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Critical Factors in Theory and Practice

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ERP Systems: Critical Factors in Theory and Practice

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Abstract

This paper reports the findings of a research project investigating the utilization and continuous improvement of Enterprise Resource Planning (ERP) systems. Adopting the aspects of a resource management framework and Critical Success Factor research, an initial framework is developed. The framework is developed through a survey of ERP system expert consultants. A number of factors and causalities are identified, including the positive role of use by top management and the role of corporate culture. Two factors were found to have a negative impact on utilization. The first is the unreflective use of ERP system implementation methods, which can 'kill' the visions and ideas of implementing ERP systems, while the second is the vanilla implementation strategy.

1. INTRODUCTION

Enterprise Resource Planning (ERP) systems constitute one of the most important developments in corporate information systems during the last decade (Davenport 1998; Hitt, Wu and Zhou 2002; Upton and McAfee 2000). The business interest in ERP systems can be explained by the benefits associated with the implementation and utilization of ERP systems (Robey, Ross and Boudreau 2002). The benefits are only related in part to the technology, most of these stemming from organizational changes such as new business processes, organizational structure, work procedures, the integration of administrative and operative activities, and the global standardization of work practices leading to organizational improvements, which the technology supports (Hedman and Borell 2003). The benefits are documented in a study which showed that the selection and acquisition decision of the market-leading ERP system (SAP R/3) leads to increased market value and the use can lead to increased productivity over time (Hitt et al. 2002).

The implementation of ERP systems is a difficult and costly organizational experiment (Robey et al. 2002). Davenport (1996) described the implementation of ERP systems as "perhaps the world's largest experiment in business change" and for most organizations "the largest change project in cost and time that they have undertaken in their history". The costs and time frame related to implementing an ERP system can be illustrated by the case of Nestlé, which will have invested, by the end of 2003, US$ 500 million in an ERP system. In 1997, the American subsidiary started the project and in 2000 the global parent decided to extend the project into a global solution (Worthen 2002).

The implementation of information systems is a necessary but insufficient prerequisite for benefits and value. Business value can only be derived from the efficient and effective utilization of information (Agarwal, Ratan and Ghosh 2000). The management of ERP system utilization is, thus, of critical importance and involves development and implementation, as well as usage of resources (Kalling 1999).

Given the increased importance and the potential benefits of ERP systems, it is critical that research focuses on utilization. This paper reports upon the results of a study focusing on factors affecting utilization. The overall research question addresses how organizations can better utilize ERP systems. Improved utilization can refer to either cognitive improvements or diffusion improvements. Cognitive improvements address

the individual user of ERP systems, e.g. whether the user can improve and extend his or her use of ERP systems. Diffusion improvements, on the other hand, address the organizational side of utilization and refer to the scope of the system and internal distribution. This paper builds upon and expands Kalling's (1999; 2003) IT resource management (ITRM) framework, which is used to analyze the empirical findings and to theorize ERP system CSFs.

The outline of the paper is as follows: The following section presents the ITRM framework and a literature survey of Enterprise Systems CSFs. An initial framework is presented as a synthesis. The third section presents the research method. The following section presents the empirical observations followed by the result and discussion. The final section concludes the paper and proposes further research.

2. THEORETICAL GROUND AND LITERATURWE REVIEW

An initial framework is developed based on an integration of Kalling's (1999; 2003) ITRM framework and ERP System CSFs research. A number of factors and causalities emerge as critical to the management of ERP systems, mostly related to the early phases.

2.1. IT Resource Management Framework

Kalling's (1999) ITRM framework is based on an integration of the resource based view literature, e.g. Barney (1991), and strategy process research, e.g. Mintzberg (1994; 1998). The framework is empirically verified and further enhanced in a comprehensive case study of the development and use of an integrated sales, manufacturing and logistics system. The framework includes two main phases (the resource and employment phases) and five tasks (identification, development, protection, internal distribution and usage). The phases and tasks are depicted in Figure 1. The arrows indicate the causality between the tasks. In Figure 1, the problems related to each task are underlined and the management activities aimed at resolving the problems are italicized. The components of the framework are described below.

According to Kalling (1999; 2003), the resource phase involves three distinct tasks, which include the identification, development and protection of resources. Identification involves the search and decision process leading to the decision to develop a resource. Problems related to identification tasks are; ambiguity concerning what resource is required and the uncertainty of how to develop the resource. Ambiguity and uncertainty can be managed by means of a strategic vision of the resource's fit, top management involvement and management of knowledge. The development tasks aim to create the resource and resemble traditional analysis, design and realization. This is viewed as a learning process involving knowledge sharing and organizational arrangements. Issues related to learning can be resolved through the acquisition of knowledge from an external party, e.g. a consultancy firm developing the resource. One critical factor promoting learning is the organizational culture, including norms and values. The strategic vision has the role of a control and support tool for the management and project group responsible for the development. The composition of the project group and its relationship with external consultants is important factors during the

development. The protection task's aim is to protect the resource from trade, imitation and substitution. This can be managed by means of legal protection or insulating the resource in different ways. Legal protection can provide durable protection. Insulating mechanisms, such as causal ambiguity and social complexity, can create temporary protection. In order to protect resources, firms have to develop and implement these quickly, as well as continuously improve their utilization. As illustrated in Figure 1 protection occurs continuously during the resource and employment phases.

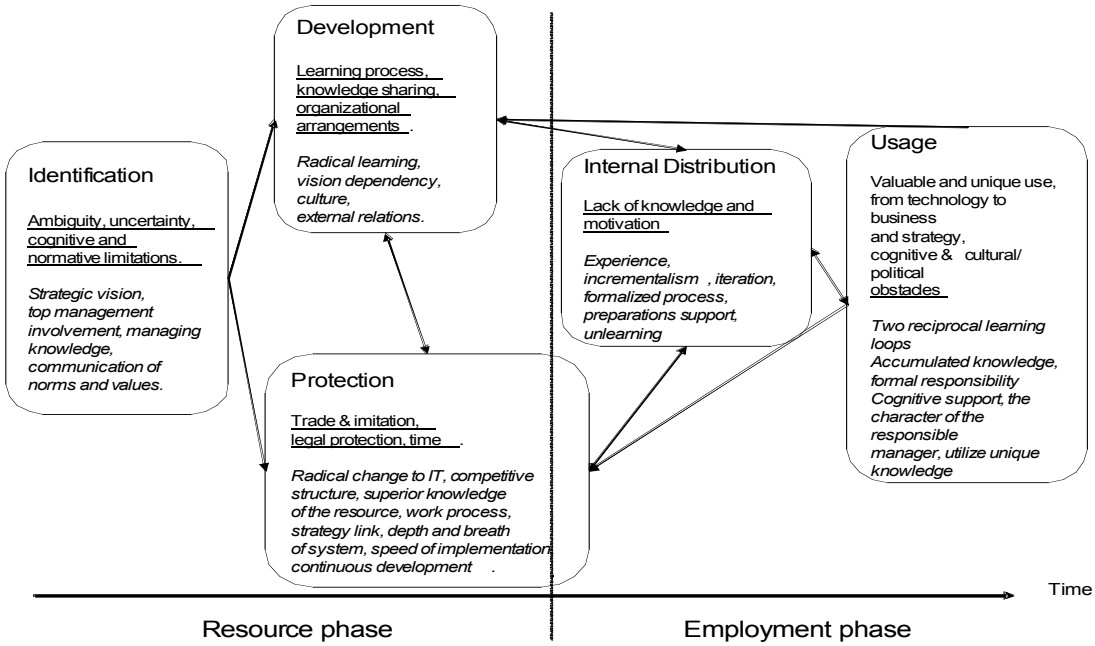

Figure 1 The ITRM Framework (adapted from Kalling 1999).

The employment phase's aim is internal distribution and usage of the resource. Internal distribution refers to the diffusion of resources. Implementation is difficult and is affected by unwillingness, poor communications, a lack of knowledge, and conflicts of interests etc, which have to be managed. The obstacles encountered during this phase can be managed through extensive training, preparations, support, unlearning the old system, and phased implementation. Usage involves using the resource in work processes. The resource can affect existing work procedures which then have to be changed, leading to resistance in the users. To overcome such problems, iterative learning is a key tool and, in particular, the interplay between the resource and the processes, i.e. how do new processes work with the resource (Kalling 1999; 2003).

Besides the two phases and five tasks of the ITRM framework, there are relationships and causalities between the phases and tasks. This is illustrated by the arrows. The time axis in Figure 1 illustrates the longitudinal aspect. The overall logic of the ITRM framework is that the requirements of a particular resource are identified. Commitment is essential during identification, through organizational and financial commitment to the project. The commitment provides a causal link with the development and protection tasks. The development of resources creates a need for protection, and the need for protection affects the development. The developed resource has to be distributed, prior to usage. The distribution or implementation has to be protected. The

actual usage can lead to requests for changes and recurrent development, protection and distribution. In order to create long-term value, the resource has to be continuously improved.

The ITRM framework has some limitations. The first is the perspective being applied, which is a management perspective. The limitation of a management view of ITRM is an issue, not related to management, is included, e.g. technical issues. Another limitation of the framework is the empirical case, which was the development of one unique information system's resource developed from scratch. This setting should be contrasted with ERP systems, which are generic systems, bought off the shelf. However, the limitation paves the way for extensions and elaborations of the framework.

2.2. ERP Systems Critical Success Factors

The concept of CSF is well established and widely used in ERP systems research and information systems research (Somers and Nelson 2001), but is also criticized (Robey et al. 2002). Robey et al. (2002) criticize CSF research for being based on variance models, speculating on the antecedents that predict and explain ERP system success, and lacking theoretical ground, which explains why project and business outcomes occur.

Table 1, presents all CSFs included in the review. One of the first publications on ERP systems was Davenport (1996). He described six CSFs, including top management support, the use of one consulting firm, cross functional steering, cross functional implementation, rapid implementation, and the communication of the holistic nature of ERP system implementations.

Parr et al. (1999), on the other hand, identified 10 factors necessary for successful implementation. Three factors were found to be "of paramount importance" including management support, a balanced project team, and organizational commitment to change. The remainder of the CSFs included best people, empowered decision makers, deliverable dates, champions, vanilla ERP (not changes to the system), smaller scope, and the definition of scope and goal. In addition, Parr et al. (1999) grouped the CSFs into four categories of CSF, management (Management support, deliverable dates, empowered decision makers), people (best people, champions), software (vanilla ERP), and project factors (smaller scope, definition of scope). Parr et al.'s (1999) list was used in Parr and Shanks' (2000) study of the varying importance of CSFs. Nine of the ten CSFs proposed by Parr et al. (1999) were used – smaller scope was not included. The successful company perceived more CSFs as important over a longer period of time, compared to the less successful company.

Skok and Legge (2002) applied a stakeholder perspective and identified four stakeholders: management, consultants, developers, and users. They used CSFs from Bancroft, Seip and Sprengel (1998), see Table 1. Bancroft et al.'s (1998) list was one of the first and was also used in Parr et al.'s (1999) study. Skok and Legge (2002) contribute to understanding ERP system projects by claiming that some CSFs are related to ERP systems projects (cultural and business change, managing consultants, managing conflicts), whereas others are general to information system projects (user

involvement, user acceptance), and others apply to projects in general (planning and control, project champion, top management support, team working). The study of Skok and Legge (2002) is the only CSF research paper applying an interpretative research approach.

Holland et al. (1999) contribute to CSF research by identifying legacy systems as CSFs. The role and importance of legacy systems are related to problems with existing legacy systems, e.g. Y2K problems and problems with upgrades and functionality. Umble, Haft and Umble (2003) on the other hand propose post evaluation and end-user training programs as CSFs. Al-Mashari, Al-Mudimigh and Zairi (2003) also stress the role of post evaluation in achieving long-term success.

The most comprehensive list of CSFs is presented by Somers and Nelson (2001). They identified 22 CSFs. Their list is based on both a literature study and a survey of 86 organizations. They applied Cooper and Zmud's (1990) technological diffusion model in order to illustrate the varying importance of different CSFs. This model includes six stages: initiation, adoption, adaptation, acceptance, routinization, and infusion. Table 2 presents the five most important factors of each stage. Top management support and communication are the two most important factors across the phases.

Nah et al. (2001) analyze ten articles and presents a list of eleven CSFs. In their analyses, they apply Markus and Tanis' (2000) Enterprise Experience life cycle to show when a CSF is relevant. The first seven factors presented by Nah et al. (2001) in Table 1 are applicable throughout the resource and employment phases; according to Kalling's terminology, the following three are critical from internal distribution to usage. The monitoring and evaluation of performance is the additional CSF, compared to Parr et al.'s list, and was perceived to be important during usage.

Hong and Kim (2002) approached CSFs quite differently. They applied an organizational fit perspective to CSFs to explain failures in Enterprise System implementations. In their research, they put forward a research model which examines the relationship between the organizational fit (data fit, process fit, user fit) and Enterprise System implementation success (cost, time, performance, benefits) and the impact of contingencies (Enterprise Systems adaptation level, process adaptation level, organizational resistance). They tested the model using a factor analysis based on responses from 34 organizations. They found strong support for the organizational fit of Enterprise Systems and its positive affect on the outcome and the perceived implementation success. The contingency factor's impact did not provide a clear result.

Table 1 Critical Success factors in Enterprise Systems literature, presented in alphabetic order

Al-Mashari et al. (2003)*	**Davenport (1996)***	**Hong and Kim (2002)**	**Parr et al. (1999)**	**Somers and Nelson (2001)**
Enterprise System package selection	Top management support	Organizational fit of Enterprise System	Management support	Top management support
Management & leadership	Use of only one consulting firm	Enterprise System adaptation level	Balanced team	Project team competence
Visioning & planning	Cross functional steering	Process adaptation model	Commitment to change	Interdepartmental cooperation
Project management	Cross functional implementation	Organizational resistance	Best people	Clear goal and objectives
Training and education	Rapid implementation		Empowered decision makers	Project management
Communication	Inform people about the holistic nature		Deliverable dates	Interdepartmental communication
System integration			Champion	Management of expectations
System testing			Vanilla ERP*	Project champion
Legacy systems management			Smaller Scope	Vendor support
Process management			Definition of scope and goal	Careful package selection
Cultural & structural change				Data analysis & conversion
Performance evaluation & management				Dedicated resources
				Use of steering committee
				Business process reengineering
				Partnership with vendor
				User training on software
				Education on new processes
				Minimal customization
				Architecture choices
				Change management
				Use of vendors' tools
				Use of consultants
Bancroft et al, (1998)*	**Holland et al. (1999)***	**Nah et al. (2001)***	**Skok and Legge (2002)**	**Umble et al. (2003)***
Communication	Legacy Systems	ERP teamwork and composition	General projects	Strategic goals with the system
Top management support	Business Vision	Top management support	*Planning and Control*	Commitment of management
Understand the corporate culture	ERP Strategy	Business plan and vision	*Project Champion*	Project management
Organizational change prior to implementation	Top Management Support	Communication	*Top management commitment*	Managing change
Empowered project manager	Project Schedule/plans	Project management	*Teamworking*	The team
Balanced team	Client Consultations	Appropriate business and IT legacy systems	IS projects	Data accuracy
Project methodology	Personnel	Champion	*User involvement and acceptance*	Education and training
Training	Business Process Change	Minimum BPR and customization	*Hybrid skills*	Focused performance measures
Expect problems	Software configuration	Software development, testing	ERP projects	Selection of system
	Client acceptance	Change management program and culture	*Cultural and Business Change*	Post implementation audit
	Monitoring and feedback	Monitoring and evaluation of performance	*Managing Consultants*	
	Communication		*Managing Conflicts*	
	Troubleshooting		*Staff retention*	

* These papers do not provide any ranking of the CSFs.

Table 2 Ranking order of CSFs in relation to the phases of Enterprise Systems (based on Somers and Nelson 2001).

Phase	CSF
Initiation	Architecture choices; Clear goal and objectives; Partnership with vendor; Top management support; Careful package selection
Adoption	Top management support; Project team importance; Use of steering committee; Partnership with vendor; Dedicated resources
Adaptation	Interdepartmental communication; Interdepartmental cooperation; Project team competence; Dedicated resources; Use of vendors' tools
Acceptance	Interdepartmental communication; Interdepartmental cooperation; Top management support; Project team competence; Education on new processes
Routinization	Interdepartmental communication; Top management support; Interdepartmental cooperation; Vendor support; User training on software
Infusion	Interdepartmental communication; Interdepartmental cooperation; Top management support; Vendor support; Partnership with vendor

2.3. Observations and Synthesis of CSF review

Despite deviations in CSFs, they show clear similarities. For instance, management support, balanced team, and communication are identified as CSFs. These factors are also to be found in the ITRM framework – using a slightly different terminology. All in all, 109 CSFs have been found, 95 of which with unique labels; see Appendix 1 where the entire list is presented in alphabetic order with references.

A number of observations can be made from the review: There are CSFs covering the entire process from selection to usage, with a strong predominance of factors related to project management and implementation (Parr et al. 1999). This can be explained by the maturity of research and the maturity of utilization. Another explanation is that researchers tend to put less focus on the use and utilization of information systems. Kalling (1999) provides support for such an explanation by claiming that there are few theoretical contributions related to usage. Parr et al. (1999) and Somers and Nelson (2001) suggest that some factors are more important than others, see Table 1 for the ranking order of some CSFs. For instance, according to Parr et al.'s (1999) study, technical factors are more important during the early phases, whereas project factors are more important during configuration and implementation, and organizational factors are equally important throughout the life cycle.

Several of the 95 factors refer to the same aspect, but using different terms. For instance, management support is also referred to as top management support (Somers and Nelson 2001), management & leadership (Al-Mashari et al. 2003), commitment of management (Umble et al. 2003) top management commitment (Skok and Legge 2002), and top management involvement (Kalling 1999). The four groups presented by Parr et al. (1999) can be used. However, the management and people groups are confusing and difficult to distinguish. The ITRM framework (Kalling 1999; 2003) can be used, but due to the management perspective in the ITRM framework, Wixom and Watson (2001), three implementation categories are chosen. Wixom and

Watson's (2001) study of data warehousing success included three factor categories, including organizational, project and technical. The organizational category includes the issues and problems addressed by the ITRM framework. Support for organizational, project and technical factors is also found in Skok and Legge (2002). In Table 3, the 95 factors were synthesized into 28 factors and grouped according to Wixom and Watson's (2001) categories.

Table 3 Organizational, Project and Technical CSFs

Organizational factors	
1. Business plan and vision including clear goals and objectives, definition of scope and overall planning and control	Somers and Nelson (2001), Al-Mashari et al. (2003) Parr, Shanks et al. (1999; 2000), Holland et al. (1999), Nah et al. (2001), Skok and Legge (2002)
2. Top management support including commitment and leadership of management	Somers and Nelson (2001), Al-Mashari et al. (2003), Bancroft et al. (1998), Parr, Shanks et al. (1999), Holland et al. (1999), Nah et al. (2001), Umble et al. (2003), Davenport (1996), Skok and Legge (2002)
3. Communication internally to inform people and manage expectations	Davenport (1996), Holland and Light (1999), Nah et al. (2001), Al-Mashari et al. (2003), Bancroft et al. (1998), Somers and Nelson (2001)
4. Selection of system to ensure organizational fit	Al-Mashari et al. (2003), Hong and Kim (2002), Umble et al. (2003), Somers and Nelson (2001)
5. Training on software and new processes	Somers and Nelson (2001), Al-Mashari et al. (2003), Bancroft et al. 1998) and Umble et al. (2003)
6. Organizational and cultural change including business process reengineering, cultural and structural change during the entire life cycle	Holland and Light (1999), Al-Mashari et al. (2003), Bancroft et al. (1998), Parr et al. (1999) and Somers and Nelson (2001)
7. Change management involving commitment to change, degree of process adaptation	Hong and Kim (2002), Al-Mashari et al. (2003), Skok and Legge (2002), Nah et al. (2001), Somers and Nelson (2001), Umble et al. (2003)
8. User acceptance	Holland et al. (1999), Skok and Legge (2002)
9. Expect problems	Bancroft et al. (1998), Skok and Legge (2002)
10. Staff retention	Skok and Legge (2002)
11. Evaluation of performance changes and provide feedback	Al-Mashari et al. (2003), Nah et al. (2001), Umble et al. (2003), Holland et al. (1999)
Project factors	
12. ERP Strategy including clear implementation plan with goals	Holland and Light (1999), Umble et al. (2003)
13. Project management must include empowered project manager and decision makers	Al-Mashari et al. (2003), Nah et al. (2001), Parr et al. (1999), Umble et al. (2003), Bancroft et al. (1998), Somers and Nelson (2001)
14. Project team competence involving a balanced team with hybrid competence based on the best and most dedicated people	Somers and Nelson (2001), Bancroft et al. (1998), Parr et al. (1999), Nah et al. (2001), Umble et al. (2003), Al-Mashari et al. (2003), Skok and Legge (2002), Holland et al. (1999)
15. Minimum BPR and customization	Somers and Nelson (2001), Holland et al. (1999), Nah et al. (2001)
16. Cross functional steering, and interdepartmental cooperation	Davenport (1996), Somers and Nelson (2001)
17. Champion	Nah et al. (2001), Skok and Legge (2002), Parr and Shanks (2000), Somers and Nelson (2001)
18. Managing consultants	Skok and Legge (2002)
19. Vendor relationship and consultants from one firm	Davenport (1996) and Somers and Nelson (2001)
20. Project plans with deliverable date	Somers and Nelson (2001), Al-Mashari et al. (2003), Holland et al. (1999), Nah et al. (2001), Umble et al. (2003), Parr et al. (1999)
21. User involvement	Holland et al. (1999), Skok and Legge (2002)
22. Cross functional implementation	Davenport (1996), Al-Mashari et al. (2003)
23. Rapid implementation	Davenport (1996)
24. Smaller scope	Parr et al. (1999)
Technical factors	
25. Vanilla ERP and fit between Enterprise System and organization	Parr, Shanks et al. (1999), Hong and Kim (2002)
26. Appropriate business and IT legacy systems with correct data and the right architectural choice	Somers and Nelson (2001), Umble et al. (2003), Al-Mashari et al. (2003), Holland et al. (1999), Nah et al. (2001)
27. Software configuration and system integration with completed testing	Al-Mashari et al. (2003), Holland et al. (1999), Nah et al. (2001)
28. Project methodology and vendor tools	Bancroft et al. (1998), Somers and Nelson (2001)

Table 3 contains 11 organizational factors, including the role of management and in particular how management manages the overall process of implementing Enterprise Systems. The importance of management has been stressed and studied. For instance, Wixom and Watson found a strong correlation between management support and data warehousing success. Management support can overcome organizational resistance and encourage people to participate. In addition, management allocates resources to the project, e.g. financial and human.

Information system projects are often complex and include a number of tasks and roles to be performed. In the case of Enterprise Systems, the role of the project manager is crucial since he or she organizes a project which, in some cases, lasts for several years and involves internal and external stakeholders. This is affected by the size and complexity of the project including vanilla ERP and minimal reengineering effort. Promoting factors are champion and cross functional steering. The time span of the implementation and clear goals for completion also affect the project. Thirteen factors out of the 28 are identified as project factors (see Table 3).

The third category is technical factors, e.g. data analysis and conversion, architecture choices, system integration, testing, legacy systems management, and project methodology. There are only four technical factors. The role of tools such as project methodology and configuration tools, e.g. IMG (Implementation Guide is the configuration tool of R/3), is important in the completion of the project. The degree of fit between system and organization affects the implementation by making it simpler. The quality and documentation of old information systems, so-called legacy systems, also affect the implementation success.

2.4. ERP Systems Management Framework

The concluding part of this section is the integration of the ITRM framework and the CSF research leading to a proposal for an ERP system Management framework (ERPM). The main difference between the ITRM framework and the proposed ERPM framework concerns the resource. ERP systems are generic resources that can be purchased from external providers, whereas the resource studied during development of the ITRM framework is a unique resource.

The selection of ERP systems and the development of a unique IT resource illustrate the issue of ‘buying versus building’ (Davis 1988). Buying information systems is basically a question of choosing between solutions. This leads to a change of terminology and the replacement of the term ‘identification’ with ‘selection’ (see Figure 2). The selection of ERP systems involves other types of ambiguity and uncertainty than the identification of a resource need, since ERP systems include most functionality and are pre-developed, leading to ambiguity as to what system to select (Umble et al. 2003) and an uncertainty regarding the fit of the system (Skok and Legge 2002).

The ‘protection’ task in the ITRM framework involved three main issues: trade, imitation and time. Trade and imitation are not found in the review of CSFs. Time, on the other hand, is addressed in CSFs in terms of ‘rapid implementations’ (Davenport 1996). The interpretation of time in CSFs is related to the success of the implementation project, whereas time in the ITRM

framework refers to protecting the unique value of the resource. This leads to the exclusion of the 'protection' task and the inclusion of time issues in the 'development' and 'internal distribution' tasks. The management protection tasks are incorporated into usage tasks, since these tasks are mostly related to usage, e.g. continuous development, cf. Figure 1.

The next enhancement of the ITRM framework relates to classification of the CSFs, according to Wixom and Watson's (2001) three categories. Classification includes three groups (organizational, project and technical factors). Given this, the ERPM framework's phases are enhanced. Besides the organization factor, including the management perspective, the resource phase is enhanced with project and technical factors and the employment phase is enhanced with project factors. In Figure 2, the three factor groups are illustrated using 'O', 'P' and 'T'.

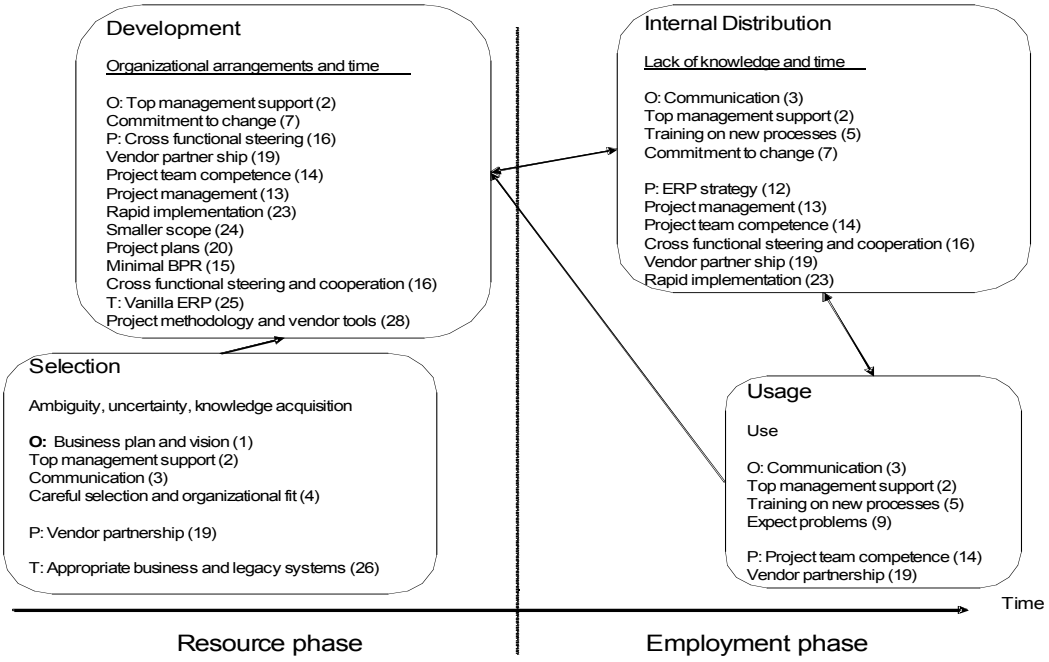

Figure 2 Initial ERP system management framework.

The 'development' task is mainly viewed as a learning process in the ITRM framework. This is not stressed in CSF research. One possible interpretation is that the selection of pre-made systems is knowledge acquisition from an external party leading the issue of knowledge acquisition during the selection task. Instead of learning, project management is stressed as important, e.g. project management, empowered project managers, champion, minimal customization, communication etc. The project factors are mostly related to the issue of the organizational arrangements of the ITRM framework.

The task of 'internal distribution' or implementation seems to be most similar between the ITRM and CSFs and is characterized by issues such as a lack of knowledge and motivation. The motivation aspect is not addressed in CSF research. The lack of knowledge, on the other hand, is expressed as dependency on consultants.

Somers and Nelson (2001) have stressed usage by outlining interdepartmental communication and cooperation, management support, vendor support, user training on software, and partnerships with vendors as related factors. The issues stressed in the ITRM framework, such as unique use, moving from technology to business, and cultural and cognitive obstacles, are not stressed in the CSF literature, apart from by Skok and Legge (2001).

The final enhancement of the ITRM framework is the mapping of some CSFs. Parr et al. (1999) and Somers and Nelson's (2001) proposals regarding the varying importance of CSFs throughout the ERP systems life cycle are used to depict the CSFs on the framework. Several CSFs from Table 3 have thus not been included in the ERPM framework, e.g. factors 6, 8, 10, 11, 17, 18, 21, 22, and 27, due to not being ranked or related to a life cycle.

The literature review, including the ITRM framework and CSFs research, has led to the proposal of an ERPM framework. The next section addresses the methodological issues related empirically enhance and further develop the ERPM framework.

3. METHODLOGY

One of the objectives researched is to increase understanding of the factors affecting the utilization of ERP systems and in particular how firms can improve utilization. This has also involved the investigation of 'current use' and 'as is improvement efforts', and 'ought to improvements'. The main focus is on ought to improvements and the relationship between phases, tasks and CSFs, where 'current use' and 'as is improvements' function as contextual backgrounds to 'ought to improvements'. In order to pursue the objectives of the research, a survey of ERP system expert consultants was selected. The survey strategy is justified by the broad experience of implementing ERP systems in different organizational settings and with different scopes. An alternative research strategy could have involved case or multiple case studies. However, in favor of the chosen strategy is the fact that ERP system consultants have a broad experience of several ERP systems and implementation contexts. ERP system consultants have been employed in research into ERP system CSFs (see for instance Somer and Nelson 1999). In addition, they represent an important stakeholder group which is seldom surveyed (Skok and Legge 2002).

The research question centered upon factors affecting the utilization of ERP systems elicited from the literature review and factors proposed during the investigation. Seven expert consultants were interviewed in order to understand how ERP systems are utilized and how organizations can improve their use of ERP systems. The respondents had, on average, 8 years' experience of ERP systems, varying from 16 to 5 years' experience, and had been involved in 75 implementation projects. Most of the respondents had held different positions, e.g. consultant, project manger, account manger, and sales manager. One of the respondents had no experience as a consultant, but was included since he had been an account manager in an industry that had large ongoing ERP system implementation and improvement programs. The experts have mainly been working in Scandinavia, but several of them have been involved in large global projects. The experts have experience from a wide range of implementation projects involving vanilla

implementation strategies, rolling implementations, and massive customizations in multi-national corporations, subsidiaries and small and medium sized firms.

The interviews were conducted in person and by telephone, during May to August 2003, and a semi-structured interview method was used. Follow-up calls were made on several occasions. Prior to each interview, an interview guide was sent to each respondent. The interviews were mostly held in public places and hand-written notes were taken. The interviews were summarized and the respondents all had the opportunity to comment, change, clarify or rephrase themselves. The interviews lasted between 1½ and 2½ hours. In addition, several of the respondents provided internal material related to the issues concerned. Altogether, 200 pages of written material have been included.

Initially, questions addressing current use were posed, i.e. how consultants perceive the organizational usage of ERP systems. These questions were posed in order to verify an initial assumption that organizations are not using their IT resources optimally. The consultants were asked to elaborate on their perception of current use. For instance, questions included why the system is not used more extensively and whether there are any differences among organizations relating to size, industry, culture, management style, perception of IT etc. This was followed by questions focusing on events leading to improvement programs, e.g. what triggers improvement programs, what are the obstacles, when do improvement programs occur, how are such programs initiated and about the role of internal and external stakeholders. The last section of the questions addressed how organizations should manage ERP systems during usage with the specific goal of improving use. This was followed by questions focusing on obstacles and promoting factors relating to improvement efforts, e.g. who can and should trigger the process, the role of management and culture etc.

To analyze the data, it was summarized and entered into a matrix for the purposes of data analysis. The matrix is shown in Table 4, with examples. For each interview, the author summarized the recorded data on the perception of 'current use' (such as cognitive and diffusion aspects) and factors affecting 'current use' (such as tasks and issues), 'as is improvements' (such as events and processes) and 'ought to improvements' (such as events, processes, organizations). Each interview was analyzed and then combined into one matrix. The final matrix was used to identify similarities and differences between the interviews.

Table 4 Matrix for data analysis

Evidence	Data captured	Examples
Current use	Cognitive	'As a typewriter.'
	Diffusion	'Only 10% of the potential users.'
Factors affecting use	Tasks	'The degree of customization.'
	Issues	'Lack of theoretical concepts.'
As is improvements	Events	'New employees.'
	Process	'Ad hoc.'

Evidence	Data captured	Examples
Ought to improvements	Events	'Continuously attempt to improve the business.'
	Process	'Work systematically.'
	Organizations*	'Create a forum which organizes and manages all business-related IT.'

* This type of data was added after the first interview.

4. RESULTS

The rows of the data analysis matrix were used to find contrasts and similarities based on their use, factors affecting use, as is improvements, and ought to improvements.

4.1. Current Use

The expert consultants perceived ERP system use as poor, both in relation to cognitive and diffusion terms. Several consultants expressed the opinion that only 10% of potential users use the system – i.e. poor utilization. The extent or scope of the system used was also perceived as limited, including the degree of the package and the degree of internal distribution. For instance, most firms do not use the human resource management and quality management functionality of the system. One of the consultants provided a comparative example of the degree of diffusion from two projects he had been involved in.

Two market-leading firms in an industry have implemented the same ERP system. One of the firms (A) uses the accounting functionality whereas the other firm (B) uses the entire package. The strategy of firm B is to use every piece of the package, whereas firm A does not have an explicit strategy related to the usage of the system in the future.

The implication for the organization, such as A, is no critical mass of users. The cognitive aspect of use was also perceived as limited. In general, there are minor differences between hierarchical levels. Poor use was exemplified by one of the experts as:

Firms use R/3 as a typewriter for procurement orders. It's a good typewriter, but expensive.

4.2. Factors affecting use

In order to understand why organizations utilize ERP systems in a limited way, several questions were posed aimed at understanding current use. The experts provided a number of factors including organizational, project and technical factors. The organizational factors affecting use span across 'development', 'internal distribution' and 'usage' tasks. The main factors leading to limited utilization are a lack of understanding of the technology and an underestimation of the organizational implications of implementing ERP systems – i.e. the interdependency between technology and business, cf. for instance factor 9 in Table 3 (Skok and Legge 2003). Several examples were provided to illustrate the lack of understanding, e.g. managers do not understand the impact of integrated systems, process orientation (most firms are still function-oriented – at

least in their minds and their function). A lack of theoretical concepts, such as accounting and logistics models, and a poor understanding of IT were provided as the main explaining factor for the lack of understanding of the technology and the technology's interdependent nature. One of the consultants expressed it as:

> *Managers know the terms (process orientation and integration), but do not understand the implication of process orientation or integration for their business – i.e. the consequences.*

The lack of understanding of ERP systems and IT in general is often related to the perception of IT's role. For instance, firms using the entire packages manage IT proactively; signaling commitment, top management support, the importance of the system etc. Other firms applying a reactive view of IT view the implementation of a system as the end per se, leading to poor utilization. Consequently, managers that do not understand technology and its implications cannot communicate the role of IT to the rest of the organization, leading to a lower level of utilization by others. In addition, systems are often purchased on the basis of a top management decision, i.e. R/3 is our strategic solution, and the vision, if there is one, is not communicated throughout the business. The following issues are not communicated, enough: Why was the system selected, what problems is it intended to solve, what are the implications of the implementation, why must work practices change, why does the business have to adapt to the system and not vice versa? Thus, no one knows why they have a certain IT solution and people and businesses are forced to work and function in accordance with the systems. The communication shortcomings create antipathy toward the system.

A problem related to the lack of understanding is that users become afraid of the system and do not try to experiment with it, inhibiting improved use and learning. Consequently, firms are looking for alternative solutions to new problems, instead of finding out whether existing technology can solve these problems. Another tendency, explaining the poor utilization of ERP systems, is that firms seek the optimal solution for each problem leading to sub optimization.

Project factors also affect utilization, and in particular the implementation strategy and project management. Implementation starts out with good ambitions, but the implementation project tends to become an IT project focusing on the technical issues. Thus, people and business issues are forgotten (change management). Top down and bottom up implementation strategies work, but they require different skills and competencies.

The top down approach often involves large numbers of external consultants. This is the best approach for consulting firms, since they can act as filters within the organization and control information flows. For instance, consultants decide which information will be presented to top management, leading to issues of lower relevance being addressed by top management, which could have been addressed by low level management. Issues that top management addresses become "important once" and quickly lead to crises. For instance, how to label invoices and orders. In addition, this approach probably leads to long implementations. Another disadvantage of top down implementation approaches relying on external consultants is that they do not know the business - business knowledge resides with the people working in the business.

The bottom up approach, on the other hand, requires an empowered project manager with the executive power to make difficult decisions, which the line must follow. An internally empowered project manager can deal with many issues, leading to quicker implementation – every decision does not have to be endorsed by top management. Another benefit of the bottom up approach is the internal acceptance and organizational endorsement of decisions. None of the implementation strategies leads to immediate success, i.e. in the short or long run. Each implementation is unique.

One technical factor was mentioned as affecting utilization.

> *One problem with ASAP (ASAP is the proprietary development and implementation method for R/3, author's note) is that it kills visions, the 2,500 Q&A questions limit the scope of the system, people's minds become shadowed by the possibilities of the system. But the implementation project will be a success – measured in terms of time and budget.*

The implementation methods used do not support human issues, since a method is only a guideline for how to do things. Hence, there is a need for skills that exceed the methods and the technical aspects of implementing the system.

The experts perceive current use to be poor, both in cognitive and diffusion terms. But, they are optimistic regarding utilization in the future. The experts have observed improvements over the years, which were explained by increased experience and maturity of integrated systems, e.g. some organizations are in their second generation of integrated system. Increased experience is closely related to maturity of utilization, which is dependent on the time of use.

4.3. As is improvements

The next issue addressed during the interviews was how firms attempt to improve use. The largest potential for improvements lies in procurement. This part of ERP systems was perceived not to be optimized, due to a lack of management involvement and a lack of focus on procurement issues. In addition, people working with procurement are often good at their jobs but lack theoretical constructs or models. The lack of such models can lead to poor requirements, since the consultants cannot specify or realize the requirements when configuring the system. There are also potentials for improvements in inventory and production.

One consultant outlined two categories of firms, cf. firm A and B above. The first one is proactive and attempts to improve its business through the system. These firms use BPR and AS-IS analysis to understand the current business and to guide improvements efforts. They work in a systematic way with pre-studies to identify problem areas and they prioritize what areas to improve. This type of firm views IT as a support tool for its business. The other types of firms are reactive, mostly applying a technical interpretation of IT and viewing it as an end in itself. Their improvement efforts are mainly oriented toward improving the IT. These firms have more frequently applied a vanilla implementation strategy - with as little adaptation of the systems as

possible. The degree of adaptation of the business and system is a sign of the organizational view of change and thus a sign of a certain culture. The point being stressed was that firms that make initial changes to their systems, during development, will also continue to make changes to their systems, or organizations, in the future.

In most cases, improvement programs are initiated because of some change in the organization, e.g. new employees or reorganization. New employees tend to be more questioning and open than people with a long working experience in the same position. However, in general, improvement programs are not triggered by a formalized process, but are based on a gut feeling and new people – i.e. they are an ad hoc process. When embarking upon an improvement program or the upgrading of a system, business cases are prerequisites both for consultancies and organizations.

Without business cases, there is no business.

Corporate culture is important and particularly if it is characterized by questioning and openness. However, the experts expressed concern regarding firms in general, that firms are short-sighted; i.e. they do not risk their day-to-day business since they are focused on their quartile reports. One consequence is the postponement of improvements programs, since these cost money. The quartile focus leads to organizations requiring a return on investment on everything, leading to no one assuming responsibility for the whole and resulting in small uncoordinated improvements efforts.

The way a firm attempts to improve its current use differs from firm to firm. The main characteristics differentiating firms attempting to improve from those not systematically improving their use lie in the perception of ERP systems, which is culturally rooted and top management involvement and use.

4.4. Ought to improvements

Another issue is how firms should manage ERP systems, with the specific goal of improving utilization. Ought to improvements address several aspects and issues addressed in the previous sections and some new aspects are introduced. The following issues constitute a summary of the suggestions made by the consultants; each of them are explored, including top management support – management use, communication of visions and ideas concerning the technology, training, let people have fun, and evaluate IT use and performance changes. The section will be structured in accordance with organizational, project and technical factors.

Most of the mentioned factors related to improvement efforts are organizational. Besides training during internal distribution, the most crucial factor is continuous training. Training should be focused on the business and how the system supports the business – not the system as such. Training courses should be small and specific, addressing one topic. Courses have to be evaluated and followed up. Courses can also involve theoretical concepts, e.g. accounting and inventory management principles. Training should be organized in networks of users – on the same hierarchical level to ensure an open discussion. A positive factor is whether there are users

from different departments with varied problems and issues. The networks can be internal and external as well as formal and informal. Independent user groups are important external networks. Besides the actual hands-on training provided, training has other important roles, for instance showing organizational commitment and communicating the long-term strategy and vision of the system. An important part of training is fun - let people have fun. Fun in this context is related to experimental training in sandbox systems using real data to play around with. This enables people to test new ways of working with and using the system. The trainer should be a person with experience of the business and preferably of the old systems as well; for instance an efficient educator can ask the user; Do you remember the old system - this was labeled xxx and now it is yyy.

Management use was perceived as a very positive factor. The two main impacts of management use were an increased management reputation and an important manifestation of management commitment. One example

A new manager at a large production site within an MNC, became the super user of R/3 and used this knowledge to get a reputation and acknowledgement from the business, due to his knowledge he could overcome his uncertainty and lack of knowledge about the business.

Time is another important factor – it takes time to understand the system, it takes time for the system and the business to initially stabilize, training takes time etc. The time issue was illustrated as:

It takes 3-5 years to forget the old system.

Evaluation is stressed as being important. The role of evaluation is to track improvements and to communicate these. This should not only be related to the system, but to changes in the business. For instance, a training course in sales should be measured against sales measurements, e.g. customer satisfaction. The Business Engineer (a tool of R/3) can be used to analyze transactions and to enhance improvement efforts. Based on this tool, it is possible to track how the system is used.

Project factors are related to the complexity of developing, distributing, and using the system. One way to decrease the complexity is to manage one project at a time, e.g. do not include shared service centers at the same time - people get confused. Hire only one type of consultant (e.g. IT consultants as opposed to organizational consultants) at a time, since different consultants have varying agendas. Controlling the consultants is important – do not sit on their laps. Consequently, it will be necessary to have internal consultants – in-house competence is crucial.

System and IT knowledge represent important skills in the project manager and system owner. In addition, the skills of the project manager affect the impact of the implementation. For instance, if the project manager follows all the rules of the implementation methods, this can lead to catastrophes. However, a skillful project manger can pick and choose his or her methods,

adapting them to new circumstances and applying them as useful support tools. The system owner takes over during usage and is crucial since this person functions as a window between business and IT by transforming business requirements into IT specifications.

The overall organization of IT activities is important when structuring improvement programs. IT activities should be organized at corporate level and responsible for all business IT, including ERP systems, CRM systems, and SCM systems Separate the forum from the corporate board and use people in the business, IT department, the board, external expertise, and let suppliers present their cases. The objective and role of the forum is to amass knowledge and learn IT. Be the part that synthesizes requirements, negotiates with external parties, environment, the long term focus and short term, as well. The forum must be open-minded – to learn from others – instead of knowing what is best themselves. In addition, a new corporate function should be created for managing master data.

> *One of the benefits of R/3 is the ability to use the same set of master data (business partners, products etc.) across the enterprise. The benefits may be obvious to most firms, but the organizational consequences - the need to establish sufficiently empowered central functions for master data maintenance - are frequently neglected. The necessary organizational changes may go against short-term cost-cutting objectives (cut down on corporate staff functions), or may be 'politically' sensitive.*

Besides managing IT applications, the organization of IT activities should be responsible for master data as well.

One important factor for achieving improved use is the initial configuration.

> *R/3 can be configured and run in a number of different languages, but there is a very strong case for doing it in English only if the firm is likely to ever implement the system in foreign affiliates, or to use non-Swedish consultants: The English (and German) versions are released before all others, and they are the only complete language-versions. The effort of maintaining consistent descriptions of configuration parameters, master data, report texts etc. in several languages in parallel is often far greater than expected.*

To summarize, the long-term business value stems from the comprehensive utilization of the ERP system supporting the main processes. Critical mass is important, leading to commitment and extended use. Nevertheless, improvement efforts are often easier than the initial implementation. As one consultant expressed this;

> *You enjoy the scenery much better on the second trip.*

5. INTEGRATION AND DISCUSION

This section integrates and discusses the empirical findings and proposes enhancements to the ERPM framework. To structure the section, it will be divided up into the resource phase and the employment phase.

5.1. Resource phase

The resource phase, including the selection and development tasks, is to some extent elaborated upon. The selection task has not been further enhanced. None of the experts has mentioned any aspects related to the selection process or the selection of a specific system. One possible explanation for this is that the experts are specialized in one ERP system. The only implicit exception is that the whole life cycle has to be well managed, including a clear vision of the system motivating the selection. This is consistent with the initial ITRM framework and Davenport's (1996) suggestions for managing ERP systems using a holistic approach. Another possible explanation is that there are so few competing ERP systems (Robey et al. (2002) defines four major ERP systems, including SAP, Oracle, Baan and PeopleSoft), leading to little ambiguity concerning the choice of system. However, selecting an ERP system is not only about choosing a system; it is also about selecting a consultation partner. The importance of selecting right consulting partner is stressed in Bhattacherjee's (2000) case study at Geneva Pharmaceuticals and is stressed by Skok and Legge (2002). This might be the main source of ambiguity and uncertainty in this type of project and is of critical importance. The changes into the ERPM framework are shown in Figure 3. In the identification task, the factor appropriate business and legacy system is deleted since no technical aspects or issues have been stressed in the empirical part of the study.

The development tasks can only commence if a system has been selected, providing the link between the tasks. The main issue is organizing the project, which involves creating a balanced team and selecting the project management and the competence and skills of the project leader and project team is emphasized. In addition it is crucial to communicate the role of the system, so that the project does not turn into a technical project that loses sight of the business objectives. Consistent with prior research into ERP systems, the use of vendor tools, minimal BPR, the vanilla implementation strategy constitute CSFs for a successful implementation, e.g. Davenport (1996), Somers and Nelson (2001) and Skok and Legge (2001). However, these factors might only be applicable to the success of development and internal distribution – not usage and utilization. Several of the experts stressed the potentially negative influence of the vanilla implementation strategy, minimal BPR, and the stringent use of vendor implementation methods on utilization. This leads to factors having a negative impact on utilization.

Implementation strategies involving organizational change and changes into the systems suggested as factors promoting improved long-term utilization. This is explained by organizations that dare to take risks during development and which will also take risks during usage. The role of management is also revised based on the empirical findings. Instead of top management involvement, it should be support and commitment. Too much involvement by top management is negative for the success of the implementation project. Vendor partnership, in Figure 2, has not been stressed as a factor, rather as an issue and is thus incorporated as an issue. The time issue based on the ITRM framework and the CSF literature review has not been found

during the empirical investigation, thus leading to the exclusion of this issue, i.e. it is not important as regards improving utilization. Parr et al. (2000) describes different implementation strategies and also speculates on different strategies CSFs.

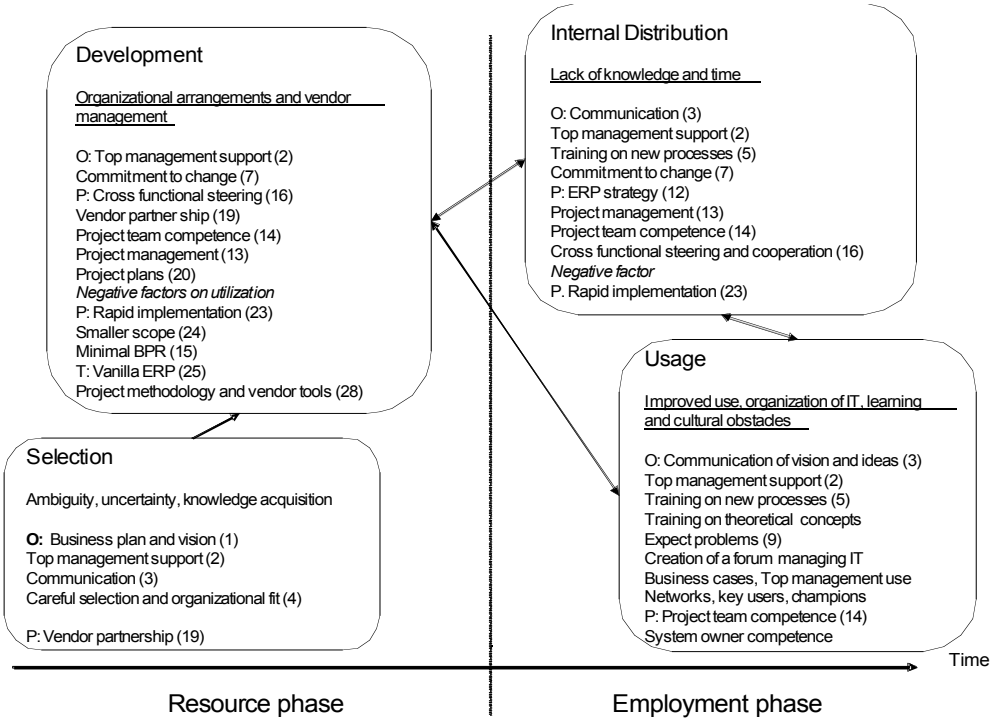

Figure 3 The enhanced ERPM framework.

5.2. Employment phase

The employment phase, including internal distribution and usage, is enhanced on the basis of the findings. The interrelationship between development and internal distribution tasks remains and thus the view of development and implementation is as an iterative process with feedback loops. The main enhancement of the internal distribution task is the exclusion of the vendor partnership which has not been stressed. Rapid implementation is changes to a potential negative factor. Davenport (1998, p. 126) expressed the problem with rapid implementations as "A speedy implementation of an enterprise system may be a wise business move, but a rash implementation is not". The remaining factors and issues are retained, e.g. communication, top management involvement, training on new process and commitment to change.

Usage tasks are supplemented with several aspects. The causality between usage and development is still the same as in Figure 2. An improvement in the system leads to development and internal distribution. This involves several related issues, e.g. learning and managing cultural obstacles, and tasks. The overall CSF for improved use is well-organized and structured activities, i.e. the organization of IT activities. This was stressed as creating a forum for managing IT resources such as ERP systems, CRM systems, and SCM systems. The role of the forum is to organize and fund the management of IT and its continuous improvement.

Communication of IT's role is important. In addition, the requirements specification, the alignment to business and the termination, and selection of IT resources can be managed by the forum. The forum consists of internal and external people with different backgrounds and competencies, e.g. top management, project leaders, system owners, vendors, users etc, to ensure a broad spectrum of competencies. Essential is the involvement of top management – not only with support and commitment, which the participation and creation of the forum signals. In Figure 3, these issues and CSFs have been incorporated. Similar conclusions are provided by Agarwal and Sambamurthy (2002) article on the role of the IT function.

The culture of the organization is a prerequisite for creating this type of forum, since it will lead to the centralization of all IT activities and could thus encounter resistance from business. For instance, the costs of the forum can be allocated to the different business units and thus affect their profit, which the business unit can oppose. Thus, it is a culture that has to be open to opinions and ideas, participation in different networks being an example of this. Previously has Cooper (1994) discussed the role organizational culture an important factor in the implementation of information technology and suggested that more successful organizations are more open than those failing.

The next issue that has to be managed is learning. In the ITRM framework learning was the main issue during development. In relation to ERP systems it seams to be during usage. In the ITRM framework, learning was perceived as radical learning. However, the findings support the role of experimental learning instead. Robey et al. (2002) comparative study of dialectic learning processes in 13 firms supports both radical and experimental learning. Sandboxes, such as the IDES client, can be used to give people a platform to test new things on. Learning processes are supported by informal and formal training, within the organization and through networks. Consultants have the role of external agents on training courses by bringing experience from other organizations, but they also act as the distributors of internal knowledge. It is important that theoretical concepts, e.g. accounting systems, are integrated into courses. Networks, such as the forum, have important roles in improved utilization. Key users can take on the role of internal teacher and inform others about how to use the system. Management's use of ERP systems is crucial, leading to increased utilization. If managers use ERP systems, their subordinates will have to use these systems, since people on lower hierarchical levels feed the system with data that is used by managers. Obstacles to efficient use have to be managed, for instance the vision of use and the interdependence between IT and business are crucial to communicate.

5.3. Summary

The aim of this paper is to improve our understanding of how ERP systems can be used 'better', referring to cognitive and diffusion aspects. Better, can only be judged by the specific context. The explanatory power of the ERPM framework stems from the theoretical foundation of the ITRM framework (Kalling 1999). The ITRM framework has been used to guide the investigation, both the empirical and the synthesis of the CSF literature. An initial framework was proposed and is presented in Figure 2. This was further enhanced by the empirical findings, leading to the proposed ERPM framework. The ERPM framework bears a strong resemblance to the ITRM framework, but is differentiated by the type of resource, i.e. specific or generic. Thus,

the main difference lies in the selection and development tasks. The ITRM framework addresses the built option and the subsequent scratch development whereas the ERPM framework addresses IT resources that are acquired from external providers. Another difference in the ERPM framework is the exclusion of protection tasks, which are not perceived as important to ERP systems, probably due to their being generic systems. However, continuous improved use is as critical to the ERPM framework as it is to the ITRM framework. The goal of improved use has different objectives in these two cases. In relation to ERP systems, improved use is aimed at increasing the long-term business value of the system. In the other case, improved or unique use is aimed at creating sustainable competitive advantages. Another difference between the frameworks is that some issues, in particular learning, seem to be more important during other tasks than in the ITRM framework.

Another contribution made by the study is the theorizing of CSF research, which has not previously been theorized (cf. Robey et al. 2002), with a few exceptions. The theoretical and practical usefulness of the ERPM framework includes some issues that are of general interest. The framework presents an overall life cycle from the selection to the usage of ERP systems, which can be used to frame future research into ERP systems. The focus on usage tasks during the employment phase is a central contribution made by the paper. This is an area which has been relatively unexplored. In relation to the ITRM framework, the ERPM framework provides other, complimentary and new issues and tasks, which can enhance our understanding of the management of ERP systems.

5.4. Limitations

The limitations of the research primarily concern two aspects. The first is the number of expert consultants participating while the second is related to the national context of the study. More expert consultants would increase the validly of the claims made. The experts interviewed thus far have a broad experience of ERP system implementations, but an increased number of experts, and in particular those with experience of other ERP systems, would enhance the study. The context of the study – one Scandinavian country – also limits the validity. In particular, one factor is related to this, namely configuration in English or German. This factor is probably important to all non-English and German speaking countries, i.e. most of the world. Other limitations to the study are the initial ITRM framework and the selection made in the literature review.

6. CONCLUSION AND FURTURE RESEARCH

The paper has reported on the results of a research program aiming to understand and improve the utilization of information systems, and ERP systems in particular. The result and contribution of the paper are threefold: This first is the focus on the usage phase, which has been under-researched (Gattiker and Goodhue 2002; Kalling 2003). Several interrelated factors have been identified, e.g. training, top management use/commitment/involvement, culture, communication, time and evaluation, administration models, the competence of project and system managers, and configuration in one language. The second contribution is the development and enhancement of the ERPM framework, including the selection, development, internal distribution and usage tasks

and the causalities between the tasks, issues and CSFs. The third contribution is the theorizing of CSFs through the ITRM framework.

The conclusions reached are similar to findings from research into IT done in the past. However, future research should investigate additional factors and causalities between tasks and issues. Three approaches seem appropriate for such research. The first is to complement the conducted study with more expert interviews. Future respondents could have international experience as well as experience of other systems. The causalities and importance of the CSFs could be tested through a LISREL analysis, thus requiring the operationalization of the ERPM framework. The third approach can be in-depth case studies, which can be used to enhance the framework. In particular, comparative case studies of different perceptions of IT.

Thus, the value of Enterprise Systems, or any other artifacts or resources, to organizations lies in their long-term use, leading to improved activities, offerings, and a better market position (Kalling, 2003), or to improvements in organizational effectiveness (Hedman and Borell 2002). Efficient use which leads to improvements is difficult to achieve, due to a lack of understanding of the artifact, the use of COTS methods, long term payback, management of the system, poor user acceptance, and shortcomings in improvement efforts.

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Appendix 1 95 CSFs

1. Appropriate business and IT legacy systems (Nah et al. 2001)	2. Managing Consultants (Skok and Legge 2002)
3. Architecture choices (Somers and Nelson 2001)	4. Minimal customization (Somers and Nelson 2001)
5. Balanced team (Bancroft et al. 1998; Parr et al. 1999)	6. Minimum BPR and customization (Nah et al. 2001)
7. Best people (Parr et al. 1999)	8. Monitoring and evaluation of performance (Nah et al. 2001)
9. Business plan and vision (Nah et al. 2001)	10. Monitoring and feedback (Holland et al. 1999)
11. Business Process Change (Holland et al. 1999)	12. Organizational change prior to implementation (Bancroft et al. 1998)
13. Business process reengineering (Somers and Nelson 2001)	14. Organizational fit of Enterprise System (Al-Mashari, Al-Mudimigh et al. 2003)
15. Business Vision (Holland et al. 1999)	16. Organizational resistance (Al-Mashari, Al-Mudimigh et al. 2003)
17. Careful package selection (Somers and Nelson 2001)	18. Partnership with vendor (Somers and Nelson 2001)
19. Champion (Nah et al. 2001) (Parr et al. 1999)	20. Performance evaluation & management (Al-Mashari, Al-Mudimigh et al. 2003)
21. Change management (Somers and Nelson 2001)	22. Personnel (Holland et al. 1999)
23. Change management program and culture (Nah et al. 2001)	24. Planning and Control (Skok and Legge 2002)
25. Clear goal and objectives (Somers and Nelson 2001)	26. Post implementation audit (Umble et al. 2003)
27. Client acceptance (Holland et al. 1999)	28. Process adaptation model (Al-Mashari, Al-Mudimigh et al. 2003)
29. Client Consultations (Holland et al. 1999)	30. Process management (Al-Mashari, Al-Mudimigh et al. 2003)
31. Commitment of management (Umble et al. 2003)	32. Project Champion (Skok and Legge 2002) (Somers and Nelson 2001)
33. Commitment to change (Parr et al. 1999)	34. Project management (Umble et al. 2003; Somers and Nelson 2001; Nah et al. 2001; Al-Mashari, Al-Mudimigh et al. 2003)
35. Communication (Al-Mashari, Al-Mudimigh et al. 2003; Bancroft et al. 1998; Holland et al. 1999; Nah et al. 2001)	36. Project methodology (Bancroft et al. 1998)
37. Cross functional implementation (Davenport 1996)	38. Project Schedule/plans (Holland et al. 1999)
39. Cross functional steering (Davenport 1996)	40. Project team competence (Somers and Nelson 2001)
41. Cultural & structural change (Al-Mashari, Al-Mudimigh et al. 2003)	42. Rapid implementation (Davenport 1996)
43. Cultural and Business Change (Skok and Legge 2002)	44. Selection of system (Umble et al. 2003)
45. Data accuracy (Umble et al. 2003)	46. Smaller Scope (Parr et al. 1999)
47. Data analysis & conversion (Somers and Nelson 2001)	48. Software configuration (Holland et al. 1999)
49. Dedicated resources (Somers and Nelson 2001)	50. Software development, testing (Nah et al. 2001)
51. Definition of scope and goal (Parr et al. 1999)	52. Staff retention (Skok and Legge 2002)
53. Deliverable dates (Parr et al. 1999)	54. Strategic goals with the system (Umble et al. 2003)
55. Education and training (Umble et al. 2003)	56. System integration (Al-Mashari, Al-Mudimigh et al. 2003)
57. Education on new processes (Somers and Nelson 2001)	58. System testing (Al-Mashari, Al-Mudimigh et al. 2003)
59. Empowered decision makers (Parr et al. 1999)	60. Teamworking (Skok and Legge 2002)
61. Empowered project manager (Bancroft et al. 1998)	62. The team (Umble et al. 2003)
63. Enterprise System adaptation level (Al-Mashari, Al-Mudimigh et al. 2003)	64. Top management commitment (Skok and Legge 2002)
65. Enterprise System package selection (Al-Mashari, Al-Mudimigh et al. 2003)	66. Top management support (Bancroft et al. 1998; Davenport 1996; Holland et al. 1999; Nah et al. 2001; Somers and Nelson 2001)
67. ERP Strategy (Holland et al. 1999)	68. Training (Bancroft et al. 1998)
69. ERP teamwork and composition (Nah et al. 2001)	70. Training and education (Al-Mashari, Al-Mudimigh et al. 2003)
71. Expect problems (Bancroft et al. 1998)	72. Troubleshooting (Holland et al. 1999)
73. Focused performance measures (Umble et al. 2003)	74. Understand the corporate culture (Bancroft et al. 1998)
75. Hybrid skills (Skok and Legge 2002)	76. Use of consultants (Somers and Nelson 2001)
77. Inform people about the holistic nature (Davenport 1996)	78. Use of only one consulting firm (Davenport 1996)
79. Interdepartmental communication (Somers and Nelson 2001)	80. Use of steering committee (Somers and Nelson 2001)
81. Interdepartmental cooperation (Somers and Nelson 2001)	82. Use of vendors' tools (Somers and Nelson 2001)
83. Legacy Systems (Holland et al. 1999)	84. User acceptance (Skok and Legge 2002)
85. Legacy systems management (Al-Mashari, Al-Mudimigh et al. 2003)	86. User involvement (Skok and Legge 2002)
87. Management & leadership (Al-Mashari, Al-Mudimigh et al. 2003)	88. User training on software (Somers and Nelson 2001)
89. Management of expectations (Somers and Nelson 2001)	90. Vanilla ERP (Parr et al. 1999)
91. Management support (Parr et al. 1999)	92. Vendor support (Somers and Nelson 2001)

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93.Managing change (Umble et al. 2003)	94.Visioning & planning (Al-Mashari, Al-Mudimigh et al. 2003)
95.Managing Conflicts (Skok and Legge 2002)	