Abstract

The aim of our study was to provide a contribution to the research field of the critical success factors (CSFs) of ERP projects, with specific focus on smaller enterprises (SMEs). Therefore, we conducted a systematic literature review in order to update the existing reviews of CSFs. On the basis of that review, we led several interviews within German SMEs and with ERP consultants experienced with ERP implementations in SMEs. As a result, we showed that all factors found in the literature also affected the success of ERP projects in SMEs. However, within those projects, technological factors gained much more importance compared to the factors which influence the success from larger ERP projects the most. For SMEs, factors like Organizational fit of the ERP system as well as ERP system tests are even more important than Top management support or Project management, which were the most important factors for large-scaled companies.

Keywords

ERP Systems, Critical Success Factors, CSF, Implementation Projects, SMEs

Motivation

Today’s enterprises are faced with the globalization of markets and fast changes in the economy. In order to cope with these conditions, the use of technology, as well as information and communication systems is almost mandatory. Specifically, the adoption of enterprise resource planning (ERP) systems as standardized systems that encompass the activities of entire enterprises has become an important factor for today’s businesses. The demand for ERP applications has increased for several reasons, including competitive pressure to become low-cost producers, expectations of revenue growth, and the desire to re-engineer businesses to respond to market challenges. A properly selected and implemented ERP system offers several benefits, such as considerable reductions in inventory costs, raw material costs, lead time for customers, production time, and production costs (Davenport 2000; Grabski and Leech 2007; Koh and Simpson 2005; Somers and Nelson 2001). Therefore, the majority of enterprises around the world use ERP systems. For example, according to a survey conducted in Germany from 2010 to 2011, ERP systems are used in more than 92 percent of all German industrial enterprises (Konradin 2011).

Due to the saturation of ERP markets targeting large-scaled enterprises, ERP system manufacturers today are also now concentrating on the growing market of small and medium-sized enterprises (SMEs) (Deep et al. 2008; Koh and Simpson 2005). This has resulted in a highly fragmented ERP market and a great diffusion of ERP systems throughout enterprises of nearly every industry and every size (Leyh 2012; Winkelmann and Klose 2008; Winkelmann and Leyh 2010). Due to the strong demand and the high fragmentation of the market, there are many ERP systems with different technologies and philosophies available on the market. This multitude of software manufacturers, vendors, and systems implies that enterprises that use or want to use ERP systems must strive to find the “right” software as well as to be
aware of the factors that influence the success of the implementation project. The implementation of an information system (e.g., an ERP system) is a complex and time-consuming project during which companies face great opportunities, but at the same time also face also enormous risks. To take advantage of the potential opportunities rather than get caught by the risks of these implementation projects, it is essential to focus on those factors that support a successful implementation of an information system (Jones et al. 2006; Ngai et al. 2004). Being aware of these factors, a company can positively influence the success of the implementation project and effectively minimize the project’s risks (Jones et al. 2006). 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 the selection, implementation, or maintenance of ERP systems, wrong implementation approaches, and ERP systems that do not fit the requirements of the enterprise can all cause financial disadvantages or disasters, perhaps even leading to insolvencies. Several examples of such negative scenarios can be found in the literature (e.g., Barker and Frolick 2003; Hsu et al. 2006). SMEs must be especially aware of the CSFs since they lack the financial, material, and personnel resources of larger companies. Thus, they are under greater pressure to implement and run ERP systems without failure and as smoothly as possible.

These critical success factors have been already considered in numerous scientific publications. Several case studies, surveys, and literature reviews have already been conducted by different researchers (e.g., Achanga et al. 2006; Finney and Corbett 2007; Nah et al. 2003; Somers and Nelson 2001). However, the existing ERP system success factor research has focused mostly on the selection and implementation of ERP systems in large enterprises. Less attention has been paid to the implementation projects in SMEs, despite the fact that research focusing on CSFs in smaller companies has been recommended in the research community for several years (e.g., Snider et al. 2009; Sun et al. 2005).

Therefore, the aim of our study was to focus on the implementation of ERP systems in SMEs, especially focusing on the differences in CSFs of larger ERP projects and smaller projects. Prior to this study, we conducted a systematic literature review in order to update the existing reviews of CSFs. On the basis of the CSFs identified, we conducted multiple interviews within German SMEs and with ERP consultants with specific experience in smaller ERP projects to obtain insights into the similarities and differences in CSFs for ERP system implementation in SMEs. Overall, our study was driven by the following research questions:

Q1: What are the critical success factors of ERP system implementation projects in small and medium-sized companies?

Q2: What similarities and differences exist between critical success factors for ERP implementation projects in larger and smaller enterprises?

Therefore, the paper is structured as follows. The next section deals with the results of our literature review. We will point out which factors are the most important and which factors seem to have little influence on the success of an ERP implementation project. Next, our data collection methodology is described before the results of the interviews are presented and the research questions are answered. Finally, the paper concludes with a summary of the results and discusses the limitations of our study.

**Literature Review of Critical Success Factors**

A critical success factor for an ERP project is defined according to Finney and Corbett (2007) as reference to any condition or element that is seen as necessary in order for the ERP implementation to be successful. In order to identify these factors that affect the success or failure of ERP projects, several case studies, surveys, and literature reviews have already been conducted by a number of researchers (e.g., Esteves-Sousa and Pastor-Collado 2000; Finney and Corbett 2007; Nah et al. 2003). Most of the literature reviews cannot be reproduced, because descriptions of the review methods and procedures are lacking. Some researchers have pointed out the limitations of the current literature review articles, specifically noting that they lack methodological rigor (Vom Brocke et al. 2009). Therefore, in order to update the existing reviews by including current ERP literature, we conducted a literature review by systematically reviewing articles in five different databases, as well as papers drawn from several
international conference proceedings. The literature review to identify the CSFs was performed in several steps, similar to the approach suggested by Webster and Watson (2002). More specifically, we conducted two separate literature reviews according to the same search procedure and steps. The first was performed in mid-2010; covering paper from 1998 to 2010 (Leyh 2012; Leyh 2011). Since we identified 20 or more papers published each year, it was essential for us to update this review every two or three years. Therefore, we conducted the second review in mid-2013; covering paper from 2009 to 2013. The steps of our review procedure are presented below. An overview is given in Figure 1 and Figure 2 with regard to the numbers of papers identified or remaining during/after each step. With each step, the number of papers was reduced according to the assembly of different criteria.

**Step 1:** The first step was to define the sources for the literature review. Therefore, several databases and conference proceedings were identified. To make our review reproducible, we provided tables with the databases and search terms in Leyh (2011) and Leyh (2012).

**Step 2:** Within this step, we had to define the search terms for the database-driven review. Keywords selected for this search were mostly derived from the keywords supplied and used by the authors of some of the relevant articles identified in a preliminary literature review. The search terms used are again listed in Leyh (2011) and Leyh (2012). Since the WISO database also provides German papers, we used the German translation of most of the search terms as well. For the conferences, only inappropriate search fields were provided. Hence, we decided to review the abstracts and titles of the papers in this step manually.

**Step 3:** During step 3 we performed the initial search according to step 1 and step 2, and afterwards eliminated duplicates.
• Review 1: The initial search provided 5,429 papers from the databases. After eliminating the duplicates, 3,419 articles remained. From the conference search, 79 papers remained. Together, 3,498 papers were identified during the initial search step.

• Review 2: During the initial search step, 4,529 articles were found. After deleting the duplicates (step 3a) and deleting double entries resulting from papers from review 1 (step 3b), 2,797 papers remained. From the conferences, 48 papers remained. Therefore, a sum total of 2,845 papers were found during these steps.

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 the results, as well. Thus, these papers had to be excluded. This was done by reviewing the abstracts of the papers and, if necessary, by a look into the paper content.

• Review 1: 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 (see Figure 1).

• Review 2: Here, 403 papers from the databases and again all conference papers remained as possibly relevant. Together, 451 had to be read in depth according to step 5 (see Figure 2).

Step 5: The fifth and final step consisted of a detailed analysis of the remaining 506 and 403 papers, and the identification of the CSFs. Therefore, the content of all papers was reviewed in depth for the purpose of categorization of the identified success factors. Emphasis was placed not only on the wording of these factors, but also on their meaning. After this step, 185 relevant papers that suggested, discussed or mentioned CSFs remained from review 1 and 146 articles remained from review 2.

Step 6: While conducting review 2, we added a sixth step. Within this step, we cross-checked papers from the same authors or similar author composition from review 1 and review 2 regarding their content (despite the duplicates check of steps 3a and 3b). Since often papers that are published at conferences are published later on as extended versions in journals, these papers should not be counted twice within the reviews. Here, we could identify eleven papers which were such extended versions. So these relevant papers had to be deleted, too. This leads to a final sum of relevant papers of 320. The results of the analysis of these papers regarding CSFs mentioned are described in the following sections.

We identified 320 papers that referred to CSFs of ERP projects. These papers were reviewed again in depth in order to determine the various concepts associated with CSFs. For each paper, the CSFs were captured, along with the publication year, the type of data collection used, and the companies (i.e., the number and size) from which the CSFs were derived.

All 320 papers were published between 1998 and mid-2013. Table 1 shows the distribution of the papers by publication year. As is shown, most of the papers were published between 2006 and 2013. Since 2004 around 20 papers each year, and since 2009 around 30 papers or more each year have been published about CSFs. Therefore, it can be argued that a review every two or three years is reasonable in order to update the results of previously performed literature reviews, especially when considering the rapidly evolving technology and the changing system availability like the “Software-as-a-Service”-concept or ERP systems provided in the cloud.

<table>
<thead>
<tr>
<th>Year</th>
<th>Papers</th>
<th>Year</th>
<th>Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>30</td>
<td>2005</td>
<td>15</td>
</tr>
<tr>
<td>2012</td>
<td>31</td>
<td>2004</td>
<td>20</td>
</tr>
<tr>
<td>2011</td>
<td>39</td>
<td>2003</td>
<td>11</td>
</tr>
<tr>
<td>2010</td>
<td>37</td>
<td>2002</td>
<td>11</td>
</tr>
<tr>
<td>2009</td>
<td>42</td>
<td>2001</td>
<td>5</td>
</tr>
</tbody>
</table>
Overall, 31 factors influencing the success of ERP system implementation were identified. Figure 3 shows the results of our review, i.e., the CSFs identified, their ranks, and each factor’s total number of occurrence in the reviewed papers.

The factors *Top management support and involvement*, *Project management*, and *User training* are the three most-named factors, with each being mentioned in more than 160 articles. The factor *Top management support and involvement* is the outstanding #1 rank, referred to in more than 200 papers.

Figure 3. ERP Project CSFs in Rank Order Based on Frequency of Appearance in Analyzed Literature

We will not describe each factor and its concepts in detail in this paper. However, to provide a comprehensive understanding of the different CSFs and their concepts, we previously described all 31 factors (Leyh 2011) as well as the top eight factors again in more detail (Leyh 2012). Regarding the form of data collection, it must be stated that the papers consist of 144 single or multiple case studies, 118 surveys, and 58 literature reviews or articles where CSFs are derived from the chosen literature.

In most previous literature reviews, the CSFs were grouped without as much attention to detail; therefore, a lower number of CSFs was used (e.g., Finney and Corbett 2007; Loh and Koh 2004; Somers and Nelson...
However, we took a different approach in our review. For the 31 factors, we used a larger number of categories than other researchers, as we expected the resulting distribution to offer greater insight. If broader definitions for some CSFs might be needed at a later time, further aggregation of the categories is still possible. Comparing these results with other literature reviews (e.g., Finney and Corbett 2007), the top five factors are obviously similar, with only the ranked positions differing. Due to our large literature base, the total numbers of observed mentions are much higher. Therefore, the differences in the CSF frequencies are much higher as well, making the distinctions in the significance of the factors clearer.

Concerning the company size during review 1 (conducted in mid-2010), only 12 papers explicitly focus on small and medium-sized enterprises (SMEs), mostly within single or multiple case studies. Within the review update (review 2, conducted in mid-2013), 25 articles dealt with SMEs explicitly. In some surveys, SMEs are included and analyzed as well, but they are a minority in these surveys. Therefore, deriving CSFs that are important for SMEs is difficult and can be seen as still lacking in the CSF research.

As is shown by Figure 4, Top management support and involvement, Project management, and User training are again the most frequently named factors for ERP projects in smaller enterprises.

![Figure 4. Literature Review – CSFs of ERP Projects in SMEs](image)

However, the differences in the CSF frequencies are only minimal and may be related to the small number of identified papers. Therefore, to derive CSFs that are important for SMEs and to realize their difference in importance is difficult due to the small number of studies focusing solely on them. Here, the minimal focus paid to SMEs’ ERP projects can be clearly seen as a research gap in the ERP CSF research area. Therefore, our study focuses on this gap. We investigated these CSFs by interviewing experienced ERP consultants as well as SMEs that have implemented ERP systems. The results will be part of the following sections.
Critical Success Factors for SMEs’ ERP projects

Study Design – Data Collection Methodology

To gain an understanding of the differences in the CSFs for ERP system projects in large-scale enterprises and SMEs, we used a qualitative exploratory approach within German small and medium-sized enterprises and within German ERP system manufacturers.

The units of analysis in our study are the implementation projects carried out within the SMEs, as well as the ERP projects for SMEs that the ERP consultants have performed so far in their career. For the data collection, we conducted several interviews with members of the ERP implementation project teams and with ERP consultants from German ERP system manufacturers to identify the factors that they determined to be relevant for the projects’ success.

In this process, we interviewed employees of nine small and medium-sized enterprises located in Germany. The SMEs operate in different industry sectors and have implemented different ERP systems. Table 5 in the Appendix gives an overview of the companies and the interviewees. Within these enterprises, we have a broad range of ERP systems (which cannot be named directly within this paper due to data protection). Only SME 1 and SME 3 have implemented the same ERP system; all other companies have implemented different systems – some quite small and industry-specific systems and some more widespread systems on the German ERP market. Most of the implementation projects took place in the mid-2000s. All of the interviewees (except one of the department managers from SME 2) were directly involved in the ERP system implementation projects.

To gather and to also include the ERP system manufacturers’ perspectives in our study, we focused on manufacturers with specific focus on ERP implementations in SMEs. Here, we interviewed ten ERP consultants from six ERP system manufacturers. Table 6 in the Appendix gives an overview of the interviewed ERP consultants. Among the ERP consultants, we were able to interview some consultants with longtime experience in more than 100 ERP projects as well as some consultants who had been working in this field for only a few years and had experience with fewer than 10 ERP projects (see Table 6).

To gain a deep and detailed view of the enterprises and their structures as well as of the consultants' experiences, we chose direct structured interviews as our method of data collection. The interviews were conducted in retrospect to the ERP projects between April and July 2013. The interviews were designed as partially standardized interviews using open to semi-open questions as initial starting points for the conversation. Both personal (face-to-face) interviews and telephone interviews were conducted by the author. An interview guideline was developed, based on the questions of Nah and Delgado (2006), who conducted a similar study, as well as on the basis of one of our previous CSF studies, which had another focus (Leyh and Muschick 2013). We changed the questions to align with our identified CSFs (see Figure 3) to ensure that all of the factors were discussed in the interviews. The interview guideline consisted of 52 main questions with further sub-questions that referred to the 31 identified CSFs. These questions were formulated in an open way, so that it would be possible to identify "new" CSFs that were not identified in the literature review. This questionnaire was sent to interviewees before the interviews took place, to allow them to prepare for their interviews. The complete listing of the formulated questions and their assignment to the success factors will not be part of this paper, but will be provided by the author upon request.

For a better analysis of the results, we recorded all interviews (the interviews typically took between 70 and 180 minutes) and transcribed them afterwards (resulting in about 450 pages of written text). As a first step, non-verbal and para-linguistic elements and other elements that were not relevant to the study were excluded. Afterwards, to evaluate the CSFs, the interviews were analyzed with reference to each CSF question block. We matched the answers and statements of the interviewees to the respective factor. Then, each CSF was ranked according to a three-tier scale (2–very important factor; 1–important factor; 0–less/non-important factor), and, for a finer classification, according to a five-tier scale (4–very important factor; 3–important factor; 2–factor was seen as relevant; 1–factor was mentioned but not seen as being very relevant; 0–factor was not seen as relevant or important/factor was not mentioned at all). This rating was done regarding the respective statements of the interviewees. We used these two scales to gain a preliminary understanding of whether differences would occur by using a finer/more detailed scale.
Here, the five-tier-scale could be seen as more appropriate for determining the importance of the factors. After setting up this ranking of CSFs, we discussed the factor rating with other researchers in this field to reduce the subjectivity of the rating. Finally, this procedure resulted in a ranking of all 31 CSFs according to the interviewees’ statements and answers.

Results of the Interviews

For each interview, a ranking of the critical success factors was set up by the author. A final ranking was created including all interviews and all individual rankings (see Table 2). As shown, the three most important factors for ERP implementation projects in small and medium-sized companies according to our study are ERP system tests, Organizational fit of the ERP system and User training with around or above 60 out of possible 76 points. Also, no further factors could be identified during the interviews. Each of the 31 factors stemming from the literature review was mentioned by at least one interviewee.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Factor</th>
<th>Factor rating (five-tier-scale)</th>
<th>Rank</th>
<th>Factor</th>
<th>Factor rating (five-tier-scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ERP system tests</td>
<td>63</td>
<td>17</td>
<td>Vendor relationship and support</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>Organizational fit of the ERP system</td>
<td>62</td>
<td>18</td>
<td>Monitoring and performance measurement</td>
<td>31</td>
</tr>
<tr>
<td>3</td>
<td>User training</td>
<td>58</td>
<td>19</td>
<td>Skills, knowledge, and expertise</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Clear goals and objectives</td>
<td>56</td>
<td>21</td>
<td>Business process reengineering</td>
<td>29</td>
</tr>
<tr>
<td>5</td>
<td>Top management support and involvement</td>
<td>52</td>
<td>22</td>
<td>Use of a steering committee</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Balanced project team</td>
<td>52</td>
<td>23</td>
<td>IT structure and legacy systems</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>ERP system configuration</td>
<td>52</td>
<td>24</td>
<td>Knowledge management</td>
<td>24</td>
</tr>
<tr>
<td>9</td>
<td>Project team leadership / empowered decision makers</td>
<td>45</td>
<td>25</td>
<td>Project champion</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Project management</td>
<td>45</td>
<td>26</td>
<td>Organizational culture</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Company’s strategy / strategy fit</td>
<td>45</td>
<td>27</td>
<td>Environment</td>
<td>19</td>
</tr>
<tr>
<td>12</td>
<td>Change management</td>
<td>41</td>
<td>29</td>
<td>Vendor’s tools and implementation methods</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Involvement of end-users and stakeholders</td>
<td>41</td>
<td></td>
<td>Troubleshooting</td>
<td>16</td>
</tr>
<tr>
<td>14</td>
<td>Available resources</td>
<td>40</td>
<td>30</td>
<td>Organizational structure</td>
<td>13</td>
</tr>
</tbody>
</table>
Critical Success Factors of ERP Projects in SMEs

<table>
<thead>
<tr>
<th>Rank</th>
<th>Results of the literature review (all company sizes)</th>
<th>Results of the literature review (SMEs)</th>
<th>Factors from the interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top management support and involvement</td>
<td>Top management support and involvement</td>
<td>ERP system tests</td>
</tr>
<tr>
<td>2</td>
<td>Project management</td>
<td>Project management</td>
<td>Organizational fit of the ERP system</td>
</tr>
<tr>
<td>3</td>
<td>User training</td>
<td>User training</td>
<td>User training</td>
</tr>
<tr>
<td>4</td>
<td>Change management</td>
<td>Balanced project team</td>
<td>Clear goals and objectives</td>
</tr>
<tr>
<td></td>
<td>Change management</td>
<td>Change management</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Balanced project team</td>
<td></td>
<td>Top management support and involvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Balanced project team</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ERP system configuration</td>
</tr>
</tbody>
</table>

Table 2. CSFs According the Five-Tier-Scale Rating

Despite User training, none of the other two factors were part of the top 5 within the ranking of the literature review (see Table 3). The factor ERP system test was not even part of the top 20 within the literature review (see Figures 3 and 4). Also, Organizational fit of the ERP system has gained more importance, according to our interviewees. The importance of both factors indicates that SMEs are forced to find the right ERP system that fits their needs and to test the system properly before the Go-Live. As mentioned in the first section, due to their lack of the financial, material, and personnel resources compared to larger companies’ failures during/after the Go-Live can easily cause financial disadvantages or disasters, perhaps even leading to the insolvency of such small companies. Therefore, this is supported by the importance of the top two factors in our study. Reasons for this can also be seen in the highly fragmented ERP system market as well as in the increasing multitude of software manufacturers and ERP systems. Enterprises are facing more and more difficulties in identifying the best fitting ERP system. Therefore, more emphasis is laid on the selection of the “right” ERP system with a high Organizational fit of the ERP system. Together with selecting the right software, the customizing of the ERP system is also seen as an important factor for ERP projects in SMEs. The factor ERP system configuration is ranked at #5 in the interviews whereas this factor was not part of the top 10 within the literature review. This also supports the statement that SMEs strongly depend on ERP systems that fit their needs even more than large companies may. SMEs cannot afford to be restricted by stiff ERP processes; moreover, it is important that the system is adapted according to the own processes. This can also be seen by looking at Business process reengineering. This factor was part of the top 10 in the literature review but is ranked at #21 in our study (see Table 2). Here, SMEs seek more to adapt the system than to change the business processes.

Table 3. Comparison of the Top Five Factors

To categorize critical success factors, Esteves-Sousa and Pastor-Colla do suggest a matrix scheme. Here, they consider the tactical or strategic direction of the CSFs and divide them into organizational and technological factors (Esteves-Sousa and Pastor-Colla 2000). Thus, tactical CSFs rather relate to short-term aspects and goals of the system implementation project itself whereby strategic factors aim towards
long-term impacts of activities with strong connections to the development of the organization in relation to mission, vision and core competencies of the business activity. Considering the technological and organizational character of the CSFs, the specificity and significance of technological factors are strongly dependent on the ERP systems themselves, whereas organizational factors focus on corporate culture and its environment with its specific processes and structures (Esteves-Sousa 2004; Esteves-Sousa and Pastor-Collado 2000; Remus 2007). Table 4 gives an overview of the categorization of the identified CSFs in our study with a focus on their ranking.

<table>
<thead>
<tr>
<th>Strategic</th>
<th>Tactical</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Critical Success Factors</strong></td>
<td><strong>Rank</strong></td>
</tr>
<tr>
<td>Clear goals and objectives</td>
<td>4</td>
</tr>
<tr>
<td>Top management support and involvement</td>
<td>5</td>
</tr>
<tr>
<td>Balanced project team</td>
<td>5</td>
</tr>
<tr>
<td>Company's strategy / Strategy fit</td>
<td>9</td>
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<tr>
<td>Project team leadership / Empowered decision makers</td>
<td>9</td>
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<td>Change management</td>
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<td>Involvement of end-users and stakeholders</td>
<td>12</td>
</tr>
<tr>
<td>Available resources</td>
<td>14</td>
</tr>
<tr>
<td>ERP system acceptance / resistance</td>
<td>16</td>
</tr>
<tr>
<td>Business process reengineering</td>
<td>21</td>
</tr>
<tr>
<td>Vendor relationship and support</td>
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<td>Use of a steering committee</td>
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<td>Organizational culture</td>
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<td>Environment</td>
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<td>Organizational structure</td>
<td>30</td>
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<tr>
<td><strong>Organizational fit of the ERP system</strong></td>
<td>2</td>
</tr>
<tr>
<td>ERP system configuration</td>
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Table 4. Categorization of CSFs (Model Adapted from (Esteves-Sousa 2004; Esteves-Sousa and Pastor-Collado 2000; Remus 2007))
We oriented on the classification and categorization of the factors according to Esteves-Sousa (2004) and Remus (2007). The factors of the top 10 are highlighted. It is shown that only a few CSFs (six out of 31) are technological factors whereas more than 50% of the factors (17 out of 31) are organizational factors with a strategic characteristic. However, the top 10 factors are spread out among all four categories but most of them are part of the organizational category. Remarkably, the most important factors are part of the technological view. This supports the statement above that the technological aspects of ERP projects and their impact on the enterprises are considered more important for SMEs than for larger companies. However, smaller enterprises and ERP manufacturers should consider both the organizational and technological aspects when implementing an ERP system.

Conclusion and Limitations

The aim of our study was to gain insight into the research field of CSFs for ERP implementation projects, with a focus on ERP projects in small and medium-sized enterprises. Research in the field of ERP system projects and their CSFs provides valuable information that may enhance the degree to which an organization’s implementation project succeeds (Finney and Corbett 2007). As a first step, we carried out a systematic literature review to identify CSFs and to update existing reviews. Our review turned up a variety of papers, i.e., case studies, surveys, and literature reviews, focusing on CSFs. All in all, we identified 320 relevant papers dealing with CSFs of ERP system projects. From these existing studies, we derived 31 different CSFs (see Figure 1). Most of the identified papers and studies focus on large companies. Small and medium-sized enterprises are – if included at all – usually underrepresented in quantitative studies. Studies exclusively focusing on SMEs are rare. We identified 37 of the 320 articles with this explicit focus. These are nearly only 12% of all published papers with a focus on CSF. Even if research focusing on CSFs in smaller companies has been recommended in the research community for several years (e.g., Snider et al. 2009; Sun et al. 2005), our reviews reveal that SMEs are still not the primary focus of CSF research. Therefore, this still can be seen as a clear lack of research.

To this end, we set up a study with the specific SME focus. We conducted several interviews within SMEs which have implemented ERP systems and with ERP consultants with several years of ERP project experience. Using a guideline consisting of 52 initial questions about CSFs, we conducted 19 interviews. We found that all 31 factors found in the literature review were mentioned by at least one interviewee and therefore, all 31 factors also somehow affect the success of the ERP system projects in SMEs. However, contrary to the ranking resulting from the literature review, we identified factors with a more technological focus being important for those ERP projects. Here, the factors ERP system tests and Organizational fit of the ERP as the most important factors as well as ERP system configuration as top 5 factor refer to more technological aspects. Hence, factors with an organizational characteristic could also be identified as part of the top 5 factors in our study (User training, Clear goals and objectives, Top management support and involvement, and Balanced project team).

Regarding the research questions, our study could show that all factors which influence the success of ERP system implementation projects in large-scaled enterprises also have influence on ERP projects. We could not identify any further factors that were not already referred to in the literature. However, we could show that the importance of the factors differs a lot and that SMEs and also the ERP manufacturers have to be aware of these differences in the factors’ characteristics, focusing also on technological aspects of the ERP implementations rather than focusing mainly on the organizational factors as they are more important for the large-scaled companies.

A few limitations of our study must be mentioned as well. For our literature review, we are aware that we cannot be certain that we have identified all relevant papers published in journals and conferences since we made a specific selection of five databases and five international conferences. Therefore, journals not included in our databases and the proceedings from other conferences might also provide relevant articles. Another limitation is the coding of the CSFs. We tried to reduce any subjectivity by formulating coding rules and by discussing the coding of the CSFs with several independent researchers. However, other researchers may code the CSFs in other ways. For the interview study, the interviews conducted and data evaluated represent only an investigation on sample ERP projects in SMEs. These results are limited to the specifics of these enterprises and the experience of the consultants. In light of this, we will conduct further case studies and some larger surveys to broaden the results of this investigation.
References


**Appendix**

<table>
<thead>
<tr>
<th>Company</th>
<th>Industry sector</th>
<th>Number of employees</th>
<th>Go-Live of the ERP system</th>
<th>Interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td>SME 1</td>
<td>Food industry</td>
<td>200 in total; 30 ERP system users</td>
<td>2005</td>
<td>Member of top management</td>
</tr>
<tr>
<td>SME 2</td>
<td>Manufacturing of metal goods / Machine-building industry</td>
<td>80 in total; around 75 ERP system users</td>
<td>2006</td>
<td>Managers of the departments purchasing and service</td>
</tr>
<tr>
<td>SME 3</td>
<td>Food industry</td>
<td>40 in total; 8 ERP system users</td>
<td>1998</td>
<td>Head of the department accounting and IT</td>
</tr>
<tr>
<td>SME 4</td>
<td>Heat treatment services</td>
<td>45 in total; around 20 ERP system users</td>
<td>2007</td>
<td>Plant manager</td>
</tr>
<tr>
<td>SME 5</td>
<td>Food industry</td>
<td>110 in total; around 50 ERP system user</td>
<td>2007</td>
<td>Head of the IT department</td>
</tr>
<tr>
<td>SME 6</td>
<td>Wood / Furniture industry</td>
<td>90 in total; 55 ERP system users</td>
<td>2000, complete system re-launch 2005</td>
<td>Member of top management (also manager of the IT department)</td>
</tr>
<tr>
<td>SME 7</td>
<td>Automotive industry</td>
<td>80 in total; 15 ERP system users</td>
<td>2005</td>
<td>Plant manager</td>
</tr>
<tr>
<td>SME 8</td>
<td>Manufacturing of metal goods / Machine-building industry</td>
<td>55 in total; 10 ERP system users</td>
<td>2012</td>
<td>Employee of the management (also member of the ERP project team)</td>
</tr>
<tr>
<td>SME 9</td>
<td>Food industry</td>
<td>75 in total; around 20 ERP system users</td>
<td>Within the end-1990s (Go-Live in several steps)</td>
<td>Head of the IT department</td>
</tr>
</tbody>
</table>

Table 5. Overview of the SMEs and Interviewees (Number of Employees Is Rounded)
<table>
<thead>
<tr>
<th>ERP manufacturer</th>
<th>ERP consultant</th>
<th>Experience with ERP projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer 1</td>
<td>Consultant 1</td>
<td>Active in the ERP business for more than 30 years; Carried out more than 100 ERP projects</td>
</tr>
<tr>
<td>Manufacturer 2</td>
<td>Consultant 2</td>
<td>User support and project support for three years; Carried out three ERP projects</td>
</tr>
<tr>
<td>Manufacturer 3</td>
<td>Consultant 3</td>
<td>ERP consultant since 2008; Carried out eight ERP projects</td>
</tr>
<tr>
<td>Manufacturer 4</td>
<td>Consultant 4</td>
<td>ERP consultant and Head of project management for Manufacturer 3 since 2013; More than 30 years of experience with ERP topics and ERP projects as employee of several SMEs</td>
</tr>
<tr>
<td>Manufacturer 5</td>
<td>Consultant 5</td>
<td>ERP consultant for Manufacturer 4 since 2011; More than 30 years of experience with ERP topics and ERP projects as employee of several SMEs and other ERP manufacturers</td>
</tr>
<tr>
<td>Consultant 6</td>
<td>ERP consultant since 2000; by now Head of Branch Office for Manufacturer 4; Carried out seven ERP projects; by now as Head of Branch Office support for 50 parallel ERP projects</td>
<td></td>
</tr>
<tr>
<td>Manufacturer 6</td>
<td>Consultant 7</td>
<td>ERP consultant for more than 16 years; Carried out more than 100 ERP projects</td>
</tr>
<tr>
<td>Consultant 8</td>
<td>ERP consultant for more than 13 years; Carried out around 130 ERP projects</td>
<td></td>
</tr>
<tr>
<td>Consultant 9</td>
<td>ERP consultant for several years; Carried out several ERP projects (detailed number was not stated)</td>
<td></td>
</tr>
<tr>
<td>Consultant 10</td>
<td>ERP consultant since 2010; Carried out five ERP projects</td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Overview of the ERP Consultants and Their Experience