

Chapter 5: Critical success Factors for ERP System Selection, Implementation and Post-Implementation

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5.1 Introduction

During the last decades, the segment of enterprise resource planning (ERP) systems was one of the fastest growing segments in the software market, and these systems are one of the most important developments in information technology. Due to strong demand, there are many ERP systems with various technologies and philosophies available, and the ERP market is strongly fragmented.

This multitude of software manufacturers, vendors, and systems means it is essential for enterprises that use or want to use ERP systems to find the right software, as well as to be aware of the factors that influence the success of the implementation project (Winkelmann & Leyh 2010). Recalling these so-called critical success factors (CSFs) is of high importance whenever a new system is to be adopted and implemented, or a running system needs to be upgraded or replaced. Errors during selection, implementation, or during the post-implementation phase of ERP systems, wrong implementation approaches, ERP systems that do not fit the requirements of the enterprise – all this can cause financial disadvantages or disasters, even leading to insolvencies. Several examples of such negative scenarios can be found in the literature (e.g., Barker & Frolick 2003; Hsu, Sylvestre & Sayed 2006).

In order to identify factors that affect the success or failure of ERP system implementation projects, several case studies, surveys, and literature reviews were already conducted by different researchers (e.g., Esteves & Pastor 2000; Finney & Corbett 2007; Nah, Zuckweiler & Lau 2003). Most of these literature reviews cannot be reproduced because of missing descriptions of review methods and procedures. Vom Brocke et al. (2009) clearly point out the drawbacks of literature review articles lacking methodological rigour. Therefore, in order to update existing reviews by including current ERP literature, we conducted a literature review – a systematic review in five different databases, and among several proceedings of international conferences. The CSFs were derived from 185 identified relevant papers, and the frequency of their entries was counted. The aggregated results of this review are presented in this chapter.

The next section presents a short overview of our data collection methodology, in order to make our review reproducible.

In section 3, critical success factors that were focused on during the review will be explained in detail. The fourth section deals with the results of the literature review. We will point out which factors are the most important, and which factors seem to have little influence on ERP project success. Finally, the chapter concludes with a summary of the results, as well as a critical acclaim of the conducted literature review.

5.2 Data Collection Methodology – Literature Review

The literature review to identify CSFs was performed in several steps similar to the approach suggested by Webster & Watson (2002). In general, it was a database-driven review with an additional search in the proceedings of several IS conferences. To make our review reproducible, tables of the databases and search terms are listed in the appendix.

The steps of our review procedure are presented in the following paragraphs. An overview of the number of papers identified or remaining during/after each step is given in **Figure 1**. With each step, the number of papers was reduced according to the assembly of different criteria.

Step 1: The first step was to define sources for the literature review. Therefore, several databases and conference proceedings were identified (cp. Appendix).

Step 2: During this step we had to define the search terms for the database-driven review. Keywords selected for this search were mostly derived from keywords supplied, and used by authors of some of the relevant articles identified in a preliminary literature review. The search terms used are listed in the appendix.

Since the WISO database also provides German papers, we also used the German translation of most of the search terms. For the conferences, only inappropriate search fields were provided. Hence, we decided to manually review abstracts and titles of the papers in this step.

Figure 1 - Progress of the Literature Review



Step 3: During step 3 we performed the initial search according to step 1 and step 2, and then eliminated duplicates. The initial search provided 5429 papers in the databases. After eliminating duplicates, 3419 articles remained. From the conference search, 79 papers remained. A total of 3498 papers were identified during the initial search step (cp. Figure 1).

Step 4: Step 4 included the identification of irrelevant papers. During the initial search we did not apply any restrictions. The search was not limited to the research field of IS; therefore, papers from other research fields were included in results, too. Thus, these papers had to be excluded. This was done by reviewing paper abstracts and, if necessary, by looking into the paper content. Of the papers, 427 stemming from the database search and all 79 conference papers remained – together this yielded 506 papers potentially relevant to the field of CSFs for ERP system implementations (cp. Figure 1).

Step 5: The fifth and final step consisted of a detailed analysis of the remaining 506 papers, and the identification of the CSFs. Therefore, the content of all 506 papers was reviewed in depth for the purpose of categorizing identified success factors. Emphasis was placed not only on the wording of these factors, but also their meaning. After this step, 185 relevant papers that suggested, discussed, or mentioned CSFs remained. The analysis results of these 185 papers mentioning CSFs are described in the following sections.

5.3 Critical Success Factors of ERP Implementation Success

A critical success factor for ERP projects is defined by Finney and Corbett (2007) as a reference to any condition or element seen as necessary for the ERP implementation to be successful. The goal of the literature review was to gain an in-depth understanding of the different CSFs already identified by other researchers.

The papers identified consist of those that presented single or multiple case studies, conducted surveys, literature reviews or articles where CSFs are derived from chosen literature. Within these papers, the following 31 CSFs were identified:

- Available Resources (budget, employees, etc.)
- Balanced Project Team
- Business Process Reengineering
- Change Management
- Clear Goals and Objectives (vision, business plan, etc.)
- Communication
- Company Strategy/Strategy Fit
- Data Accuracy (data analysis and conversion)
- Environment (national culture, language, etc.)
- ERP System Acceptance/Resistance
- ERP System Configuration
- ERP System Tests
- External Consultants
- Interdepartmental Cooperation
- Involvement of End-Users and Stakeholders
- IT Structure and Legacy Systems
- Knowledge Management
- Monitoring and Performance Measurement
- Organizational Culture
- Organizational Fit of the ERP System
- Organizational Structure
- Project Champion
- Project Leadership/Empowered Decision Makers
- Project Management
- Skills, Knowledge and Expertise

- Top Management Support and Involvement
- Troubleshooting
- Use of a Steering Committee
- User Training
- Vendor Relationship and Support
- Vendor Tools and Implementation Methods

Available Resources (budget, employees, etc.): ERP implementation projects require a lot of resources such as money, time and employees. These requirements need to be determined early in the project or even before it starts (Remus 2007). It is very difficult to secure resource commitment in advance (Reel 1999) to ensure the success of the implementation project. An appropriate budget is the basis for a solid project execution. If the budget allocated is too small other success factors can be negatively affected (Achang et al. 2006).

Balanced Project Team: In general, a project team consists of at least two people working together for a common goal, whereby each team member has defined responsibilities and functions (Humphrey 2000). The characteristics of the team members should complement each other, their experience, their knowledge, and their soft skills (Hesseler & Goertz 2007). For an ERP implementation it is important to have a solid, core implementation team comprised of the organization's best and brightest individuals (Finney & Corbett 2007). These team members should be assigned to the project on a fulltime basis. Only then can they fully concentrate on the project and not be disturbed or distracted with their daily business (Shanks & Parr 2000).

Business Process Reengineering: Business process reengineering (BPR) is a crucial project phase in ERP projects, although it often leads to delays in ERP implementation (Kumar et al. 2003). During ERP projects companies have to review their business processes, and explore new ways of doing things relative to best practices embedded in the ERP system. The deeper and more detailed this review, the better the outcome of the BPR will be (Francoise et al. 2009; Rajagopal 2002). Changing activities and workflows in business processes before, during, or after the ERP implementation may lead to a different and minimized level of ERP system configuration (Remus 2007). It is advisable to minimize the extent of ERP system modification. This reduces errors, and the company can more easily take advantage of newer versions and releases. Therefore, the project team or top management should decide to what extent the company has to change their business processes to fit the ERP system (Rosario 2000).

Change Management: Change management involves early participation of all persons affected by a change process in order to reduce resistance against these changes. Important components include adequate training, especially of the IT-department, as well as early communication of the changes in order to provide employees with an opportunity to react (Al-Mashari & Al-Mudimigh 2003). Change management strategies are responsible for handling enterprise-wide cultural and structural changes. Therefore, it is necessary to train and educate employees in various ways. Thereby, change management not only aims to prevent rejection and support acceptance, but also to make employees understand and want the changes. Integrating employees in the planning and implementation process early on is important to achieve this understanding. A support team should also be available during user training sessions, in order to clarify and answer questions regarding new processes and functions. Furthermore, an additional evaluation with end users should be accomplished after the "go live" to uncover problems and avoid discord (Loh & Koh 2004).

Clear Goals and Objectives (vision, business plan, etc.): Clear goals and objectives are seen as CSFs by many researchers (e.g., Esteves & Pastor 2000; Nah et al. 2001; Somers & Nelson 2001). This requires formulating a business vision, calculating a business case, identifying and communicating clear goals and objectives regarding ERP implementation, and providing a clear link between business goals and the company's IS strategy (Al-Mashari, Al-Mudimigh & Zairi 2003; Finney & Corbett 2007). This is needed to steer the project direction throughout the whole ERP implementation. Therefore, a good business plan that outlines proposed strategic and tangible benefits, includes resources, calculates costs and risks, and specifies a clear timeline is critical to an ERP project. These instruments can be very helpful to maintain focus on project benefits and outcomes (Loh & Koh 2004).

Communication: CSF communication is one of the most difficult and challenging tasks during the implementation of an ERP system. The existence of a clear concept addressing communication, which contains a communication strategy as well as the respective communication channels and methods, is very important. This strategy should match the goals and requirements of the ERP project, and should enable open and free communication by providing an adequate communication platform (Al-Mashari et al. 2003). Expectations at every level need to be communicated (Loh & Koh 2004). The communication between management, the project team, and employees should be clear on a regular basis.

Detailed information about the project status, achieved results, or decisions made by management is as essential as the direct discussion, for example, of fears and conflicts.

Company Strategy/Strategy fit: To ensure the success of an ERP implementation, the changes caused by the ERP system have to be linked with the company's long-time strategic goals. The ERP system should support this strategy, or even be one of the important factors for the strategy's success. The implementation project as part of the enterprise-wide strategy (e.g., the implementation as a method of strategic goal achievement) is mandatory (Soja 2007).

Data Accuracy (data analysis and conversion): A fundamental requirement for the effectiveness and the success of ERP systems is the availability of accurate data. Problems concerning data can cause heavy implementation delays. Therefore, data migration management represents a critical factor throughout implementation (Somers & Nelson 2001; Umble, Haft & Umble 2003). Identifying which data has to be loaded into the system and which is extraneous, as well as converting all disparate data structures into a single consistent format is an important challenge. The conversion process is often underestimated. In addition, interfaces with other internal and external systems (between departments such as accounting, production, data warehouses, etc.) have to be considered, too (Somers & Nelson 2001).

Environment (national culture, language, etc.): The effects and the relevance of national cultures to ERP implementation are pointed out in several studies (e.g., Krumbholz & Maiden 2001; Zhang, Lee et al. 2003). Basic values, beliefs and norms in different countries are factors that influence organizational culture, and in turn, affect the practices of professional activities, including ERP implementation (Krumbholz & Maiden 2001). Cultural differences can cause problems during an ERP project, such as different beliefs in providing access to information, miscommunication due to language difficulties, or problems in reengineering organizational processes (Xue et al. 2005).

ERP System Acceptance/Resistance: Every person and department should be responsible and accountable for the whole ERP system, and key users from different departments have to be committed to the implementation project on a fulltime basis (Zhang et al. 2005). Therefore, a lack of user and stakeholder input and acceptance may reduce the chance of a successful implementation (Soh et al. 2000). If employees are not psychologically ready for change and do not accept the new ERP system, their attitudes and behaviours will hinder them from working and resolving conflicts with consultants,

as well as from acquiring necessary ERP knowledge (McLachlin 1999). Accordingly, higher user and stakeholder support should positively affect communication and conflict resolution in the ERP consulting process (Wang & Chen 2006).

ERP System Configuration: Since the initial ERP system version is based on best practices, a configuration or adaption of the system according to business processes is necessary in every ERP implementation project. Hence, the company should try to adopt the processes and options built into the ERP as much as possible, rather than seek to modify it (Esteves & Pastor 2000). Following Hong & Kim (2002), the more strongly the original ERP software is modified (e.g., even beyond the "normal" configuration) the smaller the chance is for a successful implementation project. Hence, a good business vision is helpful because it reduces the effort of capturing the functionality of the ERP business model and therefore minimizes the effort needed for the configuration (Esteves & Pastor 2000). Extensive system modifications will not only cause implementation problems, but also harm system maintenance. Therefore, fewer adjustments reduce the effort of integrating new versions, releases or updates (Loh & Koh 2004).

ERP System Tests: In ERP implementation, "go live" on the system without adequate and planned system testing may lead to an organizational disaster. Tests and validation of an ERP system are necessary to ensure that the system works technically correctly, and that business process configuration was done the right way (Apperlath & Ritter 2000). Therefore testing and simulation exercises must be performed during the final stages of the implementation process for both separate parts / functions, and the system as a whole (Al-Mashari et al. 2003; Finney & Corbett 2007).

External Consultants: The use of external consultants depends on internal know-how and experience at the moment of project initiation (Esteves & Pastor 2000). Many organizations use consultants to facilitate the implementation process. Consultants are experienced in specific industries, have comprehensive knowledge of certain modules, and may be better able to determine what will work best for a given company (Pituro 1999). Consultants are often involved in all stages of the implementation: performing requirements analysis, recommending a suitable solution, and managing the implementation (Somers & Nelson 2001). Therefore, it is necessary to determine the number of consultants, how and when to use them, as well as their responsibilities within the implementation project (Esteves & Pastor 2000).

Interdepartmental Cooperation: To successfully implement an ERP system it is necessary that all departments cooperate at the same level of intensity and engagement, since an ERP system affects all business units and business processes across functional and departmental boundaries. This requires the sharing of common goals instead of emphasizing individual pursuits. Also, to share information within a company and between different companies requires cooperation between partners, employees, managers, and corporations based on trust and the willingness to cooperate. Issues such as prestige, job security, feelings of control, and departmental politics are also involved and have to be considered and managed (Somers & Nelson 2001 ; Stefanou 1999).

Involvement of End-Users and Stakeholders: This factor is one of the most frequently cited CSFs (Esteves et al. 2003). Users and stakeholders must perceive the system as being important and necessary to their work (Barki & Hartwick 1991). Therefore, involvement and participation in the ERP project is mandatory for all end-users and stakeholders affected by the ERP implementation, and will result in meeting more user requirements, better system quality, and an increase in use and acceptance (Esteves & Pastor 2000). It is important to get users and stakeholders involved during system implementation, and to make use of their knowledge in areas where the project team lacks expertise and knowledge (Francoise et al. 2009). According to Ghosh (2002), this involvement in the project, from start to finish, is just as crucial as the involvement of top management.

IT Structure and Legacy Systems: It is critical to assess the company' IT readiness, including IT architecture and employee skills (Finney & Corbett 2007 ; Somers & Nelson 2001). If necessary, infrastructure might need to be upgraded or changed depending on ERP system requirements (Kumar et al. 2002 ; Palaniswamy & Frank 2002). Also, the current legacy systems need attention. It is important that an organization approaches the transition of a legacy system carefully and develops a comprehensive plan. During ERP projects, existing legacy systems must be carefully reviewed, defined, and evaluated in order to prepare for possible problems and hindrances that may arise during implementation (Al-Mashari et al. 2003 ; Holland & Light 1999 ; Nah et al. 2001).

Knowledge Management: Knowledge management during ERP implementation projects is an important factor. Sharing knowledge is somewhat unique since ERP projects redefine jobs and blur traditional intra-organizational boundaries (Jones & Price 2004). It is crucial to exchange knowledge and problems within the organization. Employees possess a knowledgebase

that is indispensable to the company (Francoise et al. 2009). During ERP implementation knowledge must be shared among departments and across functional and divisional boundaries (Baskerville et al. 2000). Thus, a knowledge management process has to be established to ensure that information will be correctly exchanged within the project team, and with all other people involved in the ERP project (e.g., external consultants or the ERP vendor's employees). In addition, the organization must ensure the transfer of as much knowledge as possible from consultants or ERP vendors, in order to be able to use the new ERP system autonomously (Francoise et al. 2009).

Monitoring and Performance Measurement: In the context of project management, mechanisms for performance measurement have to be established. Measuring and evaluating performance is a critical factor for ensuring the success of any business organization (Al-Mashari et al. 2003). Constant measurement and monitoring of the progress enables early discovery of errors and gaps, as well as their removal or correction (Al-Mashari & Al-Mudimigh 2003).

Organizational Culture: Organizational culture is embedded within national culture, and is therefore a critical factor affecting ERP system implementation. Every company has its own unique organizational culture, which may or may not be strong and enduring, and which may be reflected in either openness for change, or the opposite (Zhang et al. 2005). An organization that implements an ERP system has to change its business processes to achieve a better fit with ERP best-practice processes. These changes both impact the organization's culture, and are constrained by it (Krumbholz & Maiden 2001 ; Zhang et al. 2005).

Some researchers argue that a successful technological innovation requires that either the technology be designed to fit the organization's current structure and culture, or that the organization's structure and culture has to be redesigned and changed to fit the new technology (Cabrera et al. 2001 ; Yusuf et al. 2004).

Organizational Fit of the ERP System: The fact that an ERP system's organizational fit should be thoroughly examined and considered before its implementation sounds logical. Nevertheless, ERP vendors tend to set up blind confidence in their ERP package, even if it is obvious that the organizational fit is low. Hong & Kim (2002) empirically examined to what extent the implementation success of an ERP system depends on the fit between company and ERP system, and found out that

adaptation and configuration effort negatively correlate with implementation success. Therefore, it is essential to select an ERP system carefully by considering its specific organizational fit such as company size or industry sector. Thus, selecting the right ERP system is an important factor to ensure the fit between the company and the ERP system.

Organizational Structure: Organizational structure is a determining factor in ERP system implementation. Since ERP systems are designed according to “best practice” principles, they aim to fit with the greatest possible number of companies. Therefore, configuration becomes essential to map system functions with the company structure (Soffer et al. 2005). So, the company’s structure should enable the implementation and use of ERP systems as well as other IT systems. Nevertheless, BPR can become mandatory, as not all of the company’s structure can be mapped in the ERP system, causing the structure to need adapting. Many organizations underestimate the lack of alignment between the ERP system and their organizational structure, and thus the effort required for system configuration or BPR during the implementation (Francoise et al. 2009).

Project Champion: A project champion is a staunch advocate of the ERP implementation project, and is necessary for better and faster agreement within the project team, and for overseeing the entire project life cycle and all processes. The project champion’s main tasks are to be the first contact person for any issues concerning the ERP project, and to ensure project progress within the enterprise. The project champion ensures the prompt resolution of conflicts and resistance, serving as mediator to a certain degree (Loh & Koh 2004). In many ERP implementations the leader of the ERP project takes the position of project champion, but this is not the only solution. A member of senior management that is not a direct project team member can also act as project champion.

Project Leadership/Empowered Decision Makers: The project leader should be a strong and charismatic individual with experience in both project management and directing employees. This person has to manage the project according to the project plan, and react to problems that can arise during ERP implementation. Therefore, the project leader can take the role as project champion as well. In general, project team leaders have to be empowered to make quick decisions in order to reduce delays during implementation. This is important, since even small delays can heavily impact a long-term project like ERP implementation (Esteves & Pastor 2000). With empowered decision makers and strong project leadership, effective timing with respect to the implementation is enhanced (Finney & Corbett 2007; Gupta 2000; Shanks & Parr 2000).

Project Management: Project management refers to the ongoing management of the implementation plan (Finney & Corbett 2007). The implementation of an ERP system is a unique procedure that requires enterprise-wide project management. Therefore, the planning stage involves the allocation of responsibilities, the definition of milestones and critical paths, training and human resource planning, and the determination of measures of success (Al-Mashari & Al-Mudimigh 2003; Nah et al. 2001). This creates a more organized approach to decision making, and guarantees that decisions are made by the most suitable company members. Furthermore, continuous project management makes it possible to focus on the important aspects of the ERP implementation, and ensures timeliness, and that schedules are met (Al-Mashari & Al-Mudimigh 2003). Within project management, a comprehensive documentation of tasks, responsibilities and goals is indispensable for the success of ERP implementations (Snider et al. 2009).

Skills, Knowledge and Expertise: The existing knowledge and experiences of company employees plays a central role in implementing an ERP system. Better knowledge, experience, education, and personal skills can improve the ERP project’s accomplishments, and improve the handling of the implementation. This factor is often influenced and affected by the companies’ strategy and financial budget. The acceptance of, and the readiness for changes is substantially higher in enterprises where a philosophy of constant improvement and knowledge enhancement prevails (Achanga et al. 2006).

Top Management Support and Involvement: Top management support and involvement is one of the most important success factors for an ERP implementation (Achanga et al. 2006). Committed leadership from top management is the basis for the continuous accomplishment of every project (Finney & Corbett 2007).

Thus, innovations, particularly new technologies, are better accepted by employees if they are promoted by top management. Before the project starts, top management has to identify the peculiarities and challenges of the planned ERP implementation. Since many decisions made during the project affect the whole enterprise, they can often only be made by senior managers, and will require their full acceptance and commitment (Becker et al. 2007). Commitment of top management is important in order to allocate necessary resources, make quick and effective decisions, solve conflicts that need enterprise-wide acceptance, and to reach and support a co-operation of all departments (Al-Mashari et al. 2003).

Troubleshooting: Troubleshooting is essential and starts at the shakedown phase. This factor is related to the problem and risk areas of ERP projects (Esteves & Pastor 2000; Loh & Koh 2004). Quick responses, patience, perseverance and problem solving capabilities are important during an ERP system implementation (Rosario 2000). An implementation plan should include various troubleshooting mechanisms. Two important critical “moments” are the migration of old data, and the “go live” (Esteves & Pastor 2000).

Use of a Steering Committee: To make ERP projects succeed, it is necessary to form a steering committee. A steering committee allows senior management to directly monitor the project team’s decision making, thereby ensuring adequate control mechanisms. Therefore, this committee should consist of members of senior management (from different departments or corporate functions), representatives from project management, and end users (also from different departments). Such a composition will guarantee appropriate involvement across the whole company (Somers & Nelson 2001; Sumner 1999).

User Training: Often, missing or lacking end user training is a reason for failure during the implementation of new software. The main goal of end user training is to provide an effective understanding of the new business processes, applications, and workflows that result from ERP implementation. Therefore, it is important to set up a suitable plan for the training and education of employees (Al-Mashari et al. 2003). Furthermore, during such an extensive project which employee fits best for which position or application of the new software must be determined. This strongly depends on his/her already acquired knowledge and/or for which employee additional training courses are necessary (Teich et al. 2008).

Vendor Relationship and Support: ERP systems may be a lifelong commitment for many companies. There will always be new modules and versions to install, bug fixes to be rolled out, and changes to be made in order to achieve a better fit between business and system. Therefore, good vendor support (technical assistance, emergency maintenance and updates) is an important factor. Accordingly, the relationship/partnership with the vendor is vitally important to successful ERP projects. This relationship should be strategic in nature, with the ERP provider enhancing an organization’s competitiveness and efficiency (Somers & Nelson 2001; Willcocks & Sykes 2000).

Vendor Tools and Implementation Methods: Implementation technologies, programs, and methods provided by vendors can significantly reduce the cost and time of deploying ERP systems (Somers & Nelson 2001). Depending on the chosen implementation and roll-out method (e.g., big bang strategy, satellite strategy, etc.) there are advantages and risks that have to be considered. Also, not every strategy is applicable in every ERP project or company. Hence, the choice has to be made carefully. An additional goal of implementation tools is transferring the knowledge of using the software, understanding the business processes within the organization, and recognizing industry best practices (Somers & Nelson 2001).

5.4 Literature Review – Results

As stated above, 185 papers (single or multiple case studies, surveys, literature reviews, etc.) were identified as referring to critical success factors of ERP implementation projects. These papers were reviewed again in depth in order to determine the different concepts of CSFs. Overall, 31 factors (as described above) were identified. In most previous literature reviews the CSFs were grouped more coarsely so that fewer CSFs were used (e.g., Finney & Corbett 2007; Loh & Koh 2004; Somers & Nelson 2001). This grouping was not done within our review. With 31 factors we used a larger number than other researchers, as we expected the resulting distribution to be more insightful. If wider definitions of some CSFs are needed later on, further aggregation is still possible.

After identifying the relevant papers and the factors stated within them we developed a table to match the factors with the papers for the analysis. **Figure 2** shows a snapshot of this CSF table.

Figure 2 - Snapshot of the CSF Results

ACADEMIC SOURCE COMPLETE									
ID	YEAR	FORMS OF DATA COLECTION	NUMBER OF COMPANIES & COMPANY SIZE	ERP SYSTEM CONFIGURATION	BALANCED PROJECT TEAM (CROSS-FUNCTIONAL)	PROJECT MANAGEMENT	EXTERNAL CONSULTANTS	CHANGE MANAGEMENT	USER TRAINING
1936.	2008	Literature-based, Survey	91 responses from companies which have implemented ERP systems	X			X	X	X
1685.	2008	Literature-based, Survey	281 responses		X	X	X		X
1777.	2003	Literature Review, Survey	54 responses from CIOs of companies which have implemented ERP systems		X	X		X	
1733.	2007	CFSs derived from literature and proven by field studies/ Survey	48 Mexican companies		X	X	X	X	X
1785.	2004	Case studies	5 large companies		X		X	X	X
1659.	1999	Literature Review + Case studies	8 large companies	X		X			
3048.	2009	Case study	1 large company						
1977.	2008	Survey	130 responses, SME	X					X

As is shown, the CSFs for each paper were captured, as well as the year, type of data collection used, and the companies (number and size) from which the CSFs were derived.

All 185 papers were published between 1998 and 2010. **Table 1** shows the distribution of articles per year. As is shown, most of the papers were published between 2009 and 2004. Since 2004,

each year around 20 papers about CSFs are published. Therefore, it can be argued that a review every 2 or 3 years is reasonable in order to update the results of previously performed literature reviews.

Table 1 - Paper Distribution

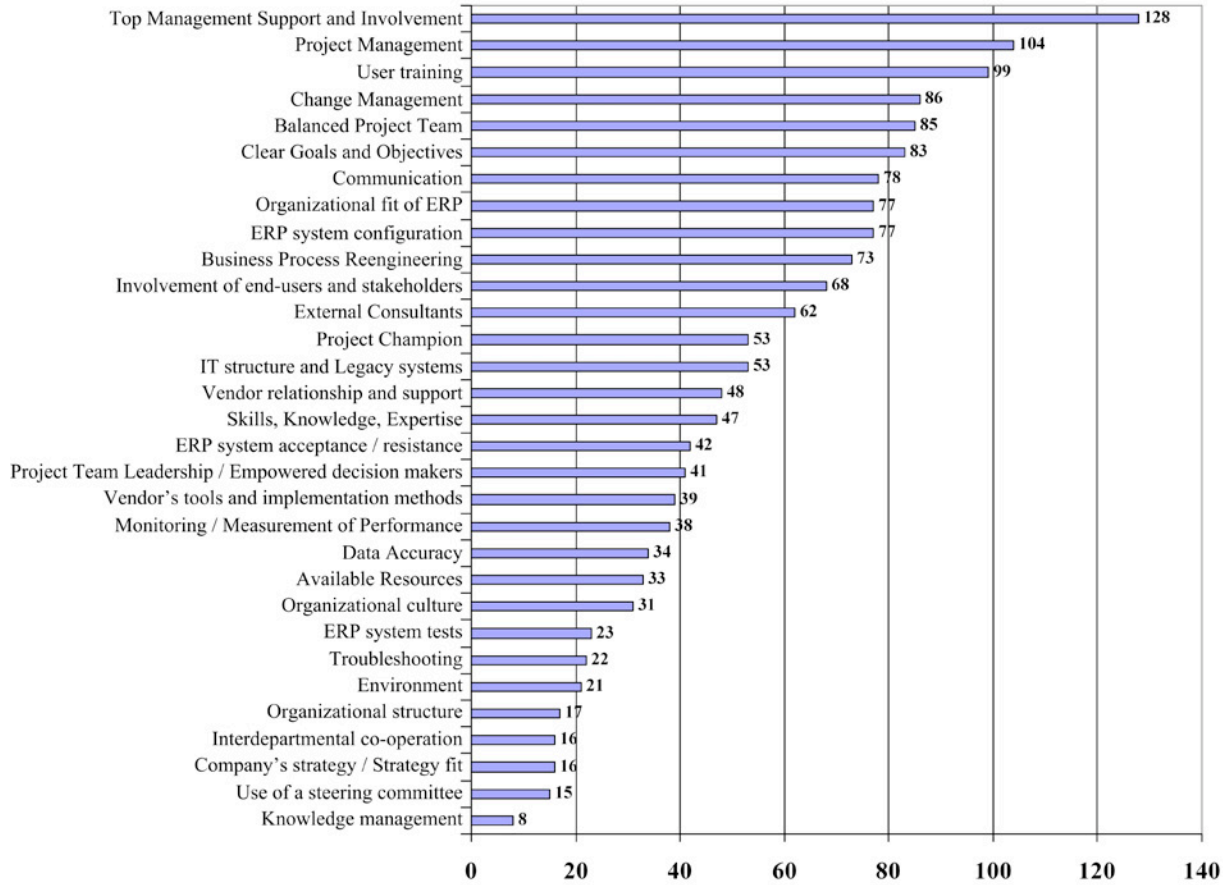
YEAR	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
ARTICLES	6	29	23	23	25	18	23	11	12	5	6	3	1

The small number of papers in 2010 is due to the fact that we conducted the database review in June 2010. Additionally, some databases provide access to journal articles only if they are older than 12 months.

Thus, these articles were not included in our review, as well as the AMCIS 2010, and the ICIS 2010, since these conferences had not taken place until the date of our review.

Figure 3 shows the results of our review – the identified CSFs and their total numbers.

Figure 3 - CSFs Ordered by Frequency



It is shown that “Top Management Support and Involvement,” “Project Management” and “User Training” are the three most named factors with a number around and above 100.

Comparing these results with other literature reviews, for example, Finney and Corbett’s (2007), it becomes obvious that the top five factors are similar, with only the positions being different. Due to our large literature base, total numbers are much higher (Table 2).

Table 2 - Literature Review Comparison

	FINNEY & CORBETT (2007)		OUR REVIEW	
	FACTOR	NUMBER OF INSTANCES	FACTOR	NUMBER OF INSTANCES
Rank #1	Top Management Commitment and Support	25	Top Management Support and Involvement	128
Rank #2	Change Management	25	Project Management	104
Rank #3	BPR and Software Configuration	23	User Training	99
Rank #4	Training and Job Redesign	23	Change Management	86
Rank #5	Project Team : the Best and Brightest	21	Balanced Project Team	85

Regarding the form of data collection, it has to be stated that the papers consist of 95 single or multiple case studies, 55 surveys and 35 literature reviews or articles where CSFs are derived from chosen literature.

Concerning company size, only 12 papers explicitly focus on small and medium sized enterprises (S&MEs), mostly within single or multiple case studies. In some surveys S&MEs are included and analyzed as well, but they are a minority in these surveys. Therefore, deriving CSFs which are important for S&MEs is difficult and can be seen as lacking in the CSF research.

5.5 Conclusion

The aim of our study was to gain insight into the research of critical success factors of ERP implementation projects. Research on ERP implementation and critical success factors can be seen as a valuable step toward increasing chances of implementation success (Finney & Corbett 2007). Our study reveals that there are several papers – case studies, surveys, and literature reviews – focusing on CSFs. All in all, we identified 185 relevant papers. From these existing studies we derived 31 different CSFs. We identified the following top three CSFs: top management support and involvement, project management, and user training.

This ranking is similar to the ranking of other literature reviews (e.g., Finney & Corbett 2007 or Somers & Nelson 2001). The number of papers included in our study exceeded the number found in most of these reviews. One reason for this is that these reviews are older than ours. As shown in Table 1 every year since 2004 around 20 or more CFS papers are published. Thus, one conclusion is that it is advisable to renew literature reviews on ERP system CSFs every two or three years in order to update results. Another conclusion is related to the size of the companies. Most of the papers and studies identified focus on large companies. Small and medium-sized enterprises are – if included at all – usually underrepresented in quantitative studies. Studies exclusively focusing on S&MEs are rare. We identified 12 out of the 185 articles with this explicit focus. This can be seen as a clear lack of research, which is mentioned by other authors as well (e.g., Snider et al. 2009).

Regarding our literature review, there are limitations that have to be mentioned, too. We are aware that we cannot be sure to have identified all relevant papers published in journals and conferences, as we selected five databases and five international conferences. Therefore, journals not included in our databases, and proceedings of other conferences might also contain relevant articles. Another limitation is the coding of the CSFs. We tried to reduce this subjectivity by formulating coding rules and by discussing the coding of CSFs among three independent researchers. Hence, other researchers may code the CSFs in another way. To repeat or reproduce our procedure, the list of identified papers from each step can be requested from the author.

Appendix – Data Sources and Search Terms

Table 3 - Sources for the Literature Review

DATABASES	CONFERENCES
Academic Search Complete	AMCIS (2009 – 1998)
Business Source Complete	ECIS (2009 – 1998)
Science Direct	HICCS (2009 – 1998)
SpringerLink	ICIS (2009 – 1998)
WISO	Wirtschaftsinformatik (2009 – 1998)

Table 4 - Search Fields and Search Terms

DATABASE + SEARCH FIELDS	SEARCH TERMS / KEYWORDS
Academics Search Complete: "TI Title" or "AB Abstract or Author Supplied Abstract"	<ul style="list-style-type: none"> • ERP + success* • ERP + failure • ERP + crit*
Business Source Complete: "TI Title" or "AB Abstract or Author Supplied Abstract"	<ul style="list-style-type: none"> • ERP + CSF • ERP + CFF • ERP + fact*
Science Direct: "Abstract, Title, Keywords"	<ul style="list-style-type: none"> • "Enterprise system*" + success* • "Enterprise system*" + failure
SpringerLink: "Title" or "Abstract"	<ul style="list-style-type: none"> • "Enterprise system*" + crit* • "Enterprise system*" + CSF
WISO: "General Search Field"	<ul style="list-style-type: none"> • "Enterprise system*" + CFF • "Enterprise system*" + fact*

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Questions

1. What does the abbreviation “CSF” mean?
2. Why is it necessary to consider CSFs in ERP implementation projects?
3. Which is the most important CSF?
4. Which CSFs have a frequency of less than 20 in the literature?
5. What are the differences between “organizational structure” and “organizational fit of the ERP system”?