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CSF's for Implementing ERP within SME's

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ABSTRACT

The study uses a project retrospective approach to study the implementation of ERP within eight SME's (small and mid-sized enterprises). A project retrospective is designed to assess project performance, to identify lessons learned, and to measure success. The findings report (1) ERP project management, (2) ERP project timeline, (3) Lessons learned, (4) Risk factors, including adequacy of skill sets and level of customization, (4) Evaluation of ERP project success, and (5) Critical success factors in ERP project implementation. Many of the themes from ERP implementation studies in larger corporations were re-iterated as keys to success: top management support, end-user involvement, vanilla implementation of key business processes, and team-building. In the SME's, project sponsors were senior managers, and project managers were less likely to have ERP project experience. Formalized ROI processes and Steering Committees were not standard. Since change was mandated from the top, and since standard vanilla processes were implemented, many of these projects stayed on-course in terms of time and budget. The story of ERP implementation in SME's indicates that these projects have definite benefits and can be effectively implemented with existing personnel and existing leadership.

Keywords

Enterprise resource planning systems, critical success factors, SME's

INTRODUCTION

This research examines critical success factors (CSFs) in enterprise resource planning implementation, focusing on small to midsized firms. Much of the research on ERP implementation addresses the critical success factors and best practices used in large-scale implementations in large organizations. Little research deals with ERP implementation in small and mid-sized enterprises (SME's). Yet, as the largest firms complete ERP implementations, ERP software vendors are focusing on the small to midsized enterprise market (Gable and Stewart, 1999). SME's face many of the same competitive problems as larger organizations, but have limited resources, experience and staffing skills (Nelson, 2007). As with the larger enterprises, ERP implementation is becoming critically important to SMEs in streamlining business processes, improving operational performance, and integrating data. Understanding the CSFs in ERP implementation is more critical to SMEs than larger organizations due to their more limited resources. SMEs may not be able to withstand the financial impact of the partial failures and project abandonments that have impacted many of their larger counterparts (Muscatello et al., 2003).

As in all large-scale IT projects, top management support, presence of a champion, good communication with stakeholders, and effective project management, are critical success factors in ERP projects (Bancroft, Seip and Sprengel, 1998). Factors which are unique to ERP implementation include re-engineering business processes, understanding corporate cultural change, and using business analysts on the project team (Sumner, 2002). Management support of the project team, a project team with the appropriate balance of technical/business skills, and commitment to change by all the stakeholders are all of paramount importance (Parr, Shanks, and Darke, 1999).

ERP implementation remains a topic of interest to IT executives. A Forrester survey found that ERP and enterprise applications remains among the top IT spending priorities for 2005 (Hamerman and Wang, 2006). A survey of the Society for Information Management in 2005 showed that ERP is among the top application and technology developments of its members (Luftman et al., 2006).

ERP systems are adopted by organizations to provide an integrated, packaged solution to their information needs. In most cases, ERP packages replace aging legacy systems which no longer meet business needs or

have become too difficult and expensive to maintain. Despite ERPs promise, these software solutions have proven “expensive and difficult to implement, often imposing their own logic on a company’s strategy and existing culture” (Pozzebbon, 2000, p. 1015). Muscatello and Parente (2006) cite ERP failure rates to be as high as 50%. Brown and Vessey (2003) observe, “Although failures to deliver projects on time and within budgets were an old IT story, enterprise systems held even higher risks – they could be a ‘bet-our-company’ type of failure” (p. 65).

RESEARCH QUESTIONS

The overall objective of this study is to determine the critical success factors and best practices associated with ERP implementation in small and mid-sized enterprises (SME's).

REVIEW OF RELATED LITERATURE

Critical Success Factors in ERP Implementation

Critical success factors are defined by Bullen and Rockart (1981) as “the few key areas of activity in which favorable results are absolutely necessary for a particular manager to reach his goals” (p. 383). A number of research studies have addressed the critical success factors for successful ERP projects.

CSF 1. Business Justification for ERP. It is important to make the business case and to establish measurable benefits at the outset of an ERP project, so that these results can be assessed (Ross, Vitale, and Willcocks, 2003). A 2005 survey of IT executives identified “IT and business alignment” as the top management concern. The survey defined IT/business alignment as “applying IT in an appropriate and timely way, in harmony and collaboration with business needs, goals, and strategies (Luftman et al., 2006, p. 83).”

CSF 2. Vanilla ERP Implementation. Re-engineering business processes to support the best practices supported by the ERP software is linked with on-time, on-budget ERP implementation (Mabert, Soni, and Venkataramanan, 2003). Vanilla ERP implementation and business process re-engineering affords the organization the greatest possible return on investment through streamlined operations (Brady and Gargeya, 2005). A “vanilla” implementation is where “the organization adopts the package without modifying it” (Soh and Sia, 2005). Minimal customization is a key factor in successful ERP projects (Parr, Shanks, and Darke, 1999, Parr and Shanks, 2000).

CSF 3. ERP Project Team has Business Experts. Business experts should be assigned to the project on a full-time basis (Brown and Vessey, 2003, Motwani, 2002, Brady and Gargeya, 2005). The project team should include members representing the business functions to be affected by the ERP implementation (Motwani, 2002).

CSF 4. ERP Project Leadership. Project leadership is a very important issue, and project leaders need to have a proven track record (Brown and Vessey, 2003). One of the lessons learned in case studies of ERP projects is that a strong project leader needs to keep the project on track, even when changes require following contingency plans (Scott and Vessey, 2002). A disciplined approach to project management which includes project scope, time, and cost management is important (Umble, et al., 2003). A project manager must prevent scope creep and must monitor project activities through tracking milestones, dates, and costs (Nah and Delgado, 2006). Bradley (2008) found a full time project manager was associated with successful ERP implementations.

CSF 5. Effective Training. User training is critical to ERP success, because people’s jobs will change. User training should focus on business processes, not just technical training on how to use the software (Willcocks and Sykes, 2000). Umble et al. (2003) cite education/training as the most widely recognized critical success factor. Bradley and Lee (2006) found a relationship between user satisfaction with training and user satisfaction with the efficiency and effectiveness of the ERP system. Training should enable managers to use query and reporting tools to generate needed reports (Ross, Vitale, and Willcocks, 2003).

CSF 6. Use of External Consultants. Effective management of external consultants is important for the success of an ERP project, because they can offer valuable expertise in analyzing cross-functional business processes and in configuring application specific modules (Brown and Vessey, 2003). Organizations

should use consultants, but take advantage of opportunities to develop internal knowledge (Willcocks and Sykes, 2000).

CSF 7. CEO Involvement. The involvement of senior executives is a common characteristic of ERP projects that finish on-time and on-budget (Mabert, Soni, and Venkataramanan, 2003, Parr and Shanks, 2000, Nah and Delgado, 2006). Top management needs to promote ERP as a top priority (Motwani, 2002, Brown and Vessey, 2003). Bradford and Florin (2003) found in a survey of SAP users that top management support is related to perceived organizational performance and user satisfaction.

CSF 8. Project Champion. A project champion is essential to project success (Willcocks and Sykes, 2000, Nah and Delgado, 2006, Parr and Shanks, 2000). Bowen et al. (2007) found both statistical and qualitative support to the proposition that higher levels of involvement of project champions are associated with IT project implementation success. Beyond this, project team members need to have the authority to make decisions on behalf of their functional area (Brown and Vessey, 2003).

CSF 9. Reducing Resistance to Change. In implementing ERP, companies often fail to address resistance to change, especially resistance to changes in job design. Since ERP implementation entails changes in business processes, change management is essential (Brown and Vessey, 2003, Nah and Delgado, 2006, Motwani, 2002). A review of 43 articles published in 20 IT and IT-related journals over the last 25 years found that user resistance is treated as a key implementation issue (Lapoint and Rivard, 2005). An organizational culture which fosters open communications is important to avoid resistance to change (Scott and Vessey, 2002).

CSF 10. Steering Committee Meets on a Regular Basis. A steering committee with executive leadership is one of the strategies used in successful ERP projects, as measured by on-time and on-budget implementation (Mabert, et. al., 2003).

METHODS

In order to study the ERP implementation process in SME's the multiple case study method (Yin, 2003) was used. Benbasat et al. (1987) posit that multiple case studies are appropriate where the research goal is theory building or theory testing. Structured interviews were conducted with the project managers directly involved in the ERP implementation. A scripted, open-ended interview form was developed to promote consistency in the collection of qualitative observations across the different firms. Eight companies participated in these structured interviews. These firms participated in the following industries: construction (4) and manufacturing (4). Gross sales ranged from \$25 million to \$500 million, with the following breakdown: \$25 to \$100 million (3), \$100 to \$250 million (2), and \$250 million to \$500 million (3).

The structured interview form was adapted from the Project Retrospective Framework developed by Nelson (2005). A project retrospective is designed to assess project performance, to identify lessons learned, and to measure success. The structured interview form includes sections on (1) ERP project information, (2) ERP project timeline, (3) Lessons learned, (4) Risk factors, including adequacy of skill sets and level of customization, (4) Evaluation of ERP project success, and (5) Critical success factors in ERP project implementation. A copy of the structured interview form is included in Appendix A.

ERP Project Characteristics and Project Timeline

In all cases, the enterprise systems projects were justified in terms of business benefits, including streamlined business processes, operational efficiencies, data integration, and better reporting. In almost all cases, these organizations were retiring homegrown, legacy systems which had been developed in a piecemeal fashion. The system benefits were perceived as better reporting, integrated data, upgradability, and integration of modules.

In terms of project leadership, the project sponsors were all C-level executives (either CEO, COO, or CFO), and project teams consisted of project managers and end-users representing functional business

areas. The enterprise systems being implemented varied from large ERP vendors such as SAP (2), and J.D. Edwards (1) to industry-specific integrated enterprise packages such as Viewpoint (2), CMIC (1), and others (2).

In terms of project scope, the ERP implementations were designed to support 90 to 100% of existing business processes. One of the major reasons for adopting ERP was process re-engineering and the ability to adopt the best practices supported by the vendor software. The enterprise systems supporting the construction industry were designed to integrate backoffice accounting/finance and project management processes, and cross-functional process integration was considered one of the main justifications for moving toward an off-the-shelf solution.

In terms of project completion, recorded in terms of expected completion date vs. actual completion date, many of the projects were successfully completed within time and cost estimates, largely because the organizations decided to implement a vanilla system. The relative success of these projects, as measured by on-time, on-budget completion, may be attributed to the fact that the scope of the projects was reasonable in comparison to multi-year, multi-million projects implemented by large multi-national corporations. The ERP projects within these SME's were completed within a year to 18 months. Of the eight projects, four were completed on-time. An additional two projects came in 12 months' late, because of scope creep in one case and lack of effective project leadership in the other.

Company	Industry	Revenue In \$millions	Project Cost \$	ERP Vendor	Project Start Date	Project Duration	Project Completion (Time)
A	Manufacturing	253		SAP	Feb-05	8 months	On-time
B	Construction	456	500,000	CMIC	Jul-05	6 months	On-time
C	Construction	209		Viewpoint	Jan-06	12 months	On-time
D	Construction	75	15% over budget	Timberline		Not provided	Not provided
E	Construction	275	197,000	Viewpoint	Jul-99	6 months	On-time
F	Manufacturing	432		SAP	1993	36 months	12 months' over
G	Manufacturing	85		J.D. Edwards	Mar-08	24 months	Not complete
H	Manufacturing	25	130,000	MZK	1993	24 months	12 months' over est.

Table 1. Summary of Case Study Site Characteristics

Although in many cases the project budgets were not available, the cost range for projects for which these data were available was between \$200,000 and \$500,000--consistent with project scope.

In most of the SME's, the project manager was playing several roles and was not able to devote 100% of the time to the ERP implementation. The same was true with the end-users serving on the project team. The issue of whether the IT staff had the skill set to implement ERP revealed that in six of the eight organizations, IT professionals did not have this skill set. The same was true for the end-users, who did not have pre-existing ERP skill sets and were "new" to the business processes which the ERP systems supported.

Lessons Learned

One of the most interesting aspects of the project retrospective methodology is the lessons learned and recommendations made by key project managers. In summarizing some of the key lessons learned, some of the themes from large-scale ERP implementations recurred, such as user involvement, better communications, top management leadership, and providing sufficient time for training.

Category	Lessons Learned	Recommendations
User involvement	“not isolating the team to commit to the ERP implementation” “include the right business users at the beginning” “identify power users”	“create a team of functional area experts” “get business units involved and keep them involved”
Data management	“don't move bad data from one system to another”	
Communications	“need to improve communications”	“better coordination between the PM and user manager”
Top management leadership	“executive sponsorship needed to be defined”	“obtain top management commitment”
Training	“training didn't address exceptions to vanilla processes”	“don't skimp on training” “enhance training”
Vanilla	“slow to implement new processes”	“recognize time to implement new practices”
Requirements	“Avoid scope creep”	
Justification for ERP	“waiting too long to replace the legacy system”	
Reporting	“underestimated time to develop reports”	
Personnel shortfalls	“inexperienced personnel caused problems”	“obtain an experienced project manager” “provide team-building activities”
Supplier Management	“Inadequate vendor commitment”	

Table 2. Lessons Learned from ERP Implementation

From these comments, it seems that the mid-sized enterprises benefitted from the experience of larger firms implementing ERP. The willingness to implement “vanilla” versions, to enable user involvement, and to mandate top management leadership are all strategies which are familiar to us from lessons learned from earlier ERP implementations among large corporations. These findings may be indicative of the fact that most of the projects were led by a C-level executive, if not the CEO, of these respective companies, and the standardization of processes was clearly a strategic decision by these leaders. Many of these companies are privately-held companies, and the justification for ERP lie in adopting these processes, data integration, and better information management. Under the leadership of senior management, these organizations decided to implement “vanilla” processes. Having access to better data for decision-making (e.g. especially financial data) was consistently mentioned as a project justification.

Project Risk Assessment

As mentioned earlier, the majority of the ERP projects in the organizations in this sample were designed to support 90 to 100% of the business processes. Several risk factors seemed to be consistent among the respondents. First, the IT staff did not have ERP relevant skill sets, and in many cases, the organizations used vendor-supplied support to handle configuration, data migration, and implementation. The same was true for the end-users. Although the end-users were fully versed in current business processes, they were new to the business processes supported by the ERP systems, and they were not acquainted with the new

technology. Because the software was not customized, end-users recognized the learning curve associated with learning new processes. However, since change was mandated by senior management, these new processes were adopted.

Project Evaluation

The ERP projects implemented among the SME's were largely accomplished on-time and on-budget, and the respondents noted that the systems were of acceptable quality in terms of meeting requirements, usability, ease of use, and maintainability. Since software was not customized as a rule, the issue of modifiability was not relevant.

The business impacts of using the enterprise system were clearly noted and included: cost savings, adoption of best practices, improved accounting processes, improved reporting, access to real-time data, and better forecasting. A number of business metrics were mentioned, including reduced time to bill customers, better forecasting, and integration of processes, but metrics for measuring the impact of the investment in terms of ROI, IRR, Earned Value, or Net Present Value analysis were not specifically mentioned.

Critical Success Factors in ERP implementation

In this study, many of the Critical Success Factors for ERP implementation were supported. In all cases, the acquisition of an enterprise system supported business goals. The ERP project manager was responsible for the management of the project, albeit not full-time, and the ERP project manager typically reported to senior management (e.g.a C-level executive). One area of contrast with respect to the SME's was that the ERP project manager did not necessarily have ERP implementation experience. Training was valued but not emphasized. CEO support for the project was a key factor, but leadership came from the CFO in four cases. The project manager was the champion. Resistance to change was largely mitigated by senior management commitment to the ERP project, though specific change management strategies were not mentioned. Projects were managed through project leadership, rather than by a formalized steering committee.

CSF	A	B	C	D	E	F	G
Alignment	X	X	X	X	X	X	X
F/T PM		X	X			X	
PM Reporting to Mgmt	X	X	X	X	X	X	X
PM Experience	X	X		X	X	X	
Training				X	X	X	
CEO Involvement	X			X	X	X	
Champion	X	X	X		X	X	X
Effective Change							
Steering Committee							

Table 3.CSF by Case Site

Conclusions and Limitations

Many of the themes from ERP implementation studies in larger corporations were re-iterated as keys to success: top management support, end-user involvement, vanilla implementation of key business processes, and team-building. In the SME's, project sponsors are C-level executives. Project managers were less likely to have ERP project experience. Formalized ROI processes and Steering Committees were not standard. Since change was mandated from the top, since the scope of the projects was clearly defined, and since standard vanilla processes were implemented, many of these projects stayed on-course in terms of time and budget. The story of ERP implementation in SME's indicates that these projects are feasible and do-able with existing personnel and existing leadership, and that the benefits are generally clear.

Limitations of this study include: small samples size limited to two industries may limit generalizability, inconsistent definitions of SME size between various studies, and a limited choice of implementation variables are examined.

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APPENDIX A: ERP Project Interview Form**Organization Name****Contact Person****Part 1: ERP Project Information**

1. Project management / leadership
 - Project sponsor
 - Project organization
 - Project manager
 - Number of full-time project team members
 - Number of full-time team members from business units
 - Stakeholders
 - Project charter: Is there a project charter?
2. The justification for the ERP decision
 - Business benefits: what business metrics were supposed to go up or down as a result?
 - Systems benefits: what systems metrics were supposed to go up or down as a result?
3. Project characteristics
 - Project scope/budget estimate
 - Project scope/budget actual
4. ERP system
 - ERP systems which were evaluated
 - Final choice of ERP system
 - Major reasons for choosing the ERP vendor

Part 2: Project Timeline

- Project start date
- Project phases (for each phase)
 - Start date
 - Expected completion date
 - Actual completion date
- Trend line of project activities
- Did scope changes impact time and cost during the project and its phases?

Part 3: Lessons Learned

1. Common Mistakes Checklist
2. Symptoms
 - Lack of strategic alignment?
 - Lack of stakeholder involvement?
 - Poor planning?
 - User resistance?
 - Insufficient training?
3. Recommendations for the future

Part 4: Project Risk Assessment

1. Actual % of business processes affected by the ERP system

2. IT skill set (Did IT staff have relevant ERP skills?)
3. End-user skill set (Did users have relevant ERP skill sets?)
 - Knowledge of business processes?
 - Knowledge of technology?
 - Other:
4. Customization (Which processes were customized? How much has been spent on customization in terms of time/budget?)

Part 5: Evaluation of ERP Project Success

1. Time: Did the ERP project come in on schedule?
2. Cost: Did the ERP project come in on budget?
3. Product: Did the ERP project produce a system of acceptable quality and a system which meets specifications, including: Requirements, Usability, Ease of Use, Modifiability, Maintainability
4. Use: Is the ERP system being used by its target constituencies?
5. Learning: Did the ERP project increase stakeholder knowledge and help prepare the organization for future challenges?
6. Value: Did the project result in improved efficiency and effectiveness for the organization. Are there measures of project success using any of these metrics: NPV, IRR, EVA, Balanced Scorecard
7. Business benefits: what business metrics have gone up or down as a result?
8. Systems benefits: what systems metrics have gone up or down as a result?

Part 5: Questions regarding the Success Factors for ERP Implementation:

1. What is the integration of ERP planning and business planning?
2. Is the ERP project manager solely responsible for the management of the project?
3. Does the ERP project manager report to the business unit's senior manager?
4. Does the ERP project manager have extensive experience?
 - a. Project management experience?
 - b. ERP experience?
5. What is the overall effectiveness of training, in terms of quantity and quality?
6. What is the level of CEO involvement?
7. Is there a champion?
8. To what extent is management effective in reducing resistance to change?
9. Does a project steering committee (headed by the CEO) meets on a regular basis (every month)?
10. What other factors are associated with project success?