	3.33	0.98
19	Manager has adequate information about employees.	2.67	0.98	3.33	0.89
20	Manager doesn't know enough about my work.	3.70	0.98	3.17	1.19
21	Manager successfully coordinates conflicts between departments.	2.54	0.91	3.17	1.03
22	Manager appropriately distributes tasks between employees.	2.37	0.79	2.83	0.83
23	Manager is fair to employees.	2.90	0.91	3.25	0.87
24	Manager coordinates the activities of the ERP implementation project.	2.73	0.94	3.25	0.97
25	Manager distributes tasks, when an individual employee is overloaded.	2.76	1.00	3.17	0.94

Note: *Deviat.* is shortcut for *Deviations*.

stics of managers' impact the factors. Due to an excessive amount of data, Table 3 shows only the correlation coefficients of these characteristics, with critical success factors; interdepartmental communication in (column 2) and interdepartmental cooperation in (column 4) in the discussed organization.

Based on the results of statistical analysis, a medium-strong positive statistical connection was indicated between critical successful factors of ERP implementation; - interdepartmental communications (column 3) and a number of managers' characteristics, such as; encouraging employees to cooperate with other departments, fully understanding

the purpose and objectives of the ERP implementation projects, supporting project management, encouraging interdepartmental communication, managing (coordinating) user expectations, ensuring employees' education and training on the new ERP, providing effective management of changes within the organization, possessing the knowledge of business processes, having sufficient information about employees, keeping adequate (relevant) information about employees, appropriately distributing tasks among employees, resolving problems quickly, and distributing work to others when individuals are overloaded.

Tabel 3: Managers impact on interdepartmental communications and cooperation (Source: Own research, 2009)

Managers impact on interdepartmental communications and cooperation	Communications		Cooperation	
	$\rho_{xy}$	p(2)	$\rho_{xy}$	p(2)
Manager supports the ERP implementation.	.002	.989	.097	.450
Project team is given sufficient power by managers.	.044	.734	.103	.424
Manager motivates (encourage) employees to cooperate with other departments.	.351**	.005	.452**	.000
Manager knows the purpose and objectives of the ERP implementation project.	.446**	.000	.537**	.000
Manager support project management.	.434**	.000	.541**	.000
Manager encourages interdepartmental communication.	.320*	.010	.458**	.000
Manager understands user's expectations.	.411**	.001	.529**	.000
Manager has participated in selection of the ERP solution.	.038	.768	.142	.266
Manager takes care of resources (human and financial).	.300*	.017	.505**	.000
Manager ensures employees are educated on the new ERP solution.	.378**	.002	.488**	.000
Manager strives to adjust processes to the new ERP solution.	.318*	.011	.268*	.034
Manager effectively manages the changes within the organization.	.489**	.000	.512**	.000
Manager uses external (and internal) consultants.	.301*	.017	.241	.058
Managers motivate employees in implementing new ERP.	.194	.129	.344**	.006
Manager motivates employees to become involved with the ERP project and cooperate with the vendor.	.214	.092	.324**	.010
Manager understands business process across the whole organization (links between processes).	.351**	.005	.290*	.021
Manager is committed to optimize business processes with new ERP solution.	.273*	.031	.328**	.009
Manager has sufficient information about employees.	.452**	.000	.625**	.000
Manager has adequate information about employees.	.439**	.000	.519**	.000
Manager doesn't know enough about my work.	-.045	.729	-.143	.264
Manager successfully coordinates conflicts between departments.	.178	.162	.504**	.000
Manager appropriately distributes tasks between employees.	.407**	.001	.408**	.001
Manager is fair to employees.	.236	.063	.406**	.001
Manager coordinates the activities of the ERP implementation project.	.362**	.004	.300*	.017
Manager distributes tasks, when an individual employee is overloaded.	.370**	.003	.539**	.000

SPSS:  $\rho_{xy}$  – Correlation coefficient, p(2) – Two-way statistical significance.

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

A statistically significant correlation (connection) is identified between interdepartmental cooperation (column 4) and the characteristics of managers, such as; possessing knowledge of the purpose and objectives of the ERP implementation project, supporting project management, managing user expectations, dedicating (taking care of) resources, effectively managing changes, keeping sufficient information about employees, keeping adequate information about employees, successfully coordinating conflicts between departments and appropriately distributing tasks when the individuals are overburdened. A low positive statistical correlation is noticeable between interdepartmental cooperation and the motivation of employees to cooperate with other departments, encouragement of communication

between departments, provision of employee training on the new ERP system, motivation of employees to implement new ERP, motivation of employees to participate in the ERP implementation project, commitment to the optimization of business processes and the appropriate distribution of tasks between employees.

Based on analysis of survey data and the project's lifecycle, we are able to conclude that managers highly impact on the cooperation between departments. Deficient and/or improper cooperation between departments in the analysis phase of ERP implementation, result in setting poor and vague objectives, with unclear purposes and ineffective time planning of the ERP implementation project. Poorly stated objectives prevent adequate optimization

of business processes and selection of appropriate ERP solutions. The cooperation between departments, which in essence means collaboration of all employees on the project as well as interdepartmental communication, is one of the critical success factors of implementing ERP in organizations within the public sector (McAdam and Donaghy, 1999: 48).

Similar statistical correlations between the characteristics of managers and CSF are also identified in the other organizations in the public sector. The strength of the correlations between managers' characteristics and the CSF in the discussed organization and in the other public sector organizations differs only slightly. This could be because, in the discussed organization the surveys were answered by ERP users, whilst in the other organizations by the project managers; another reason could be the size and structure of the organization, business, etc.

In the survey, managers were characterized with 25 variables. When setting survey questions to determine the

impact of managers on the CSF in the process change and implementation of the new IS, it was not possible to accurately determine a smaller number of complex properties in order to assess the involvement of managers working on the project, of implementing new ERP.

A factor analysis gives a simpler structure of these 25 managers' characteristics responsible for managers' impact on the CSF and, consequently, the very success of the introduction of ERP solutions. The result of factor analysis shows that there are four independent characteristics, which together explain almost 68% of the total variance space. Rotated factor matrix, with four independent characteristics (factors) is shown in Table 4.

The first factor (independent characteristic) which explains 48.0% variance of space, is managerial character of the manager, (organization, management, supervision), focusing primarily on coordination and communication. The second factor explains 9.0% of the variance of space, and represents the manager's demand for efficiency in the

Table 4: Rotated factor matrix (Source: Own research, 2009)

Observed characteristics	Factor (independent characteristics)			
	1	2	3	4
Manager supports the ERP implementation.	.194	-.045	-.178	.714
Project team is given sufficient power by managers.	-.110	.076	.106	.721
Manager motivates (encourage) employees to cooperate with other departments.	-.347	.002	.134	.443
Manager knows the purpose and objectives of the ERP implementation project.	.492	.193	.753	.063
Manager support project management.	.320	.349	.590	.002
Manager encourages interdepartmental communication.	.268	.589	.474	.158
Manager understands user's expectations.	.218	.497	-.026	.113
Manager has participated in selection of the ERP solution.	.398	.630	.230	.120
Manager takes care of resources (human and financial).	.178	.630	.278	.056
Manager ensures employees are educated on the new ERP solution.	.273	.690	.238	-.230
Manager strives to adjust processes to the new ERP solution.	.558	.375	.267	.450
Manager effectively manages the changes within the organization.	.629	.319	.394	.016
Manager uses external (and internal) consultants.	.682	.125	.350	-.071
Managers motivate employees in implementing new ERP.	.747	.248	.253	.024
Manager motivates employees to become involved with the ERP project and cooperate with the vendor.	.647	.422	.328	-.025
Manager understands business process across the whole organization (links between processes).	.657	.490	.049	-.103
Manager is committed to optimize business processes with new ERP solution.	.714	.367	-.001	-.317
Manager has sufficient information about employees.	.812	.250	.228	.078
Manager has adequate information about employees.	.829	.219	.297	.168
Manager doesn't know enough about my work.	.788	.208	.210	-.076
Manager successfully coordinates conflicts between departments.	.632	.368	.223	.049
Manager appropriately distributes tasks between employees.	.680	.359	.044	-.100
Manager is fair to employees.	.690	.323	.166	.060
Manager coordinates the activities of the ERP implementation project.	.461	.434	.065	-.055
Manager distributes tasks, when an individual employee is overloaded.	.492	.360	.192	-.132

SPSS: Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.



Tabel 5: Suggestions for the new names of the independent characteristics (Source: Own research, 2009)

Characteristic	New names of independent characteristic
1	Organizing, managing and supervising the employees and coordinating communication between all people participating in the project.
2	Optimization and computerization (IT support) of processes and optimal use of resources.
3	Knowledge of users' expectations and business processes.
4	Supporting the implementation of the ERP project and hand over (transfer) of the responsibilities to the project team.

use of the resources as well as processes optimization. This manager's feature is very important when the new ERP is implemented. The third factor which explains 6.2% of the variance of the space is the manager's knowledge about business processes and user expectations. The fourth factor explaining 4.7% variance of the space is the manager's support and commitment to implementing the new ERP, his confidence in the project team and the ability to hand over responsibilities.

A new name is assigned to four independent characteristics (factors) since they show a strong relationship with the observed characteristics (bold in Table 4). Suggestions for the new names of the independent characteristics are shown in Table 5.

On the basis of the rotated factor matrix (Table 4) the managers' impact on the CSF is estimated with four characteristics. Figure 1 shows the indirect impact of the mentioned managers' characteristics on the success of ERP implementation.

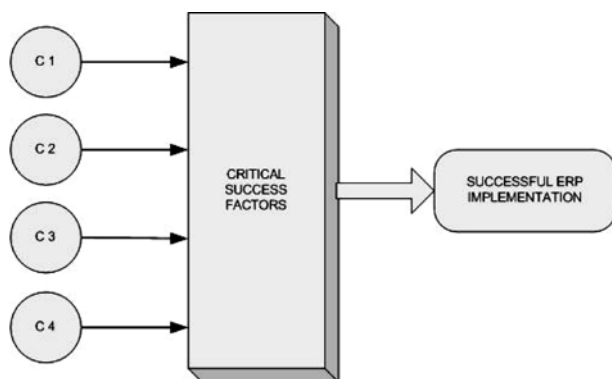


Figure 1: The impact of managers on the success of the ERP implementation (Source: Own research, 2009)

From the statistical analysis of the data we find that all managers' characteristics have an impact on the critical success factors and therefore only a strong correlation is mentioned. Strong statistical correlations of the first characteristic are found with interdepartmental cooperation, project management and the appropriate selection of ERP. Medium correlations are identified with clear goals and objectives, user training and education, user instruction on new business processes, dedicated resources, data analy-

sis and conversions, ongoing vendor support, vendor/customer partnerships and the use of vendors' development tools.

Medium correlations of the second characteristic are identified with project team competence, dedicated resources; appropriate IS architecture, data analysis and transformation, ongoing vendor support, vendor/customer partnerships and the use of vendors' development tools.

A strong statistical correlation of the third managers' characteristic is identified with, clear goals and objectives, project management, users' education on new business processes, dedicated resources and appropriate IS architecture. Medium strong correlation is identified with interdepartmental cooperation, interdepartmental communication, project team competence, the appropriate selection of ERP, user training and education (on new software), data analysis and conversions, ongoing vendor support, vendor/customer partnerships and the use of vendors' development tools.

The fourth managers' characteristic shows a medium correlation with management expectations, the appropriate IS structure and partnerships with the vendor.

A factor analysis has also given very similar results for the other organizations within the public sector. A strong statistical correlation of the first characteristic is identified with interdepartmental cooperation and communication, and the use of consultants. Medium strong statistical correlation exists with project team competences, project management, users' education (training) on new business processes, dedicated resources, appropriate IS architecture, analysis and data conversions, and partnerships with vendor.

Strong statistical correlation of the second managers' characteristic is linked with interdepartmental communication, the appropriate selection of ERP and project champions. Medium-strong correlation exists with project team competence, project champions, and users' education (training) on new business processes. The third managers' characteristic is correlated with the steering committee. A strong statistical correlation of the fourth characteristic exists with project team competence and dedicated resources.

Strong impact of the managers' characteristics on CSF is indicated in the discussed and other organizations within the public sector. The impact between individual characteristics differs and this could be the result of respondents of the survey being the end-users in the discussed organization, whilst in other organizations heads of IT departments, project managers or members of project team were the survey participants. Explaining why these differences occur is

beyond the scope of this research, as the only purpose here is to show that managers impact CSF.

According to described and statistically proven correlations, managers with their work and leadership have a great impact on CSF in implementing ERP. The hypothesis is thus confirmed (The managers have a decisive impact on the critical success factors and thus indirectly impact the success of business process reengineering and ERP implementation).

Although Pearson correlation shows only bidirectional relationship (connection), it is assumed that only managers can influence the CSF and not vice versa. The results clearly show that the effectiveness and efficiency of ERP implementation are strongly dependent on the managers. For a successful project the managers must possess specific characteristics necessary for the effective ERP implementation and the organization change – thus a much higher success rate of the project is assured. Managers have to fully understand the goals and objectives of the project, business processes, structure and functions of ERP so that they can appropriately motivate employees and provide efficient leadership throughout the project's lifecycle. Business Process Reengineering and ERP solution implementation cannot be successful without the involvement of managers and top management support.

Bokovec (2009: 179) finds that managers must understand the process of the ERP implementation and business area which must be defined from a business viewpoint thus indicating the significant impact of managers to the implementation ERP.

Leaders and managers are not the ones making changes, but are those that provide an adequate organizational environment and necessary conditions that these changes can be made. Strong leadership can bring about changes but cannot guarantee their positive effect. Changing organization systems from top-down is accepted by employees, however, they do not feel a part of it, and as such, they are not motivated enough to participate in the project, hence it is important to create a conducive environment for such changes (Scroeder, 2009).

By comparing the results of the survey it can be assumed that managers in the discussed organization, as well as in the other organizations within the wider public sector (excluding public and state administration), have a similar impact (influence) on the CSF of the ERP implementation. We can affirm with some certainty that the managers in both; public and private sector have a major impact on the success of the ERP implementation. Although the extended research has only been carried out in one "discussed" organization, all findings and results could still be considered valid for other organizations by taking into the account certain limitations.

## 5 Conclusion

Although employees have a significant impact on the success of the ERP project, since factors, such as cooperation and communication between departments and training

of users, are among the most critical success factors, the findings and results of this research show, that the managers have a far greater impact on the CSF, thus confirming our assumed hypothesis. The success of the project of ERP implementation depends on the appropriate choice of ERP solution, properly planned project, prepared analysis and strategies, and effective project management. All these are management tasks, as the results show, which state that; the success of ERP implementation strongly depends on the managers. These findings are valid for organizations within the wider public sector; however, for other organizations, we must take into account the limitations of this research.

## 6 References

- Akkermans, H. & Van Helden, K. (2002). Vicious and virtuous cycles in ERP implementation: A case study of interrelations between critical success factors, *European Journal of Information Systems*, 11(1), 35 – 46. DOI: 10.1057/palgrave/ejis/3000418.
- Al-Mashari, M. (2003). A Process Change-Oriented Model for ERP Application, *International Journal of Human-computer Interaction*, 16(1), 39 – 55. DOI: 10.1207/S15327590IJHC1601\_4.
- Bakar, Z.A. (2001). Success factors to system integration implementation: More technically oriented human related, *Malaysian Journal of Compute Science*, 14(2), 64 – 69.
- Blick, G., Gullidge, T. & Sommer, R. (2000). Defining Business Process Requirements for Large-Scale Public Sector ERP Implementations: A Case Study, *European Conference on Information Systems*, 3-5 July 2000 (pp. 1203 – 1209). Wirtschaffs Universitat, Wien, Austria: In Proceedings of the Eighth European Conference on Information Systems (Hansen HR, Bichler M, Mahrer H eds.), *ECIS 2000 Proceedings*. Paper 157. <http://aisel.aisnet.org/ecis2000/157>. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.99.7663&rep=rep1&type=pdf>.
- Bokovec, K. (2009). *Obvladovanje kompleksnosti uvajanja globalnih ERP projektov*, [Mastering the complexity of the global ERP implementation projects], doctoral dissertation, University of Ljubljana, Faculty of Economics.
- Bingi, P., Sharma M.K. & Godla J. K. (1999). Critical Issues Affecting an ERP Implementation, *Information Systems Management*, 16(3), 7 – 14. DOI: 10.1201/1078/43197.16.3.19990601/31310.2.
- Chin-Fu, H., Wen-Hsiung, W. & Yi-Ming, T. (2004). Strategies for the adaptation of ERP systems, *Industrial Management & Data systems*, 104(3), 234 – 251. DOI: 10.1108/02635570410525780.
- Holland, C.P., Light B. & Gibson N. (1999). A Critical Success Factors Model for Enterprise Resource Planning Implementation. *Proceeding of the 7th European Conference on Information Systems*, June 23-25 jun. 1999. Copenhagen: Copenhagen Business School.
- Hossain, L., Patrick, J. D. & Rashid, M.A. (2002). *Enterprise resource planning: Global opportunities and challenges*, Information Science Publishing, London.
- Kovacic, A. (1997). Kaksne uporabniske resitve potrebujemo? [What customer solutions do we need?], *Uporabna informatika*. 5(1), 8 – 15.
- Kovacic, A. (2000). Business Process Reengineering and Information Systems Renovation Projects: Problems and Assessment, *Informatika*, 24(4), 513 – 521.

- Kovacic, A. & Indihar Stemberger, M. (2007). Zakaj modelirati poslovne procese pri informatizaciji poslovanja s celovitimi programskimi rešitvami [Why is business process modelling necessary at ERP implementation], *Uporabna informatika*, 15(4), 192 – 200.
- Kovacic, A. & Bosilj-Vuksic, V. (2005). *Management poslovnih procesov: Prenova in informatizacija poslovanja s praktičnimi primeri [Business Process Management: The renovation and computerization of business with practical examples]*, GV založba [GV publisher], Ljubljana.
- Magnusson, J., Nilsson, A. & Carlsson, F. (2004). *Forecasting ERP implementation success – towards a grounded framework*, available form: <http://is2.lse.ac.uk/asp/aspectis/20040100.pdf> (1. 3. 2008).
- Mauldin, E.G. & Richtermeyer, S.B. (2004). An analysis of ERP annual report disclosures, *International Journal of Accounting Information Systems*, 5(4), 395 – 416. DOI: 10.1016/j.accinf.2004.04.005.
- McAdamR. & Donaghy, J. (1999). Business process re-engineering in the public sector: A study of staff perceptions and critical success factors, *Business Process Management Journal*, 5(1): 33 – 52. DOI: 10.1108/14637159910249135.
- Nah, F.F., Lau, J.L. & Kuang, J. (2001). Critical factors for successful implementation of enterprise systems. *Business Process Management Journal*, 7(3): 285 – 296. DOI: 10.1108/14637150110392782.
- Ngai, E.V.T., Law, C.C.H. & Wat, F.K.T. (2008). Examining the critical success factors in adoption of enterprise resource planning, *Computers in Industry*, 59(6): 548 – 564. DOI: 10.1016/j.compind.2007.12.001.
- O'Leary, D.E., (2002). *Enterprise resource planning system: System, life cycle, electronic commerce, and risk*, Cambridge University Press, New York.
- Parr, A. & Shanks, G. (2000). A model of ERP project implementation, *Journal of Information Technology*, 15(4): 289 – 303. DOI: 10.1080/02683960010009051.
- Rao, S.S. (2000). Enterprise resource planning: Business needs and technologies, *Industrial Management & Data Systems*, 00(2): 81 – 88. DOI: 10.1108/02635570010286078.
- Schmidt, F. (2003). *Top 7 Reasons SAP Projects Fail*, available form: <http://www.thespot4sap.com/Articles/Top7.asp> (17. 8. 2008).
- Scroeder, D. (2009). Menedzerji morajo znati spodbujati ideje in se nanje odzivati [Managers have to be able to promote ideas and respond to them], *Delo FT* p. 174, 2. nov. 2009, available form: <http://www.delo.si/tiskano/html/zadnji/Delo+FT> (2. 11. 2009).
- Somers, T.M. & Nelson, K.G. (2004). A taxonomy of players and activities across the ERP project life cycle, *Information & Management*, 41(3): 257 – 278. DOI: 10.1016/S0378-7206(03)00023-5.
- Somers, T.M. & Nelson, K. (2001). The impact of critical success factors across the stages of enterprise resource planning implementations, *Proceedings of the 34th Hawaii International Conference on System Sciences*, available from: <http://csdl2.computer.org/comp/proceedings/hicss/2001/0981/08/09818016.pdf>, (4. 11. 2004).
- Sternad, S. & Bobek, S. (2007). ERP sistemi [ERP systems], available form: <http://epf-oi.uni-mb.si:8000/clani/bobek/FI/ERP.pdf>, (15. 12. 2007).
- Sternad, S. & Bobek, S. (2008). Uvajanje rešitev ERP v slovenskih podjetjih: kritični dejavniki in njihova medsebojna odvisnost [ERP implementation in Slovenian companies: critical factors and their interdependence], *Organizacija*, 41(1): A28 – A36.
- Sumner, M. (1999). Critical Success Factors in Enterprise Wide Information Management Systems, *Proceedings of the Americas Conference on Information Systems*, 13-15 Avgust 1999 (pp. 232 – 234). Milwaukee, Wisconsin, USA: *AMCIS 1999 Proceedings*. Paper 83. Available from: <http://aisel.aisnet.org/amcis1999/83>.
- Umble, E.J., Haft, R.R. & Umble, M.M. (2003). Enterprise resource planning: implementation procedures and critical success factors, *European Journal of Operational Research*, 146(2): 241-257. DOI: 10.1016/S0377-2217(02)00547-7.
- Wanger, W. & Antonucci Y.L. (2004). An Analysis of the Imagine PA Public Sector ERP Project, available form: <http://csdl.computer.org/comp/proceedings/hicss/2004/2056/08/205680227b.pdf> (7. 12. 2008).
- Ward, J., Hemingway, C. & Daniel, E. (2005). A framework for addressing the organisational issues of enterprise systems implementation, *Journal of Strategic Information Systems*, 14(2): 97 - 119. DOI: 10.1016/j.jsis.2005.04.005.
- Watson, E., Vaught, S., Gutierrez, D. & Rinks, D. (2003). *ERP Implementation in State Government, Annals of IT Case Studies*, IGI Publishing, Hershey.
- Willcocks, L.P. & Sykes, R. (2000). The role of the CIO and IT function in ERP, *Communications of ACM*, 43(4): 32 – 38. DOI: 10.1145/332051.332065.
- Zabjek, D., Kovacic, A. & Indihar Stemberger, M. (2009). The influence of business process management and some other CSF on successful ERP implementation. *Business Process Management Journal*, 15 (4): 588 – 608. DOI: 10.1108/14637150910975552.

---

**Franč Ravnikar** is a graduate of the Faculty of Electrical Engineering in 1998, University of Ljubljana and is currently a doctoral student at the Faculty of Economics, University of Ljubljana. His research area is the success of ERP implementation. He is employed at RTV Slovenia, where he is involved in business processes optimizations and implementation of standards and norms.

V zadnjem času rešitve ERP uvajajo tudi organizacije v javnem sektorju in druge, ki na trgu nimajo konkurence, medtem ko je za konkurenčnost in uspešnost tistih na trgu rešitev ERP skoraj nujno potrebna. Razlog je predvsem v tem, da morajo tudi te svoje stroške poslovanja vse bolj zmanjševati, kar poskušajo rešiti z optimizacijo poslovnih procesov, ki se danes praviloma izvaja skupaj z uvajanjem rešitve ERP. Stopnja uspešnosti projektov uvajanja rešitev ERP je še vedno nizka, saj raziskave navajajo tudi do 90% neuspešnost. Na uspešnost uvedbe rešitev ERP vplivajo številni ključni dejavniki uspeha, ki so podobni v vseh organizacijah. Namen raziskave je ugotoviti vpliv menedžerjev na ključne dejavnike uspeha in s tem njihov vpliv na uspešnost uvajanja rešitev ERP. Najpomembnejši ključni dejavnik, ki vpliva na uspešnost uvajanja rešitev ERP, je podpora najvišjega vodstva; ne glede na to, ali je organizacija na trgu ali ne.

**Ključne besede:** ključni dejavniki uspeha, rešitve ERP, prenova poslovnih procesov, uspešnost uvedbe rešitev ERP.