

A study of the ERP Project Life Cycles in Small-and-Medium-Sized Enterprises: Critical Issues and Lessons Learned

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Abstract—The purpose of this research is to increase our knowledge as regards how Small-and-Medium-Sized Enterprises (SMEs) tackle ERP implementation projects to achieve successful adoption and use of these systems within the organization. SMEs have scarce resources to handle these kinds of projects which have proved to be risky and costly. There are several studies focusing on ERP implementation in larger companies, however, few studies report on challenges experienced by SMEs. Our research seeks to bridge this gap. Through a multiple case study of four companies, we identified challenges and critical elements within the different phases (pre-implementation, implementation and post-implementation) of the ERP life cycle. To interpret our findings, we utilize a well-known ERP life cycle model and critical success factors developed for larger companies which are reported in former research literature. We discuss if these models are relevant for SMEs and suggest additional critical elements identified in this study to make a framework more adapted to the SME context.

Keywords—ERP implementation challenges, ERP implementation framework, ERP life cycle model, Small-and-Medium-Sized Enterprises, ERP critical success factors

I. INTRODUCTION

THIS paper reports on a multiple case study focusing on implementation projects of Enterprise Resource Planning (ERP) systems in four Small-and-Medium-Sized Enterprises (SMEs). An ERP-system is an integrated, module-based, of the shelf software package aiming to control functional areas within the enterprise such as supply chain management, accounting and finance, material management, inventory control, and human resources [1]. The benefits are several; seamless information flow, access to real-time data, process-orientation, and improved communication across the enterprise [2]. When implementing an ERP-system, functional systems (e.g. legacy systems) are normally being phased out, and less maintenance of several systems and silo-structures that cause integration problems and data redundancy are avoided [3]. Despite of benefits, ERP implementation projects have proved to have high organizational and technical complexity, and the human consequences and required

changes in business processes are often underestimated [4]. Implementation of ERP may require changes in the processes of a company, and new routines and roles for the employees which include extensive training and preparation of changes are often necessary to succeed. Despite challenges and high implementation costs, ERP systems of several types have become increasingly popular, and the systems are widely implemented in both small and large organizations.

Former research has identified certain critical success factors which are important for gaining benefits in organizations implementing ERP-systems [5],[6]. However, the cost of an unsuccessful ERP implementation in a SME can be high [7]. Normally, SMEs have limited financial resources and IT competencies compared to larger companies, and therefore ERP-projects might be of higher risk [8]. In fact, unsuccessful implementation projects in SMEs may threaten the existence of a company. The lack of knowledge and experience with ERP-systems, may SMEs more dependent upon external consultants and support from vendors throughout the implementation process [9].

Several ERP life cycle models have been reported in the literature to emphasize important phases and related activities during an ERP project. These models have phases comprising processes of pre-implementation, implementation, and post-implementation [10], [11], [12]. In this paper we utilize the life cycle model developed by Markus and Tanis (2000) to categorize our findings into phases while identifying key activities and challenges at different stages within an ERP project carried out in SMEs. In addition, we draw on Somers' and Nelson's work (2004) to understand the importance of different critical success factors (CSFs) in an ERP project and how those may vary across different stages of the project.

In this study we seek to answer the following research questions:

- 1) How can SMEs tackle ERP implementation projects to achieve a successful adoption and use of these systems within the organization?
- 2) What are the key challenges SMEs need to consider across the different stages of an ERP life cycle?

The paper is organized as follows. In section II we review relevant ERP research followed by a description of research methods and research sites in section III. Section IV presents the results of this research and in section V we provide a discussion of the activities, challenges and CSFs identified in this study and compare our findings with former literature. Finally, in section VI we make our conclusion and

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implications of this research, and present the limitations of the study and make suggestions for future research issues.

II. PREVIOUS ERP RESEARCH

A. Related Research on ERP

The ERP literature is huge, and in this section we present research of relevance for this study, mainly focusing on ERP research in SMEs. Secondly, we present the life cycle model of Markus and Tanis (2000), and critical success factors of Somers and Nelson (2004) which we use in the interpretation of our data.

More and more SMEs are now implementing ERP-systems; however research indicates that few SMEs manage these implementations in a successful manner, and expected benefits and assumed improvements within the organizations are not achieved [7]. ERP-systems have been criticized for not keeping up to their promises because of running over budget, being time-consuming, and for demanding insuperable challenges for the implementing organization, providing less gains than expected when the system goes live [13]. In fact, it has been reported that 90 % of large companies implementing ERP-systems failed in their first trial [14]. However, the first ERP wave of implementations in large companies had a lot of technical challenges (e.g. Dow Corning [15]), and recently the technology has improved. Still the organizational challenges should not be underestimated [16]. To support organizations in their implementing process, researchers have tried to develop life cycle models to better understand the process and related activities [10], and secondly identified critical success factors (CSFs) while implementing ERP-systems [2], [5], [17]. This research may help organizations in realizing where and when they should provide particular resources at different stages in an ERP-project.

B. ERP life cycle models and critical success factors

Markus and Tanis (2000), developed the "Enterprise System Experience Cycle" which consists of four phases; 1) project chartering comprises investment decisions, definitions of business case and solution constraints, 2) The project itself which involves configuration of the system, choosing implementation and rollout strategy, and getting the system and end users up and running, 3) The shakedown phase, which is a critical phase, system needs to stabilize, bugs need to be eliminated, and the company must get back to normal operations as fast as possible, and 4) the onward and upward phase which comprises maintenance of system, supporting of the users, getting results, and upgrading decisions [10].

Related activities, challenges, and problems differ among these phases, and thus it is important for a company to know what they should focus on during different phases of the project. Problems which remain unsolved in one phase may amplify in a later phase. Somers and Nelson (2004) have identified critical success factors in ERP projects and have also looked into the importance of different activities and players across different life cycle stages [6]. Akkerman and van Helden (2002) utilized the top ten of CSFs provided by Somers and Nelson (2001), and found that several CSFs were

interrelated [2]. For instance if a project had poor top management support and weak project management, these were interrelated to other CSFs and a vicious circle developed ending in a unsuccessful outcome of the project. On the other hand, a virtuous circle of interrelated CSFs was developed if commitment from top management was the case, and a good project team was established. These factors caused positive attitudes in the organization and good communication and collaboration patterns among the employees were developed which again improved the outcome of the implementation project.

We utilize these life cycle models and CSFs as a point of departure for interpreting our findings from this study.

III. RESEARCH SITES AND METHODS

A. Research Sites

We studied four SMEs which had implemented an ERP-system or was in the implementation process (Company A, B, C, D). In the following we provide a description of each site.

Company A has approximately 180 employees and has offices in four different towns of Norway. They have activities spread over different branches related to services. Examples are operation of sport centers, nursery schools, cafés, book shops and student apartments. In addition they have departments of properties, health and culture, and finally one administration department. This company wanted an ERP-system providing them with a customized system solution, and a more future-oriented system which would easily facilitate integration with their existing legacy systems that they need to keep (e.g. systems supporting different professions). They used approximately six months to select a system, and another six months to plan and implement the system. Company A was quite pleased with the implementation process and the system was much better than the one they did replace. They implemented the system without large customizations, and the costs were approximately on budget. The integration process with the legacy systems would be more challenging and will require a new CRM module, however, the planning process for this integration process is still going on. In this company we interviewed the project leader of the ERP-project who is the manager of economics and information technology (IT).

Company B deals with production and sales of health and hospital equipment. The company has 36 employees in one location of Norway. They are one of the country's leading companies regarding material of first aid and emergency treatment. They have a wide range of clients comprising hospitals, offshore installations, national defense, help organizations, veterinarians and the public market. The company has high demand for innovativeness and they need to develop new products fast to keep competitive. The company needed a system that could handle scalability since they had a continuous growth of the company. They wanted a system which could support the decision processes and provide them with financial control including simplified management of customers, vendors, processes, goods, logistics, calculations,

and accurate accounting information. The company needed to use historical data to make prognoses of future customer demands. In addition, they wanted a system which easily could be extended with new modules and functionalities, so the system could grow in time with the company. In total they used approximately two years on planning and implementing the system. The system was implemented according to budget, and they were quite pleased with the functionalities that the system offered. In this company we interviewed two of the employees; one IT professional, and the project leader of the ERP-project who was the manager of economics and IT in the company.

Company C is a vendor of materials for buildings and interiors. They have 130 employees in two locations of Norway. The company has several carpenters which participate in projects of new buildings or renovation either as responsible entrepreneur or in collaboration with other companies. The company offers architecture competency and delivers decoration packages for industry buildings including planning and installation. Company C wanted a new ERP-system which could replace their legacy system in accounting and finance. In addition, they wanted an electronic document system to handle all their invoices. They wanted to implement modules supporting finance and salary, time registration, electronic invoicing and a document management system. They used nearly a year to plan and select a system, and six months on the implementation process. The employees in the company have reported that they are satisfied with the system. However, the time registration module did not function according to the expectations. Thus they needed to replace this module with a new one from another vendor. This caused extra costs. In Company C, we interviewed the project leader who was partly employed by the company as a financial manager, and partly he was running his own business and was an external consultant supporting and leading the company's overall ERP implementation process.

Company D operates in the steel industry and delivers steel constructions to offshore industry and gas construction sites. The company has 70 employees and is co-located in one city of Norway. The company seeks to deliver high quality products and needs to do their project fast and be precisely regarding project time schedules. The company needs to follow institutional requirements regarding quality, security, and economics within their contracts with clients. The company has established procedures that can identify materials and products at all stages in the manufacturing process. The company has employees working with machines, certified welders and engineers with specialized competencies.

B. Research Methods

The study is based upon an overall qualitative approach. The process of data collection and analysis proceeded in accordance with the interpretive research tradition [18]. We interviewed key personnel, mainly the project leaders, involved with the ERP projects within the companies. We conducted face-to-face interviews and used a semi-structured interview guide. The interviews lasted approximately one

hour, were digitally recorded and fully transcribed. After transcription, the empirical material was further systemized, and reduced [19]. Then a meaning condensation was done by compressing long statements into briefer statements to get the main sense out of the text, and for creating themes by interpreting the natural meaning units [20]. We combined existing theories and concepts from the literature (e.g. ERP implementation literature, ERP life cycle models, critical success factors) with empirical findings to get a broader understanding of how SMEs may achieve a successful adoption and use of an ERP-system.

IV. FINDINGS

We utilize the phases of an ERP life cycle to systemize our data [10]. To simplify, we use three phases; 1) Pre-implementation phase (denoted as Project chartering phase [10]) comprising selection of vendor and system, and signing a contract, 2) Implementation phase (denoted as Project phase [10]), including the installation and configuration of the ERP-system, and 3) Post-implementation phase (denoted as Shakedown phase and Onward and Upward phase[10]) involving solving of bugs, stabilization, further adaption, training, support and maintenance after the system is rolled out.

A. Pre-implementation Phase

Company A. The top manager of the company initiated the need for a new system, and the IT and economic manager got the role as project leader. In addition, the accounting manager was involved. The rest of the organization was not involved in the selection process, however, they communicated their decisions across the organization, e.g. to department leaders. They developed a detailed requirement specification and evaluated three different systems. Selection criteria were related to ease of use (e.g. good GUI, and screen shots), relevant functionalities (e.g. electronic invoice opportunity), options for future extensions (e.g. they wanted a CRM-module in near future), and the system should be easy to integrate with other systems. The accounting module was especially important since this module should communicate with other systems. The system should be able to use existing data from other systems. The selected vendor had to be acknowledged in the market. In addition, they selected the system and vendor that were able to solve the most critical business case scenarios.

Company B. Project leader and one employee from the IT staff were responsible for selecting the system. In particular the IT professional played an important role since he knew the processes of the company, showed great interest for the project and followed the requirement specification in detail throughout the project. They had both experiences with similar kind of project, and the IT professional had business competencies in addition to IT competencies. Since he had worked in the company for a long time, he knew the old ERP-system and processes related to logistics, production and inventory management. When the project team was established, the company reviewed infrastructural issues and

the hardware situation. They upgraded those to be prepared for the new ERP-system. The upgrade included also new work stations for employees and new servers. In parallel with these activities, they mapped the business processes in the company and developed a requirement specification. Three different ERP-systems were evaluated before they made a decision. The company put weight on a number of selection criteria. They wanted a system with a well-known reputation offered from a local vendor that could give them continuous support, the new system should be easy to install on existing infrastructure and hardware, and the system should support the existing processes within the company since they wanted to keep the most of their processes without changes. They meant that their existing processes were good, and they did not want to change them because they expected resistance in the organization. They looked for a system supporting logistics, production management, sales and marketing. The system should be easy to use and should have decision support functionality. Both the local supplier and consultants had to actively be involved during the implementation process. The cost of the system did also matter. The company chose the system and vendor which they found to be best based upon the abovementioned selection criteria. In addition, the selected vendor and system were able to solve the overall requirement specification in a competent way.

Company C. The project leader of the ERP-project had broad experience from different IT systems. He was responsible for most of the decisions during the overall project. However, in the selection process of the vendor and system, top manager and two employees from the economic department were involved. The project manager participated at an ERP conference to increase his competencies on ERP-systems. Here he made contacts with potential vendors. Since Company C is a small company and ERP-systems are standardized software packages, he decided not to make a requirement specification. Four different systems were evaluated. Important criteria were that the system was supported by a local vendor, they wanted a "traditional" system (not software-as-a-service that is dependent upon internet), and a system particularly made for small enterprises. They wanted to implement modules supporting finance, salary, time registration, and document management (e.g. to scan invoices to make them digitalized and readable in the system). Two different supplier of the same system were considered, and only one of them was able to demonstrate the system in an acceptable way. The project manager emphasized that personal qualities of the consultant demonstrating the system, was important for the decision of supplier. In addition, they checked references for both of the suppliers.

Company D. The project leader had former experience with ERP-systems. She involved the accounting manager in the decision process and discussed with employees working in different functional areas which the system was supposed to support (e.g. production, order, project documentation). This is a small company and the project leader is responsible of the purchases in the company and made the project plan and decided resources needed for the ERP project. A requirement

specification was designed, however, only a few was involved with this, and they did not use much time on this activity. Company D consulted other companies regarding which system was the best in the market. They trusted these references, and no vendors were invited to demonstrate their systems. They decided to buy a package with more functionalities then they needed because this choice had a good price. They evaluated two local vendors; they selected a vendor that was well-known in the company based upon experiences from former IT investments.

B. Implementation Phase

Company A. They used the vendor to install the system on servers and work stations across the organization. The project leader put emphasize on involvement of the users of the system. Training of the users was important in this phase. The users did also get individual training in addition to training in common sessions. The external consultants were responsible for the data conversion process which was a comprehensive and important activity. They put a lot of resource into this and the project leader and the accounting manager controlled the input data to the new system. After comprehensive testing procedures, they implemented the system through a big-bang approach. This was not a complex implementation since they implemented modules incrementally.

Company B. One consultant from the vendor was actively involved before, during and after the implementation process. The users were satisfied with the consultant since he had personal qualities such as being a good listener to users' problems, and he also put effort into understanding the company's processes. The company attempted to clean the data properly before transferring them to the new system. They put emphasize on "discipline" in the databases and related structures. They implemented the system through a big-bang approach after a period of testing and training. It was challenging to test the system since the users did not have much knowledge about the system. They decided to test the most important processes, and the consultant was responsible of all data transfers. They chose to adapt the system to the business processes, and not the other way around. The primary reason for this was that the users did not want to change their routines. Process changes would have been better, however, the company decided to postpone process improvements to later on.

Company C. Most of the implementation was taken care of by the vendor. However, the vendor did not meet up to the expectations and spent a lot more time than they had promised. The company was not able to use the system according to the plan, and not all the modules were implemented. The consultant was a junior, and lacked experiences with this kind of system implementation. This phase turned out to be a nightmare for the company, and they decided to break the contract with the vendor. After a long period with much hassle, they assigned a contract with a more competent vendor which they still use for support.

The company put much effort into training of the users. Firstly, the project leader and employees from accounting got training both through common sessions and individually. The other users participated at common training sessions for only

one hour. The company transferred some of their old data through the new system (e.g. customer, vendor and employee data). This was a cumbersome process since they did it partly manually through punching or by transporting excel sheets. They did not transfer the accounting data. They had nearly 1000 projects to complete before the transition to a new system. Thus it was a challenge to avoid data redundancy since there was doubling of data between the old and new system. They used a big-bang approach. The new system was customized to fit with existing processes which was the reason for many of the problems. The project went far over budget because of extra time resources.

Company D. The project leader emphasized the importance of selecting the right vendor that has competencies regarding ERP-implementation. The consultant cleaned and transferred data to the new system. This was an opportunity to get rid of irrelevant data. There was limited training related to the finance module since the users had experience with the old system, and it was an easy transition. The order module was more complicated and data competencies among the users were lower. They needed more training.

C. Post-implementation Phase

Company A. The consultants changed their role after the testing of the system, and did not stay on site; however, they were available for support. The project leader emphasized the importance of having good consultants in this phase who were able to answer questions quickly and for further development of the system when that is needed. The users got further training after the implementation. The company got problems when they decided to implement new modules.

The consultants promised more than they were able to deliver. The company did not have proper contracts and documentation on the process. This became an expensive lesson learned.

Company B. The interviewees emphasized the importance of creating a knowledge network of both internal employees and external consultants after the implementation. In addition, they have dedicated super users across the organization. After the implementation, the primary consultant stayed two weeks on site to follow up and support the users. The company has gradually built internal competencies on the system, and has become more and more independent of external competencies. They have several super users which make the organization less vulnerable for losing competencies if some employees leave. Still they need external consultants for further development of the system.

The training of the users have been challenging in particular for the users who do not use the system on a daily basis. It requires much of the users since they still need to explore the system to learn more. The employees that are regularly using the system have built more knowledge about the system. To make the system as easy as possible, the user access rights are reduced to a minimum for each user – each user has only access to what he/she needs. This does also increase the security of the system.

Company C. The implementing organization is dependent upon external consultants after the implementation. They have support from a local vendor and get help quite quickly when needed. The vendor upgrades the system on a remote basis.

The company emphasized the importance of having a consultant they can trust and who is available on request. They are satisfied with the support they get from this vendor. The training of the users continued in this phase. Many users can work more independently than before since the system provide them with important status reports on different projects. The company had to consider a new system for the time registration module in this phase, since the one implemented in the system, did not work according to the requirements. They chose another system with a local vendor and started to train 130 users. They were pleased with this module and the adoption went fine.

The company got problems because of the decision to only transfer a selection of the historical data during the implementation phase. These data were project data, and they had to use both systems which generated extra work. The internal expenses turned out to be far more than expected in this phase.

Company D. The competence of the vendor was important. The first vendor went bankrupt and the company had to make a new contract with another vendor. The selection of vendor during the pre-implementation phase was not considered well enough, and this problem became visible at the post-implementation stage. The existing vendor is better; however, the company is not completely happy with the situation since sometimes they have to wait too long for support. The training of the users had to continue in this phase. The project leader emphasized that the users would have benefitted from having more training on an earlier stage; in particular the users who worked with orders and production were lacking competencies.

V. DISCUSSION

We have studied the life cycle of ERP-systems in four different SMEs. Through a multiple case study we have identified activities and challenges these companies experienced throughout their ERP projects.

SMEs have some challenges that are different than larger companies. SMEs have less resources and competencies about complex system, thus they are more dependent of external support. The SMEs wanted support from a local vendor. A good partnership with the vendor through all the phases seems to be important for SMEs. All companies emphasized that. This might be an issue which is less critical for larger companies which have their own IT department and more resources to build up their own competencies.

In the pre-implementation phase we found that selection of project leader and project team, development of requirement specification, reviewing the market, allocating of resources, evaluating different systems, selection of vendor and system, and making a contract with the vendor, were the most central activities. One of the companies did also upgrade their infrastructure and hardware to be prepared for the ERP-system. Important activities during the implementation phase were user training, cleaning and conversion of data, testing of the system, customization of the system, and implementation (mainly by a big-bang approach). In the post-implementation process, the training of users continued, and the companies were dependent upon support from the vendor. One of the

companies emphasized strongly the importance of creating a knowledge network of internal employees and external consultants to increase system competencies.

TABLE I

CHALLENGES COMPARED WITH FRAMEWORK OF MARKUS AND TANIS (2000)

Challenges identified in this study	Challenges identified by Markus and Tanis (2002)
<i>Pre-implementation phase</i>	<i>Pre-implementation phase</i>
Defining the right requirements and needs	Misunderstanding regarding organizational requirements
Selection of system	Selection insufficient software and hardware
Selection of vendor	The vendor promise too much
Contract with the vendor	Insufficient contract with the vendor
<i>Implementation phase</i>	<i>Implementation phase</i>
Ineffective cleaning of data	
Inappropriate customization and implementing of module	Customizations that do not work
Project leader spends too much time – conflict with the contract	The vendor has insufficient competencies
Problems with allocation of user rights	
<i>Post-implementation phase</i>	<i>Post-implementation phase</i>
Problems with use of the system	The competence of the user stagnates after training
Users avoiding to use the system	The system is little used or no used at all
Problems with module	Wrong decision in former phases get visible, selected wrong system
Problem with support	Wrong decision in former phases, selected wrong vendor
Problems with user access	Wrong decision in former phases, the system is not configured properly
Problems with data redundancy	Errors in former phases, insufficient transfer of data
Problems with the customizations carried out during implementation	Errors in former phases became visible

The SMEs under study experienced a wide range of challenges during their ERP life cycles. In the pre-implementation phase the problems were related to selection of the most appropriate system and vendor, and making a good contract. In the implementation phase, some of the companies had problems with ineffective cleaning and conversion of data, time-consuming activities related to customization, problems with assigning correct user access rights, and some of the consultants were not experienced with ERP-projects which caused expensive delays. In the post-implementation phase, problems related to earlier phases became visible. Examples of challenges were selection of wrong vendor or system, incomplete transfer of data, and insufficient training of users.

Table 1 makes a summary of important challenges identified in the different phases of the ERP-project for these SMEs. The findings are compared with challenges identified by Markus and Tanis [10]. There are several similarities between the challenges identified in this study and challenges emphasized by Markus and Tanis. For example an insufficient preparation in the pre-implementation phase may cause serious problems in later phases. We see the same pattern in our findings; some of the companies got problems in the post-implementation phase because of poor requirement specification and/or they did not put enough effort into the

selection of system or vendor. Poor data cleaning and only partly transfer of historical data to the new system in the implementation phase, did also cause problems for some of the companies in the post-implementation phase.

We also compare critical issues identified in this study, with critical success factors (CSFs) identified in a study of larger companies conducted by Somers and Nelson [6]. We found that there are specific CSFs important for larger companies which are less important for SMEs. Table 2 depicts this comparison. In this study, we identified critical issues in all phases which are not highlighted by Somers and Nelson (2004).

These were *competence building* and *selection of vendor* in the pre-implementation phase. All four companies emphasized particularly the latter issue since qualifications of the vendor became important for the outcome of the project. *Testing of the system* and *upgrading of the infrastructure and hardware* were important for some of the companies in the implementation phase. Moreover, *dedicated super user* and creation of *internal/external knowledge network* were important in the post-implementation phase.

Table 2 does not depict all CSFs identified by Somers and Nelson (2004). They identified several CSFs which seem to be not that important for SMEs. For example change management, use of steering committee, management of expectations, and minimal customizations were important CSFs in that study.

VI. CONCLUSION AND IMPLICATIONS

This research has reported on a multiple case study conducted in four companies. The study focused on how SMEs dealt with different stages in an ERP life cycle. Different activities, challenges and critical issues have been identified and compared with former framework and CSFs from the literature [10], [5]. Our study shows that critical issues in an ERP life cycle may differ between SMEs and larger companies. In accordance with Somers and Nelson (2004) our study does also show how critical issues may vary across the stages of the ERP life cycle.

TABLE II

COMPARING CRITICAL ISSUES WITH SELECTED CSFs DEVELOPED BY SOMERS AND NELSON (2001; 2004)

Critical issues identified this study	Somers and Nelson (2004)
<i>Pre-implementation phase</i>	<i>Pre-implementation phase</i>
Project leader	Project management
Project team	
Infrastructure and hardware	Clear goals and objectives
Dedicating resources	Architecture choices
	Dedicating resources
Evaluate and select system	Careful selection of package
Evaluate and select vendor	
Competence building	
<i>Implementation phase</i>	<i>Implementation phase</i>
Customer-vendor partnership	Partnership vendor
Project leader	
Project team	Project team
User training	User training
Data conversion and transfer	Data analysis and conversion
Customization decisions	Minimal customization

Communication across the organization
Testing of system
Upgrading infrastructure and hardware

Interdepartmental communication

Post-implementation phase

Vendor support
User training
Project leader
Project team
Process improvement
Dedicated super user
Knowledge network
external/internal

Post-implementation phase

Vendor support
User training on software
Project team competence
BPR

The SMEs in this study customized their systems to their processes, and did minimal changes in business processes. That caused problems later in the project. Somers and Nelson (2004) suggest minimal customization, which seems to be important for SMEs as well.

This study has increased our knowledge about the ERP life cycle in SMEs. Our findings might be useful for other SMEs that consider investment of ERP-systems. We have identified critical issues which are in particular important for SMEs. Future studies may utilize these findings as a point of departure for a broader investigation across several SMEs. It would be interesting to see if our findings are generalizable to other SMEs as well as see what the differences are.

REFERENCES

- [1] Davenport, T.H., Putting the Enterprise into the Enterprise System. Harvard Business Review. vol. 76(4), 121-131 (1998)
- [2] Akkermans, H. and K. Van Helden, Vicious and virtuous cycles in ERP implementation : a case study of interrelations between critical success factors. European Journal of Information Systems. vol. 11(1), 35-46 (2002)
- [3] Ross, J.W. and M.R. Vitale, The ERP Revolution: Surviving vs. Thriving. Information Systems Frontiers. vol. 2(2), 233-241 (2000)
- [4] Volkoff, O., D.M. Strong, and M.B. Elmes, Technological Embeddedness and Organizational Change. Organization Science. vol. 18(5), 832-848 (2007)
- [5] Somers, T. and K.G. Nelson. The Impact of Critical Success Factors across the Stages of Enterprise Resource Planning Implementations. Proceedings of HICCS (2001)
- [6] Somers, T.M. and K.G. Nelson, A taxonomy of players and activities across the ERP project life cycle. Information & Management. vol. 41(3), 257-278 (2004)
- [7] Sun, A.Y.T., A. Yazdani, and J.D. Overend, Achievement assessment for enterprise resource planning (ERP) system implementations based on critical success factors (CSFs). International Journal of Production Economics. vol. 98(2), 189-203 (2005)
- [8] Fisher, D.M., et al., Evaluating Mid-level ERP Software. Journal of Computer Information Systems. vol. 45(1), 38-46 (2004)
- [9] Chen, R.-S., et al., Role Negotiation and Interaction: An Exploratory Case Study of the Impact of Management Consultants on ERP System Implementation in SMEs in Taiwan. Information Systems Management. vol. 25(2), 159 - 173 (2008)
- [10] Markus, M.L. and C. Tanis, The enterprise systems experience - from adoption to success, in Framing the Domains of IT research: Projecting the future...through the past, R.W. Zmud, Editor, Pinaflex Educational Resources: Cincinnati OH. pp. 173-207 (2000)
- [11] Esteves, J.M. and J.A. Pastor, An ERP Life-cycle-based Research Agenda, in First International workshop in Enterprise Management and Resource Planning: Methods, Tools and Architectures – EMRPS'99: Venice, Italy. pp. 359-371 (1999)
- [12] Aloini, D., R. Dulmin, and V. Mininno, Risk management in ERP project introduction: Review of the literature. Information & Management. vol. 44(6), 547-567 (2007)
- [13] King, S.F. and T.F. Burgess, Beyond critical success factors: A dynamic model of enterprise system innovation. International Journal of Information Management. vol. 26(1), 59-69 (2006)
- [14] Donovan, R.M. Successful ERP implementation first time. 1999 [cited 2011 Jan 5]; Available from: <http://www.inventoryinc.com/pdf/perfor8.pdf>.
- [15] Ross, J., Dow Corning Corporation: business processes and information technology. Journal of Information Technology. vol. 14(3), 253-266 (1999)
- [16] Strong, D. and O. Volkoff, Understanding Organization-Enterprise System Fit: A Path to Theorizing the Information Technology Artifact. MIS Quarterly. vol. 34(4), 731-756 (2010)
- [17] Moon, Y., B., Enterprise Resource Planning (ERP): a review of the literature. International Journal of Management and Enterprise Development. vol. 4(3), 235-264 (2007)
- [18] Walsham, G., Doing Interpretive Research. European Journal of Information Systems. vol. 15(3), 320-330 (2006)
- [19] Miles, M.B. and A.M. Huberman, Qualitative data analysis: an expanded sourcebook. Thousand Oaks, California: Sage (1994)
- [20] Kvale, S. and S. Brinkmann, Interviews: learning the craft of qualitative research interviewing. Los Angeles, Calif.: Sage (2009)