CRITICAL SUCCESS FACTORS IN INTERNATIONAL ERP IMPLEMENTATIONS: A CASE RESEARCH APPROACH

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ABSTRACT

This study examines through two longitudinal studies of international ERP implementations the perceptions of the project managers towards twenty-two critical success factors shown to influence the outcome of ERP implementations. The paper first examines the perceptions of the critical success factors at differing stages of project development at each company. Findings include the shift in emphasis during the implementation from top management support, clear goals and objectives together with strong inter-departmental communication, viewed as being critical early in the project lifecycle, to a convergence upon: top management support, project team competence and interdepartmental co-operation in the final stages of the implementation. The study also examines, through the critical success factors, the impacts and issues in implementation related to the use of vendors located in different countries. Findings include: an increased emphasis upon the determination of clear goals and objectives at the project outset, and, importantly, the provision by international vendors of added value in terms of new business practice knowledge and enhanced project team capability.

Keywords: Case study, Enterprise Resource Planning Systems, Critical Success Factors, International MIS Implementations

INTRODUCTION

The evolution and development of 'enterprise class' systems in the form of ERP systems has been a major catalyst of change within organizations over the last decade and a half. ERP environments have had mixed results. They have often freed organizations from the limitations of traditional hard coded systems, enabling companies to be more adaptive and flexible in light of changing market demands (9, 39). The ERP implementation learning curve, however, saw many of the early installations being unstable, several of which failed spectacularly, including, for example, installations at FoxMeyer (21) and Hershey Foods (43). While there have been examples of successful ERP implementations e.g., Cisco (4, 50), it has been estimated that 90% of all early ERP projects were either late or over budget (29). Organizations such as Volkswagen (44, 46), Cleveland State University (45), Whirlpool (7) and W.L. Gore have suffered similar problems. Whirlpool for example decided to push ahead with their implementation; even though their SAP consultants had red-flagged a functional issue that they felt may affect the outcome of the implementation, which in fact did ultimately result in a major problem with their supply chain (7). Failures and problems during implementation itself have been subjects of an extensive literature (33, 49, 52) and while high visibility failure is not as common at large organizations as in the past, application integration problems do still occur (13), especially when organizations attempt to customize their ERP systems (6, 25, 38). However, with the increased demand for ERP systems by smaller organizations, cost overruns or failures in process design can cause significant problems as these new adopters may have limited resources, experience or staffing skills with which to overcome these issues (1).

Organizations have found themselves stretched further when implementations are performed by contractors, consultants and vendors that are geographically dispersed and whose activities require additional project management resources to be dedicated to the task of implementation (24, 48). A particularly important dimension that is implicit in many studies but is still under-researched is how the international dimensions of an ERP project relate to difficulties experienced, and outcomes. For example, Markus, Axline, Petrie and Tanis (28) found that a decentralized global organizational structure could render null and void the whole concept of ERP as appropriate for that organization. There is a need for many more studies of the role such international dimensions play in ERP outcomes.

RESEARCH OBJECTIVES

This paper has three aims. Firstly, a consideration of the critical success factors (CSFs) deemed important in the determination of ERP implementation outcomes. This is approached through a detailed assessment of previous research. Secondly, through two longitudinal case studies, the research assesses the relative importance of Somers and Nelson's (42) categorization of twenty-two CSFs at different stages in their implementation. Finally, the paper also assesses the affects of the environmental and cultural issues surrounding the international nature of the project implementations.

As the literature review will show, the area of CSFs for ERP implementation has been an active field of research and while interest in cultural issues as they relate to ERP implementations has been growing, there has been very limited study of international vendor-client relationships combined with an assessment of CSFs as they apply to ERP implementations. This research aims to provide steps and insights into the confluence of these areas.

LITERATURE REVIEW

Critical Success Factors

A key research question in examining the deployment of ERP systems is centered on determining the critical success

factors that lie behind a successful implementation. In fact, this area has been subjected to a significant amount of prior research. Several approaches have been taken. Slevin & Pinto (40) originally proposed ten CSFs for project management. Their work was built upon by Holland & Light (17). They partitioned the implementation process into strategic and tactical subgroups, adding factors specific to software projects. The application and modification of existing project management techniques to ERP was also addressed by Weston (51), who also considered the issues surrounding the development stages that the project passes through, associated metrics, and the software used in ERP implementations. These issues have been further investigated by other researchers. Notably Ahituv et. al., (2) who investigated systems development methodologies for ERP systems, while Huang et al., focused upon the need for organizations to create a repository of implementation best practice to ensure consistency across ERP implementations (19). Zviron et al., considered the issues surrounding the measurement of user satisfaction and perceived usefulness in the ERP context (55). While Sumner (47) considered implementation issues through series of ERP case studies resulting in a set of guidelines designed to promote success in large software project implementations.

Nah, Lau and Kuang (31) undertook a literature search of ERP implementations and identified eleven CSFs and considered their relationship to Markus and Tanis's process-orientated ERP Life cycle model (27). Bajwa and Garcia (5) developed an integrative framework for the assimilation of ERP systems, extending the literature in the area of critical external antecedents, while Gulledge and Sommer (15) examined the issues surrounding scoping business processes when splitting SAP instances. Parr and Shanks (32) built on their earlier research into CSFs, identifying ten enabling factors, then using further case research to construct a project phase model for ERP implementation. Meanwhile an influential study by Somers and Nelson (42) also examined the literature for CSFs and took Cooper and Zmud's six stage IT implementation process model (8) as a basis for ranking and categorize them by stage. The Somers-Nelson CSF classification was extended by Akkermans and van Helden who, through the application of a longitudinal case study, showed that inter-dependencies both indirect and direct exist within the success factors and importantly that 'they all influenced each other in the same direction i.e., all positive or negative, leading to a self perpetuating or cycle of good or poor performance' (3). Research has also been undertaken on subsets of CSFs classifications; for example, Sarker and Lee (37) examined three major social enablers in ERP implementations, while Gefen (12) considered the issue of trust between vendors and clients within ERP implementations and Luo and Strong proposed a framework for evaluating implementation choices pertaining to the customization pf an ERP (26).

Environmental and Cultural Issues in ERP Implementations

A second aspect investigated by this study concerns the impact that international development teams and their cultures have upon ERP implementation success. There is a growing literature in the area of 'cultural fit'. Several models have been proposed that relate cultural and environmental factors to the international dimension. Soh, Kein and Tay-Yap (41), in their study of seven public hospitals in Singapore, defined a cultural 'misfit' as 'the gaps between the functionality offered by the package and that required by the adopting organization'. They further suggested that misfits 'may be worse in Asia because the business models underlying most ERP packages reflect European and U.S. industry practices' (41) Their research suggested that, in order to minimize misfits, a misfit analysis be performed involving the key users of the final ERP product, the IS organization and the ERP vendor. Gulla & Mollan (14) discussed the issues surrounding a distributed, multi-cultural implementation of SAP R/3 through a case study example at Hydro Agri Europe (HAE), they considered the company's attempt to deal with multiple languages, legal systems and value systems. Their study suggested two processes that may be useful to 'harmonize business processes and organizational structures' (14), these being 'fit analysis' and 'job analysis.' Rugg and Krumbholz (35, 36) proposed a methodology for helping organizations to elicit an understanding of their culture, which can be modeled to assist in the selection and installation of the ERP system and its environment (see also (36)). Hong and Kim (18) also considered CSF's in relation to 'organizational fit' and identified that 'beyond a certain level of organizational fit more [process] adoption will only lead to lower implementation success'. A study by Huang and Palvia (20) suggested a framework for comparing ERP implementations in advanced and developing countries. Davidson (10) considered cultural misfit issues and highlighted the North American-Western Europe centric nature of the ERP systems development. Krumbholz and Maiden (22) and Krumbholz, Galliers and Maiden (23) have also performed an investigation of the issues surrounding ERP implementations within different organizational and national cultures.

ERP implementations are particularly worth continuing to research because the software and technology bases themselves are changing quickly with time, presenting new risks and issues. Furthermore over time, organizational learning leads to different perspectives on what critical success factors might be, and where management emphasis needs to lie. These factors are confirmed by Ross, Vitale and Willcocks (34) whose original 1998 study has been updated with further research that reflects internet delivery of ERP capability. Additionally, all the research points to ERP sharing many issue with other types of IT-based project implementations e.g. size, complexity, newness of technology, availability of technical expertise, but also presenting distinctive and changing factors. Thus as Markus and Tannis (27) and Willcocks and Sykes (53) have pointed out, amongst other features, ERP packages requiring a mix of old and new skills; a 'whole organization' suite of packages; software embodying generic best practices that imply large scale business process re-engineering; recognition of the degree of customization possible or prudent; integrated software requiring further assembly of the technology platform. Moreover, in summarizing the research Shanks, Seddon and Willcocks (39) have suggested that once systems are up and running, second-wave enterprise resource planning involves further implementation and learning, with additional, possibly changing CSFs, if ERPs are to be exploited for meaningful business value. Thus, CSFs in ERP implementations deserve further confirmation and investigation for possible extensions.

Additionally, while the two relevant literatures explored here show much work and hypothesizing about critical success factors on the one hand, and international and cultural issues on the other, studies so far have not endeavored to bring these two literatures together and explore these issues at the same time in the sort of single empirically-based study that will be reported on here.

RESEARCH DESIGN AND APPROACH

The aim of the research was; firstly, to better understand project managers' perceptions of critical success factors (CSFs) as they affect the outcome of ERP implementations at distinct stages of the implementation. To this end, after reviewing the extant literature, we chose to utilize the CSFs developed by Somers and Nelson (42) and built upon by Akkermans & van Helden, (3), since these emerged as sound pieces of research yielding typical results. Table 1 shows Somers and Nelson's results, providing the mean rankings of CSFs by degree of importance in ERP implementation.

TABLE 1
The mean rankings of Critical Success Factors by degree of importance in ERP implementation (Somers & Nelson, 2001).

Critical Success Factor	Mean
Top Management Support	4.29
Project Team Competence	4.20
Interdepartmental Co-operation	4.19
Clear Goals and Objectives	4.15
Project Management	4.13
Inter-departmental Communication	4.09
Management of Expectations	4.04
Project Champion	4.03
Vendor Support	4.03
Careful Package Selection	3.89
Data Analysis and Conversion	3.83
Dedicated Resources	3.81
Steering Committee	3.97
User Training	3.97
Education on New Bus. Processes	3.76
BPR	3.68
Minimal Customization	3.68
Architecture Choices	3.44
Change Management	3.43
Vendor Partnership	3.39
Vendor Tools	3.15
Use of Consultants	2.90

The work of Somers and Nelson was based upon a large-scale meta-study of the case study literature in the area of ERP implementation from which they identified twenty-two critical success factors. Their study also solicited information from respondents to ascertain the stage at which their implementation had reached, identifying from the data the top five CSF by stage (42). Akkermans and van Helden (3) extended the work of Somers and Nelson (42) by investigating through a single case study the inter-related causality of the ten most important CSFs as ranked by Somers and Nelson. Thus, this paper aims to complement and extend the work of these four researchers by investigating the perceived importance of the CSFs to the successful outcome of an ERP implementation amongst project team managers involved in implementations of systems from vendors who were located in another country from the client implementation.

A case study approach was utilized in this research in order to follow two companies over an eighteen month period. The approaches follows those advocated by McCutcheon and Meredith (30), Yin (54), Hedman and Borell (16) and Eisenhardt (11) which promote consistency in observation, results and data acquired across case organizations. During the eighteen months period, a variety of methods were used to track the progress of the implementations including semi-structured interviews, participative observation, receipt and review of documents relating to the ERP implementation progress and results, email updates, and survey instruments. The survey instruments are described in detail in Appendix A and Appendix B. Appendix A shows the questionnaire adapted from Somers and Nelson (42) for use in the present research. It suggests twenty two CSFs which respondents can rank. The questionnaire was administered before the interviews, during which respondents could elaborate on their scorings, and add other CSFs with reasons if they felt this to be necessary. The interviews ranged beyond this CSF debate into a range of factors and events emerging during implementation and other issues that the respondents found to be important to raise. Appendix B shows the additional questionnaire we devised as a research tool, derived from the prior research literature reviewed above, in order to elicit respondent views on these cultural and international issues, discussion of which also formed part of all the interviews. Structured interviews with the relevant project managers in the two companies were conducted, using the questionnaire results as starting points. In addition, to flesh out case study detail and gain added focus; we interviewed five or more stakeholders from both of the companies to ask questions pertaining to events, difficulties and levels of success. Stakeholders covered senior business executives, project managers, senior technical officers, vendors and project staff. These were much more loosely structured interviews, lasting between 25 and 45 minutes each. The case findings report project manager responses only where supported by a sufficient body of stakeholder opinion as reported in the additional interviews conducted, and by the relevant documentation reviewed.

The case companies were chosen to represent two different organizational sizes: a small to medium enterprise based in the Caribbean that is a division of a holding company and a medium sized UK based company with international divisions. While the case study method has limitations in terms of statistical, as opposed to analytical, generalization of results, it is a highly applicable method to a longitudinal study that covers an evolving organizational-technology relationship. The international nature of the organization-vendor relationship was also of importance. The two companies were selected because they utilized vendors and consultants in a second country. The two companies are further described and classified, together with the relevant ERP implementations, in Table 2.

We now report on the findings of the longitudinal studies and provide an analysis of the CSF focusing upon the international dimension of the implementations. Throughout the companies and respondents have been anonymized at the request of the respondents.

CASES AND ANALYSIS

Company A

Case study A was performed at a division of a holding company

TABLE 2
Profile of the Technologies and Project Status at the Case Study Organizations

Company	Function	System Justification	Primary Status	Project Date	Start-End
A	Alcoholic Beverage Manufacturer	Microsoft Navision	Development of a unified system	Ongoing rollout through other divisions	Phase I: May 6, 2002-October 1, 2002
B	Energy Solutions	Intentia Lawson	To globalize and standardize the entire	Majority of larger UK units	Spring 2001-Fall 2003

located in the Caribbean. The division's main activities are based upon the cultivation of sugar fruit crops, the manufacture of sugar, distillation, blending, bottling, distribution and export of alcohol and other liquor based products. The group as a whole has revenues of more than $US2 billion but does not disclose divisional results.

The decision to move to an ERP in Company A was driven from the process integration issues that surrounded their existing systems. The objective of the ERP implementation was to replace six different legacy systems, which had limited data interchange capabilities with Navision, a Microsoft product and both its vendor and consultants were based in the United States.

The re-engineering effort commenced in May of 2002 and phase one of the implementation was completed in October of that year. The implementation switch-over was, according to the project manager, of "big bang" in nature, all the old data was archived, the old system turned off and the new system turned on, no data was carried over from the old system. The implementation itself was performed by a core team of eighteen project members headed by the CIO.

The implementation was deemed a success by the company from several perspectives. Firstly, the system was efficiently and effectively implemented, but more importantly the system was live with 75% of the total desired functionality in time for the companies' key sales period (October-December). The ERP system also facilitated greater throughput of transactions than the previous systems during this peak sales period, with no major problems occurring when compared against the previous year during which the legacy system had 'died' for a period and the company could process no transactions.

During the implementation process respondents in the case interviews provided a map that plotted the period of development and the CSFs (45) that the project manager considered important.

At the outset of the implementation the project manager considered his three most important factors to be: *1: Top management support, 2: Clear goals and objectives, and 3: Dedicated resources.* At the midpoint the project manager had changed his three leading CSFs to be: *1: Top management support, 2: Project team competence and 3: Dedicated resources.* At the end of the project his top three CSFs had again changed to include: *1: Top management support, 2: Dedicated resources, and 3: Management of expectations.* For complete results see Table 3.

The international dimension of the project however also significantly influenced the CSFs for the implementation. Drawing upon the interviews and the survey instrument data we will now consider some of the CSFs that were affected by the international nature of the project:

Careful Package Selection: The project manager summed up the companies feelings with regard to the selection of the Microsoft package as a CSF as follows: *"The selection of vendor was a key to the companies' successful ERP implementation."* The choice of vendor was made in part by considering the training issues to be undertaken following implementation. The workforce's previous familiarization with other Microsoft products lowered the employees' learning curve.

Vendor Support: Even though the organization chose Microsoft products, there were at the time of the project proposal, no local vendors to support the product. The organization had to work through the Atlanta office of Microsoft who recommended two companies that could support the product, one in the Mid West (USA) and one in the Dominican Republic. Company A then decided to engage the US based company, primarily as they had installed more systems but also because they spoke English in which the system interface was to be developed. While the vendor located in the Dominican Republic were also competent, their abilities to be bi-lingual were limited and this it was considered could have hindered interaction with the other integration partners involved in the project. Vendor support was utilized on a limited basis, problems were thoroughly examined internally and only when all attempts to solve them were exhausted was the vendor contacted. This was a policy decision as external vendor support was simply too expensive to be used without real cause.

Vendor Partnership: The careful management of the vendor partnership was a very important CSF for Company A, the actual vendor, a Miami company who were subcontracting from a Midwest consulting firm was vital in keeping the project moving forward. The relationship status was excellent, due in part to the fact that case study A was the largest client both in terms of size of project and revenue for the subcontractor in Miami and that the Case Organization was considering implementing ERP's at its other divisions a contract the vendor partner may well obtain if the first implementation went smoothly. The Case organization did find that being a small, remote contract with the large Midwest Consulting firm led to communication delays as the consultants rotated through their other engagements. However, the company adapted and they felt that once the support-client relationship was understood that it did not in fact slow down the development greatly or affect the cycle time of development.

Resources: An international CSF that was considered important to the projects on time implementation was access to physical resources. Importing servers and the equipment was a difficult and frequently frustrating process. Obtaining even basic equipment such as LCD projectors became an issue, taking significantly more effort than would have been expended in countries with greater access to resources.

Trust: The issue of trust became another international CSF that was considered vitally important. The company is very protective of the formulas for the products and their preparation. However

TABLE 3
Critical Success Factors for Company A

Critical Success Factor	*Pre Implementation*	*Post Implementation*
Top Management Support	Extremely Important	Extremely Important
Project Team Competence	Important	Extremely Important
Interdepartmental Co-operation	Neutral	Important
Clear Goals and Objectives	Extremely Important	Extremely Important
Project Management	Extremely Important	Important
Inter-departmental Communication	Important	Important
Management of Expectations	Important	Extremely Important
Project Champion	Extremely Important	Extremely Important
Vendor Support	Important	Important
Careful Package Selection	Important	Extremely Important
Data Analysis and Conversion	Somewhat Important	Somewhat Important
Dedicated Resources	Important	Extremely Important
Steering Committee	Extremely Important	Important
User Training	Important	Important
Education on New Bus. Processes	Neutral	Extremely Important
BPR	Extremely Important	Neutral
Minimal Customization	Important	Important
Architecture Choices	Important	Somewhat Important
Change Management	Extremely Important	Important
Vendor Partnership	Neutral	Neutral
Vendor Tools	Neutral	Neutral
Use of Consultants	Neutral	Important

the company had to release the information to the consulting firm who were developing a parallel implementation at their location. The legal dimension was a very important aspect of this CSF and the lawyers went back and forth over a long time period, the issue being compounded by the fact that the case study company and the vendor were using different legal authorities as the basis for their contracts.

Consultants: The use of consultant was limited by the project manager due to the expense both in terms of hourly billing rates but also for logistics costs. Their solution was to take a single consultant on board from Navision and to send the project manager for training. These team members then acted as disseminators of training and project knowledge.

Summary to Case A

The case study is an example of a SME rapidly transitioning from a legacy environment through an implementation of a Microsoft ERP system. Throughout the project two factors were considered critical: *top management support,* and *dedicated resources*. The first of these, top management support, was exemplified by the fact that the Group Managing Director envisioned the project and had his support throughout. This enabled the political issues to be either ignored or brushed aside by the CIO and the project manager. The top level of management support enabled the project group to manage the project, in a large part by edict. While this may not have been the most satisfactory management style for an inclusive team approach, it was effective. The implementation was on tight deadlines and a working live system was required by the commencement of the company's major period of sales activity. However, even with top-level management support the ability to obtain dedicated employees to the ERP project team was met with limited success. The ability to dedicate more resources would have facilitated the development and a smoother deployment.

The project was characterized throughout by a rapid development style. However, the fact that there were few clearly defined initial objectives and goals was a double-edged sword for the project team, in that it facilitated them to define the new system without constraints, but it also forced them to take on the added burden of process and BPR design, typically a time and resource intensive aspect of development. Having developed the system specifications, selected the system, the vendor and consultants, the project team then identified their own critical success factor: *internal project team competence* and worked hard to ramp up the internal knowledge base for the team members and to draw onto the team the best and most appropriate employees in the company. At the end of the project, it was realized that it would have been advantageous to have focused earlier in the implementation upon *management of expectations*. This would have led to a smoother deployment and eased the user training.

From the perspective of international CSFs, three stand out: Firstly, the issue of *trust* amongst partners is a key. The provision of key corporate intellectual property to third parties is a very sensitive area, made all the more difficult when the legal systems the partners operate under are not uniform. The second international CSF is the *selection of vendor*. The selection of a system based upon the scale of implementation in relation to

TABLE 4
Critical Success Factors for Company B

Critical Success Factor	*Pre Implementation*	*Post Implementation*
Top Management Support	Extremely Important	Extremely Important
Project Team Competence	Extremely Important	Important
Interdepartmental Co-operation	Important	Important
Clear Goals and Objectives	Extremely Important	Extremely Important
Project Management	Extremely Important	Extremely Important
Inter-departmental Communication	Important	Important
Management of Expectations	Extremely Important	Extremely Important
Project Champion	Extremely Important	Extremely Important
Vendor Support	Extremely Important	Extremely Important
Careful Package Selection	Extremely Important	Extremely Important
Data Analysis and Conversion	Important	Extremely Important
Dedicated Resources	Extremely Important	Extremely Important
Steering Committee	Extremely Important	Extremely Important
User Training	Extremely Important	Extremely Important
Education on New Bus. Processes	Extremely Important	Extremely Important
BPR	Important	Extremely Important
Minimal Customization	Important	Important
Architecture Choices	Important	Important
Change Management	Extremely Important	Extremely Important
Vendor Partnership	Extremely Important	Extremely Important
Vendor Tools	Extremely Important	Important
Use of Consultants	Extremely Important	Extremely Important

resources available is key. This company decided that the best way to accomplish their goal of a rapid deployment was to select a Microsoft product aimed at SMEs and that the familiar interface would streamline the implementation and educational processes. The third CSF is ***vendor support.*** The costs associated with an international vendor relationship are extremely high and for small to medium enterprises and the utilization of external entities in consulting, training and supporting roles can prove a sever drain on the budget if poorly considered.

Overall the system development was considered a success, with a planned two-year ROI. The Companies future plans include developing the ERP system in the other divisions and linking the systems to suppliers, partners and customers external to the organization.

Company B

Case study B was performed at the U.S. division of a leading global supplier of energy solutions headquartered in the UK during the period 2001-2003. The company employs approximately two thousand people worldwide, in more than 27 countries and generates global revenues of more than $US 500 million.

For Company B, the decision to move to a Lawton ERP product was considered a 'Strategic Technical Initiative' based upon the companies desire to 'globalize and standardize the entire company.' Prior to this initiative 'each operating unit was operating separately and it was viewed that it was ineffective and inefficient; the company was running everything from systems procured from small third, fourth or even fifth tier ERP vendors to excel and Microsoft word; the company literally had some operating units doing everything out of excel, there was no standard accountancy, and no standard way of tracking assets. So the aim of the ERP was to be able to reduce administrative overhead and bring standardization and globalization to the business. The role of the CIO was seen as a key enabler of success and elevated to function as a Global officer of the company. A new CIO was recruited personally by the CEO from a larger company, with the intent of not just implementing an ERP but to build an IT-based business strategy, implementing process change and execute change throughout the organization.

The case study through survey and interview processes allowed the relationships between the CSFs (42) that the US project manager and the corporate CIO considered important during different phases of the implementation to be monitored (for complete results see Table 4). While all CSF's were ranked as high or very high, discussions and interviews identified that the two most important of these as: *'executive top management'* and *'vendor support'* were considered the key factors over the life of the project.

The project manager for the case study was located in the United States, the corporate head office was located in the UK and the primary software vendor was located in Scandinavia whose representative office in the United States was located a considerable distance from Company B's U.S. primary business unit. We will now consider some of the CSFs that were affected by the international dimension of the project.

Software Functionality and Customization: The global nature of the deployment placed the ERP system under strain in terms

of its functionality and operational ability across all theaters and regions. For example the vendor initially had difficulties in capturing the significant complexity of the US sales taxes e.g., state, city, county etc. This required the vendor to modify the system at the implementation level and necessitated the project team at Company B to expend additional resources in order to explain to the European consultants and application programmers exactly how this function should work.

Vendor-Client Proximity: The distances between the parties (USA, UK, and Scandinavia) were considered a major issue, in terms of accessibility to the vendor and in terms of cultural proximity. The physical distance between vendor and client has a direct bearing upon the nature, type and frequency of meetings between the parties.

The distance and need to physically meet also had a cultural dimension. While it was felt that ultimately the differing cultural work practices did not distract from the quality of the implementation, the project manager and his team did experience increased costs and a periods of heightened stress levels due to these differences.

A third aspect of the vendor-client proximity CSF was the impact it has on cycle time. In this implementation it was felt that that the international nature of the vendors and its impact on communication lengthened the cycle time of the project development. While technologies such as instant messenger, email, voice mail and Internet meetings were utilized, they were felt to be constrictive, while video conferencing an expensive second best to physical meetings.

Project Management Overhead: The international nature of the implementation also placed an added dimension of burden on management overhead. The investment, planning and project management overhead was increased significantly having a vendor in Scandinavia rather than a vendor such as SAP with a local office and all the support that entails.

Education on New Business Processes: While much of the implementation was a standard configuration, several processes required customization. Three issues arose: Firstly, the distance from the vendor's training facilities caused higher training costs as the training fell upon the application consultants. Second, the training of employees on the custom aspects caused Company B to endure greater expenditures than would have been the case if only standard ERP functionality had been used. Thirdly, the internal customization of functions forced the company to perform its own education of employees, a non-core function at a time when the project team was already overextended.

Summary of Case B

The case study illustrates a customer-vendor development initiative that was truly multi-locational in nature. In accord with Somers and Nelson's CSFs, Company B considered its success to be based upon: *the continuous presence of strong top management support, interdepartmental co-operation and vendor support.*

From the perspective of international CSFs two inter-connected factors stand out: *customization* and *vendor support.* Firstly, it was clear that customization had to be minimized, not only would this avoid the need to write custom code for custom processes together with the associated cost, but it would also limit the multiplicative effect that the company's distance from the vendor would have upon expenditures. The company was also clear that strong vendor relationships and support were critical given the time and distance that separated many of the business units from the vendor. However it also became apparent that there were cultural differences between the vendor and Company B that while not ultimately fatal, was draining and stress inducing upon the project team at the time, and which with easier and greater communication could have been marginalized.

Overall, the system development was considered a success, with a planned ROI of four to five years. The companies' future plans include developing the ERP system in the remaining business units.

RESEARCH CONTRIBUTIONS

This study was undertaken over an eighteen-month period and considered the implementation of ERP systems at the divisions of two manufacturing organizations that were can be categorized as small to medium in size and scale. The study had two objectives, first to consider the perceived importance of Somers and Nelson's critical success factors pre- and post- implementation and second to consider whether the fact that the implementations were being performed by internationally based vendors and teams affected the outcome of the projects.

The results relating to the first research question showed that only three of Somers and Nelson's critical success factors (ranked: 1st 4th and 19th) were considered important prior to the implementation of the ERPs by the project teams. However, following the implementation there was agreement by all of the study participants upon the top four ranked factors as shown by Somers and Nelson's, as well as agreement upon the importance of several other factors.

The longitudinal examination of the two case studies highlighted the need for project team leaders (CIO's) to reinforce the need for careful planning in the *process change management* aspect of the implementation. The CIO in Case B considered this vital, noting that the 'change management curve' holds for ERP implementations, in that organizational productivity dips preceding, during and following the implementation of new 'process systems,' where the amount of resistance to change equals the dip in productivity and the duration of the productivity downturn is related to the employees carry over of old work processes in spite of new work or system practices.

The results relating to the second research question, which considered the impact of utilizing an international vendor, indicated that the use of these vendors *did not detract from the quality of the implementation and that the use of international vendors helped facilitate clear goals and objectives.* It was felt that *international vendors enhanced the project teams' competence and facilitated education on new business processes.* The international nature of the vendor did not limit customization on the ERP projects in the study nor was it felt that the international nature of the vendor detracted from their ability to support the projects.

FUTURE RESEARCH DIRECTIONS

In addition to extending the scope of the data set covered in this study, we identified several areas for further research relating to ERP systems development and the impact of international technology implementations. Firstly, the work could be extended by an examination of the CSFs associated with the type of ERP implementation e.g., phased, concurrent or 'big bang'. Similarly, the longitudinal method used in this paper could be used to examine the CSFs associated with implementations of different

durations, e.g., rapid small implementations versus multi-year implementations. The international implementation issues could also be developed further by drawing from the literature associated with developing or running IT solutions offshore. This literature has close associations to the project management requirements of enterprise scale system implementations that are international in scope. The nature of offshoring contracts, vendor relationships, and project management could be examined. This area of research could potentially yield valuable information pertaining to the differences between local and international scale implementations, on topics such as project cycle time, communication overhead and user training. Clearly, more research in the area of international vendor implementations is needed and it is hoped that this study will provide a first step in this area.

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APPENDIX A
Questionnaire to elicit information about Company X with Respect to the CSFs Ranking the ERP project Pre-Implementation

Please rank the following critical success factors (place a X in the box most appropriate) according to their projected FUTURE potential contribution towards a successful ERP implementation project.

	Extremely Important for Success (5)	Important Important for Success (4)	Neutral (3)	Somewhat Important for Success (2)	Not Not Important for Success (1)
Top Management Support					
Project Team Competence					
Interdepartmental Co-operation					
Clear Goals and Objectives					
Project Management					
Inter-departmental Communication					
Management of Expectations					
Project Champion					
Vendor Support					
Careful Package Selection					
Data Analysis and Conversion					
Dedicated Resources					
Steering Committee					
User Training					
Education on New Business Processes					
BPR					
Minimal Customization					
Architecture Choices					
Change Management					
Vendor Partnership					
Vendor Tools					
Use of Consultants					

CSFs taken from: Somers, T.M., & Nelson, K. (2001) The Impact of Critical Success Factors across the Stages of Enterprise Resource Planning Implementations. *Proceedings of the 34th Hawaii International Conference on System Sciences* (HICSS-3) January 3-6, 2001, Maui, Hawaii. (CD-ROM)

APPENDIX B
International Culture Related Questionnaire
to elicit information about Company X with Respect to the ERP Implementation

The purpose of this questionnaire is to derive information about the international nature of the vendors and consultants utilized by your company in its ERP implementation.

The results of this questionnaire are going to be analyzed together with the critical success factor interviews performed earlier, so as to be able to elicit international-related effects on the implementation.

Please mark the box that applies best to each statement.

A — Strongly Agree
B — Agree
C — Tend to agree
D — Neutral
E — Tend to Disagree
F — Disagree
G — Strongly Disagree

	A	B	C	D	E	F	G
Q1. The international nature of the vendors limited the amount of customization performed on the ERP system							
Q2. The international nature of the vendors facilitated the development of clear goals and objectives at the project outset							
Q3. The international nature of the vendors detract from their ability to support the project							
Q4. The international nature of the vendors detracted from the final quality of the project implementation.							
Q5. The international nature of the vendors lengthened the cycle t time of the project development.							
Q6. The international nature of the vendors limited the utilization of consultants.							
Q7. The international nature of the vendors limited the level of communication with the vendors during the project.							
Q8. The international nature of the vendors created a significant management overhead during the project							
Q9. The international nature of the vendors facilitated education on new business processes							
Q10. The international nature of the vendors enhanced the project teams competence							
Q11. The international nature of the vendors facilitated user training.							