Success Factors for Dynamics NAV Solution Implementation: What Matters and How

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Abstract: Enterprise resource planning (ERP) solution implementation is a complex process that requires substantial resources and efforts and involves considerable risks reflected in the time, scope, and cost of project implementation, yet the results are very uncertain. As ERP hype has reached large organizations as well as small and medium enterprises, we examined the critical success factors in ERP implementation. Based on the literature review, a model was developed. The results of our survey in Slovenia demonstrated that organizations have to pay attention to different critical success factors in different phases of the implementation process. Recommendations for future implementations and comments on our findings are included in the conclusion.

INTRODUCTION

Enterprise resource planning (ERP) solutions are defined as customizable, standard application software that includes integrated business solutions for the core processes and the main administrative functions. They can be also defined as comprehensive package software solutions that seek to integrate the complete range of business processes and functions in order to present a holistic view of the business from a single information and IT architecture. ERP solutions include an enterprise-wide set of management tools that balance demand and supply; contain the ability to link customers and suppliers into a complete supply chain; employ proven business processes for decision-making; provide high degrees of cross-functional integration among sales, marketing, manufacturing, operations, logistics, purchasing, finance, new product development, and human resources; enable people to run their business with high levels of customer service and productivity while simultaneously ensuring lower costs and inventories; and provide the foundation for effective e-commerce (Wallace & Kremzar, 2001). ERP systems can also have the following additional characteristics: support for multiple currencies and languages, support for specific industries, and the ability to customize without programming (O'Leary, 2000). Thus, we can say that ERP systems consist of multi-functional standards and multi-lingual and multi-legislative software modules as well as offer process integration across an entire organization.

ERP solutions are designed using the principles of best practices, which means that ERP vendors search for the best organizational business models in a branch and then adopt that business model in their ERP solutions. Instead of tailoring the ERP system specifications to meet organizational requirements, organizations have to adopt business processes to an ERP system. Organizations should select the ERP package that fits the organization, provides industry functionality, supports changing business environments, is easy integrate with other organizational information systems, includes vendor support during and post implementation, is complete and stable, and includes the availability of implementation accelerators such as training materials, user procedures, help text, and process models (Shields, 2001). Based on these characteristics, ERP implementation projects are large, strategic, and complex projects that involve lots of risks in terms of time, scope, and costs for project implementation. Therefore, organizations have to create conditions in which they can implement the chosen solution in the expected time, scope, and estimated costs. Thus, organizations should be aware of the most critical factors for success (CSFs) in ERP implementation. Over the past few years, CFSs of ERP implementation have been well studied (Estaves & Pastor, 2001), but very little attention has been paid to CSFs

of ERP implementation during each phase of the implementation. Although they all have the same goal—namely, to improve some aspect of the organization, such as strategic, organizational, business, management, operational, or IT infrastructure issues (Hedman & Borell, 2002)—experiences show that different CSFs have to be considered when implementing different ERP systems and that all CSF are not equally important in all phases.

To contribute to the discussion on this topic, we intend to explore the implementation process of ERP systems and compile recommendations. In the first part of the chapter, ERP implementation strategies and methods as well as critical success factors of ERP implementation will be discussed. In the second part, a field research (mainly findings, not scientific details) conducted in Slovenia on a sample of organizations that have implemented Microsoft Dynamics NAV solution will be presented. CSFs and their importance as well as how CFSs influence each other and the importance of CFSs in different implementation phases were researched. The results of the field research will be used to present recommendations for organizations.

ERP IMPLEMENTATION

Strategies and Methods

A review of past research on ERP implementation revealed different approaches and strategies for ERP implementation. Organizations have to consider different strategies early in the project as this decision influences all aspects of ERP implementation projects and can ultimately lead to either success or failure. Shields (2001) identified three stages of ERP project implementation. The first stage consists of pre-project activities, including initial commitment. The second stage deals with specific project implementation activities: start, manage, analyze, configure, test, change, support, prepare, and go live. The third stage is focused on post-project activities, which are as important as the first two phases as we have to perform various activities for further improvement of the adopted system. The fact that each phase includes several activities is a result of aggressive implementation time set by the management.

Bancroft, Seip, and Sprengel (2001) developed a five-phase model: Focus, As-Is Phase, To-Be Phase, Construction and Testing Phase, and Implementation Phase. The Focus Phase is essentially a planning phase that includes setting up the steering committee, selecting and structuring the project team, developing the project's guiding principles, and creating a project plan. The As-Is Phase includes analyzing current business processes in light of ERP functions, installing the ERP package, mapping business processes onto the ERP functions, and conducting the required training for the project team. The To-Be phase consists of high-level design, detailed design subject, and user acceptance followed by interactive prototyping and constant communication with users. The Construction and Testing Phase activities include developing a comprehensive configuration, testing using real data, building and testing interfaces, designing and testing reports, and running system and user tests. Finally, the Implementation Phase consists of building networks, installing desktops, and managing user training as well as providing support.

Because of the high number of failed ERP implementation projects, ERP vendors have also developed their own methodologies that best fit their packages. Microsoft developed its own methodology for implementing Microsoft Dynamics ERP packages, called Microsoft Dynamics Sure Step (Microsoft, 2007). This methodology provides implementers with implementation guidance combined with project management discipline, tools and template sets for diagnostics, analysis, deployment, migration, configuration, and upgrade. The Sure Step methodology helps reduce risks by making implementation projects simpler, faster, and more manageable as it unifies project management terminology, tools, and roles and streamlines processes and communication among the project stakeholders. The methodology entails a phased approach that consists of Diagnostics, Analysis, Design, Development, Deployment, and Operation. The Diagnostics Phase deals with gathering information in order to prepare an adequate proposal for the customer. The basis for such documentation is detailed requirements and gap/fit analyses. During the Analysis Phase, functional requirements are documented and agreed upon; these details are then incorporated into the existing project plan and schedule. The Design Phase includes the design of both the overall solution configuration and the specific customizations and integrations needed to cover business requirements identified during the previous phase. Mapping and designing of data migration processes also have to be performed. The Development Phase includes the actual development of customizations, integrations, and data migration processes that are established through design specifications. Components are also tested and verified. This phase is followed by the Deployment Phase, which includes all activities related to the final system and load testing, training of end users, and the actual cut-over to the new production environment. The main goal of the Operation Phase is the transition into on-going support; final

project- and software-related documentation is also prepared. The Sure Step methodology emphasizes the need for careful project team assembly and definition of members' roles and responsibilities as well as communication channels.

Because of the complexity of ERP implementation, it is critical not to focus exclusively on the implementation methodology steps; conditions must be created in which the chosen solution can be implemented within the expected timeframe, scope, and budget. This means that organizations should be aware of critical success factors (CSFs) in ERP implementation (Sternad & Bobek, 2004).

Critical Success Factors in ERP Projects

Over the past several years considerable research has been published on CSFs in ERP implementation. We located 20 such papers and tabulated the number of times researchers identified specific success factors as critical. Table 1 lists the 14 CSFs mentioned by more than 5 authors, along with the authors identifying them. The CSFs are more deeply explained after the table.

Top management support and involvement (CSF 1). Nearly all of the research included top management support and involvement as critical to the success of ERP implementation and as needed throughout the implementation project (Aduri, Lin, & Ma, 2002; Gattiker & CFPIM, 2002; Somers & Nelson, 2004; Stratman, 2002; Umble et al., 2002). Top management support is critical because management must make fast and effective decisions, resolve conflicts, bring everyone to the same thinking to promote company-wide acceptance of the project, and build cooperation among the diverse groups in the organization. This factor may also be independent across regions and countries (Ngai et al., 2007).

Clear goals, objectives, scope, and planning (CSF 2). Aduri et al. (2002) identified clearly defined business and strategic objectives as the most critical factor. Having a clearly defined vision and mission as well as formulating the right policies and strategies serves as the blueprint for organizational success (Al-Mashari et al., 2003; Khan, 2002; Ngai et al., 2007; Parr & Shanks, 2000; Umble et al., 2002). Clear goals and objectives should be specific and operational and indicate the general directions of the project (Somers & Nelson, 2004); they should also provide a clear link between business goals and IS strategy (Finney & Corbett, 2007). Well-defined objectives help keep the project constantly focused and are essential for analyzing and measuring success. Project scope is the initial blueprint of an implementation plan (Gargeya & Brady, 2005).

Project team competence and organization (CSF 3). When speaking about the project team, several authors referred to the competencies, knowledge, and organization of the team. We collapsed these into one critical success factor labeled as "project team competencies and organization." Mabert et al. (2003) and Wang et al. (2007) mentioned that implementation teams spent extra time up front to define in great detail exactly how the implementation would be carried out. Selecting and motivating the right employees to participate in implementation processes is critical for the implementation's success (Jarrar et al., 2000; Khan, 2002). Teams must consist of the right mix of business analysts, technical experts, and users from within the organization as well as consultants from external companies (Bancroft et al., 1998; Ngai et al., 2007; Parr & Shanks, 2000; Skok & Legge, 2002) who are chosen for their skills, past accomplishments, reputations, and flexibility (Umble et al., 2002).

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Table 1: Published articles about CSF of ERP implementation

CSF / Authors	CSF 1	CSF 2	CSF 3	CSF 4	CSF 5	CSF 6	CSF 7	CSF 8/9	CSF 10	CSF 11	CSF 12	CSF 13	CSF 14	CSF 15
Akkermans & Helden (2002)	x	x	x	x	x	x	x	x		x	x	x	x	x
Al-Mashari, Al-Mudimigh, & Zairi (2003)	x	x			x	x	x	x		x				
Al-Sehali (2000)	x	x				x	x	x	x	x		x	x	x
Bancroft et al. (2001)			x	x	x	x		x			x			
Estaves, Pastor, & Casanovas (2002)	x	x	x	x	x	x		x	x	x	x	x	x	
Finney & Corbett (2007)	x	x				x	x				x		x	
Gargeya & Brady (2005)	x	x	x	x	x	x	x	x				x	x	
Gattiker & CFPIM (2002)	x				x				x			x		x
Jarrar, Al-Mudimigh, & Zairi (2000)	x		x	x	x	x						x		
Khan (2002)		x	x	x				x	x	x	x		x	
Mabert, Soni, & Venkataramanan (2003)	x	x	x	x				x					x	
Ngai, Law, & Wat (2007)	x	x	x	x	x	x					x	x		x
Parr & Shanks (2000)	x	x	x	x		x					x		x	
Skok & Legge (2002)	x		x	x	x	x			x	x	x			
Somers & Nelson (2003)	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Stratman (2002)	x	x			x	x	x							
Umble, Haft, & Umble (2002)	x	x	x	x		x	x							x
Wang, Shih, Jiang, & Klein (2007)	x		x	x			x		x	x				
Welti (1999)	x	x	x	x	x		x		x	x				x
Zhang, Lee, Zhang, & Banerjee (2002)	x				x		x		x			x		x
Count of mentioned CFS	18	14	14	14	13	14	11	9	9	9	9	9	9	8

CSF 1 - Top management support and involvement
CSF 2 - Clear goals, objectives, scope, and planning
CSF 3 - Project team competence and organization
CSF 4 - User training and education
CSF 5 - Business process reengineering
CSF 6 - Change management
CSF 7 - Project management
CSF 8/9 - Effective communication
CSF 10 - User involvement
CSF 11 - Consultants
CSF 12 - Project champion
CSF 13-Architecture choice
CSF 14 - Minimal customization
CSF 15 - Data analysis and conversion

Project team competence and organization (CSF 3). When speaking about the project team, several authors referred to the competencies, knowledge, and organization of the team. We collapsed these into one critical success factor labeled as "project team competencies and organization." Mabert et al. (2003) and Wang et al. (2007) mentioned that implementation teams spent extra time up front to define in great detail exactly how the implementation would be carried out. Selecting and motivating the right employees to participate in implementation processes is critical for the implementation's success (Jarrar et al., 2000; Khan, 2002). Teams must consist of the right mix of business analysts, technical experts, and users from within the organization as well as consultants from external companies (Bancroft et al., 1998; Ngai et al., 2007; Parr & Shanks, 2000; Skok & Legge, 2002) who are chosen for their skills, past accomplishments, reputations, and flexibility (Umble et al., 2002).

User training and education (CSF 4). A lack of user training and understanding of how ERP systems work appears to be responsible for many problems and failures in ERP implementation (Somers & Nelson, 2004). Several authors added that inadequate training has been a significant reason for many ERP system failures (Aduri et al., 2002; Akkermans & Helden, 2002; Al-Mashari et al., 2003; Bancroft et al., 2001; Bradford & Florin, 2003; Estaves et al., 2002; Gargeya & Brady, 2005; Umble et al., 2002). If employees do not understand how a system works, they will invent their own processes using the parts of the system that they are able to manipulate (Umble et al., 2002). The full benefits of ERP are not realized until end users use the new system properly. Organizations should also consider that, through a managerial consensus, changes are necessary and possible; thus, organizations they can charge them with disseminating this information to their subordinates (Gargeya & Brady, 2005).

Business process reengineering (CSF 5). ERP systems are essentially developed as instruments for improving business processes such as manufacturing, purchasing, or distribution (Al-Mashari et al., 2002) and are built around best practices in specific industries (O'Leary, 2000). However, the software may not necessarily fit an organization's business processes because implementing ERP is not a matter of changing software systems; rather, it involves repositioning the company and transforming business practices (Jarrar et al., 2000). Thus, implementing an ERP system requires reengineering the existing business processes to fit best business practices. Organizations should first perform a thorough analysis of current business processes and compare the results to ERP packages in order to choose the appropriate one based on the mutual fit (Ngai et al., 2007).

Change management (CSF 6). The existing organizational structure and processes found in most companies are not compatible with the structure, tools, and types of information provided by ERP systems because every ERP system imposes its own logic on an organization's strategy, organization, and culture (Umble et al., 2002). These changes may significantly affect organizational structures, policies, processes, and employees and can cause resistance, confusion, redundancies, and errors if not managed effectively. Many ERP implementations fail to achieve expected benefits in part because companies underestimate the effort involved in change management (Al-Mashari et al., 2003; Somers & Nelson, 2004; Stratman, 2002).

Project management (CSF 7). Given that the combination of hardware and software with organizational, human, and political issues make many ERP projects huge, complex, and risky, effective project management is crucial from initiation to acceptance (Akkermans & Helden, 2002; Somers & Nelson, 2004; Stratman, 2002). Al-Mashari et al. (2003) found that approximately 90% of implementations are late or over-budget, which may be due to poor cost and scheduling estimates or changes in project scope rather than project-management failure. Zhang et al. (2002) argued that companies should have effective project management to control the implementation process, avoid budget overruns, and ensure the implementation within schedule. Effective project management requires (1) a formal implementation plan, (2) a realistic time frame, (3) periodic project status meetings, (4) an effective project leader who is also a champion, and (5) project team members who are stakeholders.

Effective communication (CSF 8/9). The importance of communication across different business functions and departments is well established in the IT implementation literature because communication significantly impacts results from the initiation phase through system acceptance while helping minimize possible user resistance. Communication has to cover the scope, objectives, and tasks of an ERP implementation project (Al-Mashari et al., 2003). We need effective communication on project teams and within the organization. Good communication on a project team can be ensured through weekly team meetings where team and project status updates are provided, postings on the company intranet, and formal and informal information sessions (Khan, 2002). Project teams should also be located on same location in the same area (floor) so that they can have common meeting spaces. The progress of the ERP project should be readily discernible to all employees in the organization (Al-Sehali, 2000); this should include project status, impending changes, and training

announcements made through the company intranet, newsletters, and e-mails. We divided this factor into two CSFs: communication within the project team (CSF 8) and communication between the project team and the organization (CSF 9) for the purposes of our survey.

User involvement (CSF 10). Because ERP systems cross functional and departmental boundaries, cooperation and involvement of all people in the organization are essential (Somers & Nelson, 2004). Gattiker and CFPIM (2002) argued that system implementation represents a threat to users' perceptions of control over their work. A period of transition during which users must cope with differences between old and new work systems is often beneficial. Involving users in defining organizational information system needs can decrease their resistance to ERP systems as users often perceive their role as central in decision making (Wang et al., 2007).

Consultants (CSF 11). A great deal of know-how is essential for the complex implementation of an integrated standard software package. The success of a project depends strongly on the capabilities of the consultants, who are the only ones with in-depth knowledge of the software (Al-Sehali, 2000; Welti, 1999). Consultants provide a very valuable service by filling gaps, providing expertise, and thinking outside the box (Khan, 2002; Wang et al., 2007). They are specialized and can usually work faster and more efficiently than others involved in the implementation process.

Project champions or sponsors (CSF 12). Project champions or sponsors are individuals who have a clear understanding of what is going on; they are critical to implementation success (Skok & Legge, 2002). Champions ideally have experience in previous implementation efforts to manage conflicts that arise before and after implementation. Project champions perform the crucial functions of transformational leadership, facilitation, and marketing the project to the users. Project champions play a critical role in the acceptance of the technology and are usually at the senior management level so they have the authority to make substantial organizational changes occur (Akkermans & Helden; 2002; Finney & Corbett, 2007; Ngai et al., 2007).

Architecture choice (packages selection; CSF 13). All ERP packages have limited capabilities. Some packages are more suited for larger companies while others fit smaller firms better. Akkermans and Helden (2002) pointed out that some packages have become a "de facto" standard in the industry. Some have a stronger presence in certain parts of the world. To increase the probability of success, management must choose software that most closely fits its requirements, such as hardware platforms, databases, and operation systems (Zhang et al., 2002). A gap analysis of organizational requirements and ERP features with the involvement of technical staff and key users is a necessary exercise (Ngai et al., 2007).

Minimal customization (CSF 14). The integrative design of ERP systems increases the complexity involved in source code modification. Most companies significantly underestimate the effort required for code modification (Mabet et al., 2003). Al-Sehali (2000) said that the vendor's code should be used as much as possible, even if this means sacrificing functionality, so upgrades from release to release can be done easily. Finney and Corbett (2007) suggested that organizations use a vanilla ERP solution, which means minimal customization. Therefore, every modification request should be carefully evaluated and approved or rejected after considering all the options.

Data analysis and conversion (CSF 15). The quality of preexisting data and information systems has also been cited as an important factor in successful ERP implementation (Gattiker & CFPIM, 2002; Ngai et al., 2007). If data problems are not fixed in legacy systems, they will be apparent in the new system as well (Al-Sehali, 2000). Zhang et al. (2002) and Umble et al. (2002) pointed out that ERP modules are intricately interlinked; inaccurate data input into one module will adversely affect the functioning of other modules.

Organizations have to know which factors are critical and important for them according to the implementation methodology used by the ERP vendor and how they are differentiated through different phases of the implementation process.

A SURVEY OF CSF IN ERP IMPLEMENTATION PROJECTS

To research the importance of ERP implementation CSFs according to project phases as well as analyze the importance of distinct CSFs for different methodologies, we conducted an empirical study using a web questionnaire mailed to 171 companies in Slovenia that had implemented an ERP solution in the recent past. Our sample consisted of companies that had implemented SAP R/3 or mySAP ERP (54 companies) and/or Microsoft Dynamics NAV (117 companies). The sample included all Slovenian companies mentioned on the SAP and Microsoft reference webpages in our country (in 2005). Forty-five questionnaires were returned for a

return rate of 26.3%. Of the 45 questionnaires returned, 22 refer to SAP solutions and 23 refer to Microsoft Dynamics NAV solutions; 13 questionnaires were from small companies, 13 were from medium-sized companies, and 19 were from large companies (see Table 2). The organizations in our sample were mainly from manufacturing (52.1%), followed by retail (14.6%), service (14.6%), and other (18.7%) areas.

Table 2: Distribution of organizations responding to the questionnaire by size and vendor

	SAP	NAV
Small companies	1	12
Medium-sized companies	5	8
Large companies	16	3
Total	22	23

Note: We used the Slovenian classification of organization size.

We asked companies how they implemented their ERP solution. They could choose from one of three answers: methodology of ERP vendor, own methodology, or other. Table 3 shows that 77.8% of the companies used the implementation methodology recommended by the ERP vendor, 17.8% companies used their own implementation methodology, and 4.4 % used other methodologies.

We asked companies to rank the 15 ERP implementation CSFs we extracted from the published research (Table 1), with 1 being the most important factor and 15 being the least important factor. The results from our survey show the following overall importance of CSF rankings (M_x represents the arithmetic mean):

1. CSF 2 Clear goals, objectives, scope, and planning ($M_x = 2.96$)
2. CSF 1 Top management support and involvement ($M_x = 5.00$)
3. CSF 3 Project team competence and organization ($M_x = 5.39$)
4. CSF 10 User involvement ($M_x = 6.77$)
5. CSF 8 Communication within the project team ($M_x = 7.64$)
6. CSF 4 User training and education ($M_x = 7.82$)
7. CSF 9 Communication between the project team and the organization ($M_x = 7.83$)
8. CSF 5 Business process reengineering ($M_x = 8.27$)
9. CSF 11 Consultants ($M_x = 8.67$)
10. CSF 12 Project champion ($M_x = 8.86$)
11. CSF 15 Data analysis and conversion ($M_x = 9.05$)
12. CSF 14 Minimal customization ($M_x = 9.23$)
13. CSF 7 Project management ($M_x = 10.20$)
14. CSF 6 Change management ($M_x = 11.40$)
15. CSF 13 Architecture choice ($M_x = 12.40$)

Table 3: Implementation methodologies chosen by companies

	SAP	NAV	Answer	Percent
Methodology of ERP vendor	16	19	35	77.8
Own methodology	4	4	8	17.8
Other	2	0	2	4.4
Total	22	23	45	100.0

Respondents' CSF rankings and the frequency with which CSFs are mentioned in the literature (Table 4) correlate strongly ($r = 0.745$, $p \geq 0.001$). This correspondence adds face validity to the relevance of our data and findings concerning the importance of CSFs associated with different methodologies.

In the ranking list of the literature at the beginning of the paper (as well as in the second column of Table 4), more CSFs have the same number, representing the number of authors who mentioned these CSFs. It can be presumed that more groups of CSFs have the same importance. The rank of individual CSFs and the variation in rank among companies were calculated according to the place of their standard means. The 15 CSFs were categorized into 5 groups. Within each group, no distinctive differences occur between CSF ranks. The rank of individual CSFs and the variation in rank among companies are presented in Figure 1.

Table 4: Comparison of CSF ranking in the literature and in our survey

	Literature*	Survey
CSF 1 Top management support and involvement	1	2
CSF 2 Clear goals, objectives, scope, and planning	2	1
CSF 3 Project team competence and organization	2	3
CSF 4 User training and education	2	7
CSF 5 Business process reengineering	5	8
CSF 6 Change management	5	14
CSF 7 Project management	7	13
CSF 8 Communication within project team	8	6
CSF 9 Communication between project team and organization	8	5
CSF 10 User involvement	8	4
CSF 11 Consultants	8	9
CSF 12 Project champion	8	10
CSF 13 Architecture choice	8	15
CSF 14 Minimal customization	8	12
CSF 15 Data analysis and conversion	15	11

*If some number occurs in the literature more times, it means that it was equally important for the author (see Table 1).

The first group consists of only one factor: CSF 2 clear goals, objectives, and scope. The second group of equally important CSFs includes two factors: CSF 1 top management support and involvement and CSF 3 project team competence and organization. The third group includes CSF 10 user involvement, CSF 8 communication within the project team, CSF 4 user training and education, CSF 9 communication between the project team and the organization, and CSF 5 business process reengineering. The fourth group of equally important CSFs comprises CSF 11 consultants, CSF 12 project champion, CSF 15 data analysis and conversion, CSF 14 minimal customization, and CSF 7 project management. The last and least important group of equally important CSFs consists of CSF 6 change management and CSF 13 architecture choice.

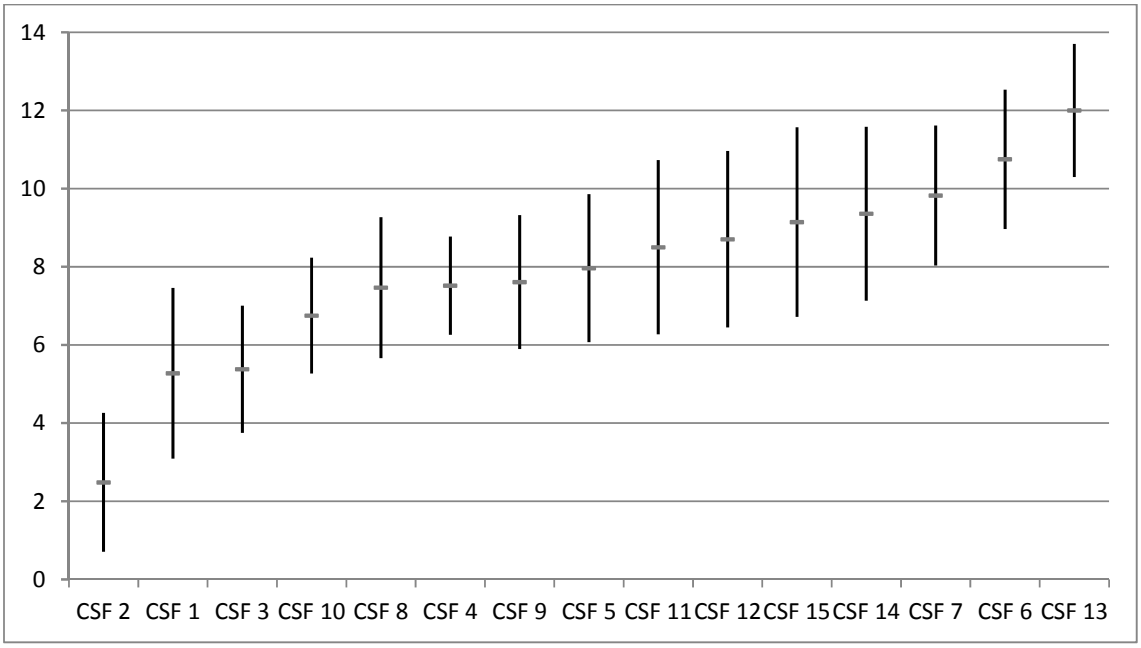

Figure 1: CSFs presented by standard means and variation in rank among companies

As Table 4 and Figure 1 illustrate, highly ranked CSFs in both lists include CSF 2 clear goals, objectives, scope and planning; CSF 1 top management support and involvement; and CSF 3 project team competence and organization. Respondents ranked CSF 10 user involvement fourth, although it ranked eighth in the published literature. The biggest difference in rankings between our survey and the published literature is in the perceived

importance of CSF 6 change management, which the research literature ranked fifth but survey respondents ranked fourteenth. A significant difference also exists for CSF 13 architecture choice, which the literature ranked eighth while respondents ranked it fifteenth place, and for CSF 7 project management, which the literature ranked seventh but respondents ranked thirteenth. All other CSFs are ranked identically or very close for both rankings.

We further wanted to research if a correlation exists between CSFs. Our data showed correlations between the identified CSFs as follows (Table 5):

1. High positive correlations between CSFs, significant at the 0.01 level:
   - CSF 1 top management support and involvement and CSF 2 clear goals, objectives, scope and planning (r = 0.843)
   - CSF 2 clear goals, objectives, scope and planning and CSF 3 project team competence and organization (r = 0.706)
2. Moderate positive correlations between CSFs, significant at the 0.01 level:
   - CSF 1 top management support and involvement and CSF 3 project team organization and competence (r = 0.631)
   - CSF 8 communication within the project team and CSF 9 communication between project team and organization
     (r = 0.616)
   - CSF 10 user involvement and CSF 13 architecture choice (r = 0.576)
   - CSF 3 project team organization and competence and CSF 8 communication within the project team (r= 0.57)
3. Moderate positive correlations between CSFs, significant at the 0.05 level:
   - CSF 1 top management support and involvement and CSF 12 project champion (r = 0.478)
   - CSF 1 top management support and involvement and CSF 6 change management (r = 0.449)
   - CSF 4 user training and education and CSF 15 data analysis and conversion (r = 0.443)
   - CSF 2 clear goals, objectives, scope and planning and CSF 6 change management (r = 0.436)
   - CSF 1 top management support and involvement and CSF 7 project management (r = 0.435)
   - CSF 5 business process reengineering and CSF 15 data analysis and conversion (r = 0.431)
   - CSF 3 project team organization and competence and CSF 7 project management (r = 0.426)
4. Negative correlations between CSFs significant at the 0.05 level:
   - CSF 7 project management and CSF 4 user training and education (r = -0.491)
   - CSF 3 project team competence and organization and CSF 15 data analysis and conversion (r = -0.477)
   - CSF 8 communication within the project team and CSF 14 minimal customization (r = -0.448)
   - CSF 3 project team competence and organization and CSF 4 user training and education (r = -0.426)

Table 5: Correlation of CSFs According to Range

	CSF 2	CSF 1	CSF 3	CSF 7	CSF 8	CSF 9	CSF 11	CSF 10	CSF 4	CSF 6	CSF 5	CSF 12	CSF 13	CSF 14	CSF 15
CSF 2	1	.843(**)	.706(**)	.338	.260	.186	-.056	-.223	-.143	.436(*)	-.158	.352	-.151	-.380	-.273
CSF 1	.843(**)	1	.631(**)	.435(*)	.015	.029	-.081	-.331	-.262	.449(*)	-.306	.478(*)	-.326	-.176	-.396
CSF 3	.706(**)	.631(**)	1	.426(*)	.570(**)	.340	-.273	-.215	-.426(*)	.387	-.054	.344	-.429	-.145	-.477(*)
CSF 7	.338	.435(*)	.426(*)	1	.083	-.007	-.045	-.276	-.491(*)	.092	-.278	.416	-.192	-.178	-.304
CSF 8	.260	.015	.570(**)	.083	1	.616(**)	-.188	.124	-.344	.111	.227	-.220	.106	-.448(*)	-.112
CSF 9	.186	.029	.340	-.007	.616(**)	1	-.234	.077	-.262	.061	.088	-.292	.163	-.088	-.082
CSF 11	-.056	-.081	-.273	-.045	-.188	-.234	1	.122	-.101	-.227	.149	-.107	.350	.025	.126
CSF 10	-.223	-.331	-.215	-.276	.124	.077	.122	1	.251	-.403	.077	-.229	.576(**)	-.243	.235
CSF 4	-.143	-.262	-.426(*)	-.491(*)	-.344	-.262	-.101	.251	1	.016	.104	-.262	.139	-.069	.443(*)
CSF 6	.436(*)	.449(*)	.387	.092	.111	.061	-.227	-.403	.016	1	.183	.262	-.083	.016	-.213
CSF 5	-.158	-.306	-.054	-.278	.227	.088	.149	.077	.104	.183	1	-.183	.195	.243	.431(*)
CSF 12	.352	.478(*)	.344	.416	-.220	-.292	-.107	-.229	-.262	.262	-.183	1	-.247	.104	-.425
CSF 13	-.151	-.326	-.429	-.192	.106	.163	.350	.576(**)	.139	-.083	.195	-.247	1	-.106	.192
CSF 14	-.380	-.176	-.145	-.178	-.448(*)	-.088	.025	-.243	-.069	.016	.243	.104	-.106	1	.124
CSF 15	-.273	-.396	-.477(*)	-.304	-.112	-.082	.126	.235	.443(*)	-.213	.431(*)	-.425	.192	.124	1

**Pearson's correlation is significant at the 0.01 level (2-tailed).
*Pearson's correlation is significant at the 0.05 level (2-tailed).

CSF 2- Clear goals, objectives, scope and planning
CSF 1 - Top management support and involvement
CSF 3 - Project team competence and organization
CSF 7 - Project management
CSF 8 - Communication within project team

CSF 9 - Communication between project team and organization
CSF 11 - Consultants
CSF 10 - User involvement
CSF 4 - User training and education
CSF 6 - Change management

CSF 5 - Business process reengineering
CSF 12 - Project champion
CSF 13 - Architecture choice
CSF 14 - Minimal customization
CSF 15 - Data analysis and conversion

As these results indicate, a high correlation exists between CSF 2 clear goals, objectives, scope and planning and CSF 1 top management support and involvement as well as CSF 3 project team competences and organization. Clear goals, objectives, and scope should be specific and operational and indicate the general directions of the project (Somers & Nelson, 2004). They help keep the project constantly focused and are essential for analyzing and measuring success. Meanwhile, top management is responsible for making fast and effective decisions, resolving conflicts, and promoting organization-wide acceptance of the project. If a company has clearly defined goals, objectives, scope, and plan of ERP, the top management's role is seen in monitoring the progress of the project, providing directions to the implementation teams, and establishing clear priorities (Mabert et al., 2003). On the other hand, project teams spend a lot of time defining in great detail exactly what and how the implementation will be carried out (Mabert et al., 2003), including which modules and process options will be implemented and how the senior management priorities will be incorporated.

ANALYSIS OF CSFS IN MICROSOFT DYNAMICS NAV IMPLEMENTATION PROJECTS

The survey included 23 companies that had implemented Microsoft Dynamics NAV (see Table 2), but only 19 of them were using the methodology of the ERP vendor (in our case Microsoft Sure Step) as the implementation methodology (see Table 3). We wanted to examine whether a difference in ranking of importance of CSFs occurred based on the Microsoft Sure Step implementation methodology. Table 6 shows that the most important CSF corresponding to Microsoft Dynamics NAV projects implemented according to Microsoft Sure Step is also CSF 2 clear goals, objectives, scope, and planning.

Table 6: Range of CSFs according to sure step methodology

CSF	**M_{XN}**	**$Range_N$**
CSF 2 Clear goals, objectives, scope, and planning	3,14	1
CSF 11 Consultants	6,36	2
CSF 1 Top management support and involvement	6,57	3
CSF 10 User involvement	6,57	4
CSF 12 Project champion	7,07	5
CSF 4 User training and education	7,21	6
CSF 9 Communication between project team and organization	8,07	7
CSF 14 Minimal customization	8,14	8
CSF 13 Architecture choice	8,50	9
CSF 3 Project team competence and organization	8,85	10
CSF 6 Change management	9,46	11
CSF 5 Business process reengineering	10,46	12
CSF 8 Communication within project team	11,14	13
CSF 15 Data analysis and conversion	11,54	14
CSF 7 Project management	11,85	15

The groups of CSFs with the same importance were researched. The rank of individual CSFs and variation in the rank among companies were calculated regarding the place of their standard means. Fifteen CSFs were categorized into four groups. No distinctive differences between CSF ranks occurred within each group. The rank of individual CSFs and variation in the rank among companies are presented in Figure 2.

The first group consists of only one factor, which is CSF 2 clear goals, objectives and scope. The second group of equally important CSFs includes five factors: CSF 11 consultants, CSF 1 top management support and involvement, CSF 10 user involvement, CSF 12 project champion, and CSF 4 user training and education. The third group includes CSF 9 communication between project team and organization, CSF 14 minimal customization, CSF 13 architecture choice, CSF 3 project team competence and organization, and CSF 6 change management. The least important group of equally important CSFs includes CSF 5 business process

reengineering, CSF 8 communication within the project team, CSF 15 data analysis and conversion, and CSF 7 project management.

Table 6 indicates a big difference from the CSF ranking in the literature (Table 4) in terms of CSF 11 consultants, which the literature ranked eighth but the survey of Microsoft Dynamics NAV respondents ranked second. One reason for this difference could be that the Microsoft Dynamics NAV solution is implemented in small to medium-sized companies (see Table 2), which do not have a lot free resources and knowledge to implement such solutions and they rely heavily on consultants. Skok and Legge (2002) argued that the use of consultants is important, but the over-use of consultants could mean that the company loses ownership of the project. Therefore, an organization has to establish a knowledge transfer mechanism by which consultants' role is clearly defined and their skills and expertise are acquired and transferred adequately (Al-Mashari et al., 2003). Another significant difference emerged in terms of CSF 12 project champion. The literature ranked it lower, but the survey of Microsoft Dynamics NAV respondents ranked it fifth. However, this difference may be also a factor of organization size. In small companies, the CIO is the only member of top management; he/she also fulfills the role of project champion. A big difference in ranking was also evident for CSF 8 communication within the project team. Again, company size may explain this difference. Small companies may not pay adequate attention to teaching their end users because of the costs associated with such education and training. Table 6 indicates a difference in the rankings of CSF 13 architecture choice, CSF 14 minimal customization, CSF 3 project team competence and organization, and CSF 5 business process reengineering.

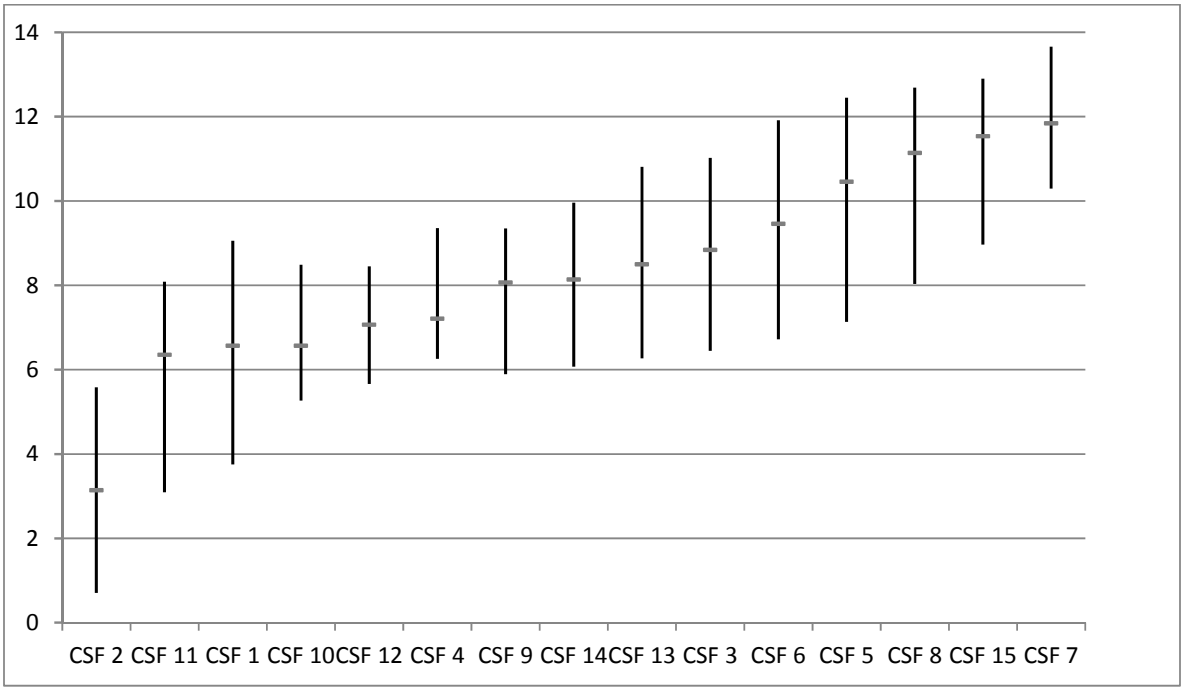

Figure 2: CSFs Microsoft Dynamics NAV implementation projects presented by standard mean and variation in the rank among companies

Our hypothesis in the survey was that all CSFs are not equally important in all phases of an ERP implementation process. In our questionnaire, the respondents indicated the relative importance of CSFs for each phase (I - selection of ERP solution, II - business processes analysis, III - ERP solution configuration, IV - ERP solution testing, V - ERP solution installation, and VI - ERP solution stabilizing), where 1 was the least important factor and 4 was the most important factor. For each CSF we calculated an arithmetic mean (see Table 7). The average arithmetic mean was 2.5 because organizations have to select values 1, 2, 3, or 4 for each CSF in each phase. If the arithmetic mean is 2.5 or higher, the cell is shaded grey, suggesting that those CSFs are more critical or important in the specific phase indicated.

Table 7 shows that CSF 6 change management and CSF 12 project champion are not as critical in any phase. On other hand, CSF 2 clear goals, objective, and scope, CSF 3 project team competence and organization, CSF 8 communication within the project team, and CSF 9 communication between project team and organization are

critical factors in every phase of ERP implementation. CSF 1 top management support and involvement and CSF 13 architecture choice are important in phase I - selection of ERP solution. CSF 4 user training and education and CSF 10 user involvement are more important in the final three phases (ERP solution testing, ERP solution installation, and ERP solution stabilizing). CSF 7 project management is important in the selection of an ERP solution phase and in the ERP solution configuration phase. CSF 11 consultants is critical in the ERP solution configuration phase. CSF 14 minimal customization is important in the first two phases whereas CSF 15 data analysis and conversion is important in the selection of the ERP solution phase, the ERP solution testing phase, and the ERP solution installation phase.

Table 7: Arithmetic Mean for CSF's in terms of phases of Sure Step methodology

Microsoft Dynamics NAV	**I**	**II**	**III**	**IV**	**V**	**VI**
CSF 1 Top management support and involvement	3.00	2.33	2.07	1.93	2.13	2.07
CSF 2 Clear goals, objectives, scope, and planning	3.40	3.13	3.00	2.67	2.80	2.93
CSF 3 Project team competence and organization	2.73	2.93	2.93	2.87	2.87	2.60
CSF 4 User training and education	1.93	2.27	2.47	2.60	2.53	3.00
CSF 5 Business process reengineering	2.73	2.87	2.80	2.60	2.87	2.60
CSF 6 Change management	1.87	2.07	1.93	2.00	2.27	2.33
CSF 7 Project management	2.53	2.47	2.53	2.20	2.20	2.00
CSF 8 Communication within project team	2.87	3.07	2.93	2.93	2.87	2.80
CSF 9 Communication between project team and organization	2.67	3.13	2.53	3.07	2.93	3.07
CSF 10 User involvement	2.33	2.47	2.33	3.00	3.00	2.73
CSF 11 Consultants	2.13	2.40	2.67	2.47	2.47	2.13
CSF 12 Project champion	2.40	2.33	1.80	2.07	2.00	1.93
CSF 13 Architecture choice	2.73	2.07	2.13	2.00	1.93	1.73
CSF 14 Minimal customization	2.67	2.53	2.47	2.27	2.13	1.87
CSF 15 Data analysis and conversion	2.53	2.33	2.47	2.53	2.80	2.13

CONCLUSION

Like many new fields in information systems, ERP solutions have many synonyms, such as integrated standard software packages, enterprise systems, enterprise-wide systems, and integrated vendor systems. ERP solutions allow organizations to replace their existing information systems with a single integrated system. They are defined as customizable, standard application software that incorporates integrated business solutions for the core processes and the main administrative functions. They can also be defined as comprehensive package software solutions that seek to integrate the complete range of business processes and functions in order to present a holistic view of the business from a single IT architecture. ERP solutions consist of more modules and support business processes on the operative level in an organization.

ERP solutions are designed using the principles of best practices, which means that ERP vendors search for the best organizational business models in branches and then adopt that business model in their ERP solutions (Sternad & Bobek, 2004). Instead of tailoring the ERP system specifications to meet organizational requirements, organizations have to adopt business processes to an ERP system. As such, organizations should select the ERP package that fits their organization, provides industry functionality, supports changing business environments, easily integrates with other IS in organizations, includes vendor support during and post implementation, is complete and stable, and offers implementation accelerators such as training materials, user procedures, help text, and process models (Shields, 2001).

To be successful with EPR implementation, a company has to take into account the implementation strategy, implementation method (implementation process), and implementation CSFs. Numerous ERP implementations are failures because companies think that they are technological, not management issues. Failed ERP implementations indicate underestimated management issues. Thus, it is essential that organizations create the overall conditions in which they can implement the chosen solution within the expected timeframe, scope, and estimated costs.

Organizations should be aware of the most critical success factors of ERP implementations. Previous research has examined CSFs, 20 of which have been mentioned by more than one researcher. These CSFs were researched within Slovenian companies that had recently conducted ERP implementation processes. The most important CSFs—according to both the literature and Slovenian organizations—are clear goals, objectives, scope, and planning; project team competence; and organization and top management support and involvement. Our survey respondents ranked user involvement fourth, but the literature ranked it eighth. The biggest difference in CSF ranking was in factor change management and factor project management, which the literature ranked sixth, but our survey respondents ranked fourteenth. A similar outcome resulted for project management, which ranked thirteenth. Factor business process reengineering was ranked fifth in the literature and eighth among survey respondents. All other CSFs are ranked similarly in both lists.

The analysis of CSFs in Microsoft Dynamics NAV implementation projects where Microsoft Sure Step implementation methodology was used shows that clear goals, objectives, scope and planning are also the most important factor. The biggest difference regarding CSF ranking related to consultants, project champion, and communication within the project team. Our assumption in surveying respondents was that all CSFs are not equally important during all phases of an ERP implementation process. Thus, we concluded that methodology drives the importance of different CSFs, which have to be noted when implementing ERP projects in all phases of implementation. If we take into account that in our sample Microsoft Dynamics NAV was implemented by small and medium-sized organizations, part of the importance of CSFs found may be explained by the size of the organization implementing the project.

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