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A Theoretical Model and Framework for Understanding Knowledge Management System Implementation

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ABSTRACT

The study's objective is to arrive at a theoretical model and framework to guide research into the implementation of KMS, while also seeking to inform practice. In order to achieve this, the paper applies the critical success factors (CSF) method in a field study of successful KMS implementations across 12 large multinational organisations operating in a range of sectors. The paper first generates a 'collective set' of CSFs from extant research to construct an a priori model and framework: this is then empirically validated and extended using the field study findings to arrive at a 'collective set' of CSFs for all 12 organisations. These are then employed to refine and extend the theoretical model using insights from the literature on capability theory. It is hoped that the model and framework will aid theory building and future empirical research on this highly important and relevant topic.

Keywords: *business strategy; critical success factors (CSFs); information technology; knowledge management; knowledge management system; organisational factors*

INTRODUCTION

KM initiatives fail more often than they succeed (McDermott & O'Dell, 2001). Massey, Montoya-Weiss, and O'Driscoll (2002) argue "that there has been very little research on how to successfully develop and implement KM solutions to enhance performance, particularly in core business processes" (p. 271). The dearth of such research gave rise to calls by practitioners for practical guidelines on how to build and implement KMS, and how to facilitate organizational change to promote knowledge sharing (Alavi & Leidner, 2002; cf. Moffett, McAdam, & Parkinson, 2003). Accordingly, Wong (2005) argues that there is a "need for

a more systematic and deliberate study on the critical success factors (CSFs) for implementing KM… [as] Organisations need to be cognizant and aware of the factors that will influence the success of a KM initiative" (p. 261): This study seeks to address such concerns.

It is with these points in mind that this study seeks to arrive at a theoretical model and framework of critical success factors to guide research into the implementation of KMS. It also aims to inform practice, as practitioners in organisations remain unsure as to how to go about planning and deploying KMS (Moffett et al., 2003). In order to achieve its objective, the article adopts a qualitative research approach and applies Rockart's (1976) CSF method in a field study of KMS implementations across 12 large multinational organisations operating in a range of sectors. Drawing on Rockart (1979), CSFs may be defined for KM as "the few key areas where "things must go right" for the [KMS implementation] to flourish. If the results in these areas are not adequate, the organisation's efforts [at KM] will be less than desired" (p. 217). In order to attain its stated objective, this study first identifies a collective set of CSFs from the KM literature, which are used to construct a theoretical model and associated framework. Both the framework and the CSFs that constitute it are then empirically validated in the organisations studied; practitioners in these organisations also helped identify additional factors as being of importance. The outcome of this endeavour is a refined and extended model and framework for KMS implementation. In order to undertake the study with the required degree of rigour, the concepts of IS implementation and KMSs, as applied in this study, are first delineated.

IS Implementation Defined

In an early article on IS implementation, Zmud and Cox (1979) argued that "MIS implementation is commonly viewed as involving a series of related activities" (p. 35). Inter alia, these stages are defined by Zmud and Cox as the initiation, strategic design, technical design, development, conversion, and evaluation stages. However, researchers subsequently adopted the convention of referring to the "conversion" stage as the implementation stage and using the term IS development to refer to planning, analysis, design, design, implementation, and use. In essence, IS implementation takes place when the technology dimension is integrated with the people and process dimensions (within particular organisational and institutional contexts and environments) in order to arrive at an organisational IS—furthermore, it overlaps and is intertwined with the "use" phase, as well as the operation and maintenance activities (Iivari, 1990; Iivari & Ervasti, 1994). Thus, when exploring the phenomenon of IS implementation so defined, researchers will attempt to investigate preceding related factors, processes, or activities in order to explain or understand how success in IS implementation is achieved. This is the approach adopted in the present study.

Table 1. Knowledge management processes and IT artefacts

KM Processes	IT Artefacts	IT Platforms
Knowledge creation	Data mining and learning tools	Groupware and communication technologies Intranets
Knowledge storage and retrieval	Electronic bulletin boards, nowledge repositories, Databases	
Knowledge transfer	Electronic bulletin boards, Discussion forums, Knowledge directories (e.g. "Yellow Pages" of subject matter experts)	
Knowledge application	Expert systems, Workflow systems	

Knowledge Management Systems and Knowledge Sharing

Alavi and Leidner (2001) posit that "Knowledge management systems (KMS) refer to a class of information systems applied to managing organizational knowledge. That is, they are IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer, and application" (p. 114). Drawing on Alavi and Leidner (1999, 2001), Table 1 provides examples of technologies that, researchers argue, help organisations manage their knowledge resources. Given a multiplicity of KM processes (i.e., knowledge creation, storage, etc.) and related IT artefacts, practitioners and researchers decided to simplify matters by focusing on IT for knowledge sharing (Benbya, 2006; Butler & Murphy, 2007). Jennex and Olfman (2004, 2006), for example, posit that KMS, and the knowledge sharing technologies they employ, focus either on processes/tasks or are generic and are infrastructure based. Thus, IT helps organisations share knowledge on processes, tasks, or projects in order to improve their effectiveness; with the infrastructural approach, non-task specific knowledge, or general organisational knowledge is the object of knowledge sharing activities. It is clear from Jennex and Olfman (2004, 2006), however, that a KMS might apply IT to share both task-specific and non-task-specific knowledge in certain organisations. The trend towards focusing on knowledge sharing is also underlined by Benbya (2006), who categorises effective knowledge sharing technologies as being both integrative, highly accessible, and searchable, because "[i]ntegration is a strong predictor of KMS effectiveness, the ability of a system to integrate knowledge from a variety of sources and present it in a manner that enables easy access and reuse is associated with both knowledge quality and knowledge usage" (p. 4). Benbya's conceptualisation is therefore applied in concert with the task/process and generic/infrastructure classification proposed by Jennex and Olfman (2004, 2006) in the present study to help compare the KMS in the organisations studied.

The remainder of this article is structured as follows: The second section describes a range of CSFs identified in the literature that are associated with the successful implementation of KM strategies and KMS. This section concludes by presenting a KMS implementation model and research framework for empirical validation in the field prior to comprehensive testing in future research. The third section outlines this study's qualitative research approach. The fourth section then describes and analyses the findings of the field study of 12 organisations. The fifth section presents a refined theoretical model and outlines a path to full theory development. Finally, a number of conclusions are offered.

TOWARDS A KMS IMPLEMENTATION MODEL

There have been several studies on the success factors for KM and KMS—see, for examples, Skyrme and Amidon (1997), Davenport, De Long, & Beers (1998), Holsapple and Joshi (2000); Hasanali (2002); similar factors were also reported in more recent meta-analyses of KM/KMS success factors by Jennex and Olfman (2004, 2006) and Lam and Chua (2005). The challenge for this study will be to build on this body of research to arrive at a set of collective critical success factors that are representative of the key obstacles facing practitioners in implementing KMS.

Zack (1999a) argues that the most important consideration for guiding a knowledge management initiative in an organisation is its strategy. It seems logical therefore to gather together "collective" CSFs under this heading: support for this position is found in Massey et al. (2002). IT-related factors form a second factor grouping; for example, Chua (2004) indicates that "[w]hen used in tandem with an appropriate KM strategy, technology is a powerful enabler of organisational success" (p. 96). The third factor grouping is identified by Alavi and Leidner (1999), who conclude that the "effective resolution of cultural and

organizational issues was identified as a major concern in the deployment of KMS. This result is consistent with the IT management literature, which advocates organizational and behavioural change management as critical success factors in the implementation of information systems" (p. 21); thus organisational factors form the final grouping. These three factor groupings—strategy, IT, and organisation—will help the articulation of a parsimonious model of KMS implementation that possesses, what Markus and Robey (1988) term, an "empirical fidelity" with the phenomenon under investigation—the implementation of KMS.

KM Strategy CSFs[1]

While knowledge is recognized as a critical resource for sustained competitive advantages, successful KM remains a key challenge to organisations (Davenport & Prusak, 1998; Lam & Chua, 2005; Wong, 2005). Table 2 illustrates the strategy-based CSFs for KM. According to Hansen et al. (1999) "a company's knowledge management strategy should reflect its competitive strategy" (p. 109); thus, Table 2 indicates that KM strategy must be closely aligned to business strategy (Lam & Chua, 2005). It also indicates that an effective KM strategy should ensure senior management support for, and commitment to, the initiative (Hasanali, 2002). A KMS strategy should also articulate an organisation's knowledge sharing objectives, so that they may be conveyed to all members of staff, not only senior managers and project members (Mason & Pauleen, 2003); it must also provide a clear and unambiguous definition of knowledge (Jennex & Olfman, 2006). The research cited in Table 2 also illustrates that the implementation of KM also requires the establishment of new roles and responsibilities for KM within an organisation (Butler & Murphy, 2007; Davenport et al., 1998).

Information Technology-Related CSFs

The emphasis on implementing IT artefacts for knowledge creation and sharing has several implications for potential success factors, as is indicated in Table 3. Gray and Durcikova (2006) report, for example, that "[a] key limitation on the potential effectiveness of any IT-based system is its ease of use…it follows that one reason why analysts may not source knowledge from a repository is that the technology is not sufficiently easy to use—that is, it may be awkward, slow, or difficult enough to use that analysts may believe that the benefits do not outweigh the costs" (p. 184). Accordingly,

Table 2. Strategy-based CSFs for KM

Critical Success Factor	Source
Having a close alignment of KM strategy with corporate strategy	Chua (2004); Davenport and Prusak (1998); Hansen, Nohria, and Tierney (1999); Lam and Chua (2005); Sunassee and Sewry (2002), Wong (2005), Zack (1999a, 1999b)
Possessing a comprehensive definition of and communicating KM objectives	Hackett (2000); Jennex and Olfman (2006); Mason and Pauleen (2003)
Ensuring top management commitment	Davenport et al. (1998); Hasanali (2002); Holsapple and Joshi (2000); Jennex and Olfman (2006); Lam and Chua (2005); McDermott and O'Dell (2001); Sunassee and Sewry (2002); Wong (2005)
Developing new roles and responsibilities around KM	Butler, Feller, Pope, Murphy, and Emerson (2006); Butler and Murphy (2007); Davenport and Prusak (1998); Davenport et al. (1998); Hasanali (2002); Roth (2003)

Table 3. IT-related CSF

Critical Success Factor	Source
The KMS must be designed so as to be easy to use	Butler and Murphy (2007); Butler et al. (2006); Damodaran and Olphert (2000); Gray and Durcikova (2006); Hasanali (2002); Lam and Chua (2005); Mason and Pauleen (2003)
Build the KMS with Web Technologies	Alavi and Leidner (1999); Butler et al. (2006); Davenport and Prusak (1998); Lam and Chua (2005); Stenmark (2002)
Ensure the KMS presents accurate and appropriate results	Benbya (2006); Damodaran and Olphert (2000); Lam and Chua (2005)
Ensuring that security concerns are balanced with the need for openness	Alavi and Leidner (1999), Butler et al. (2006), Gold, Malhotra, and Segars (2001); Jennex and Olfman (2006)
Having a high degree of IT participation and involvement	Alavi and Leidner (2001); Davenport and Prusak (1998); Malhotra and Galletta (2003).
Having a high degree of user participation and involvement throughout the project	Damodaran and Olphert (2000); Lam and Chua (2005); Malhotra and Galletta (2003); Mason and Pauleen (2003)

Damodaran and Olphert (2000) found that speed and response times of the system are crucial to system success. Thus, KM tools must seamlessly integrate into the day-to-day routine and activities of employees; if it is difficult to use and takes them away from their core activities, they will not see the advantages of using the system (Alavi & Leidner, 1999).

Stenmark (2002) argues that Web-based intranets offer an excellent IT platform for knowledge sharing. Lam and Chua's (2005) empirical findings provide support for this perspective, as do Butler et al. (2006) who illustrate that Web-based technologies form the key components of a core IT artefact for knowledge sharing.

Gold et al. (2001) argue that trust and openness are at the core of knowledge sharing behaviours; however, as knowledge is a valuable firm-specific resource, security is also an important consideration (Alavi & Leidner, 1999; Jennex & Olfman, 2006). In this context, security is viewed as being a technological issue, while openness associated with interpersonal or cultural dimensions (Gold et al., 2001). In their action research study on KMS design, however, Butler et al. (2006) clearly focus on "openness" over security when it comes to developing IT artefacts for knowledge sharing. Indeed, security is low in the hierarchy of success factors, 12th in fact, for KMS, as reported by Jennex and Olfman (2006). Thus in designing a KMS, the issues of security need to be balanced with openness in KMS design and use.

The IT/IS function in an organisation plays a key supporting role in KMS design, development, and implementation (Davenport & Prusak, 1998): However, the development of such an infrastructure should be business-oriented, as researchers maintain that the development of the KMS should be user-driven and based on the business objectives of an organisation (Damodaran & Olphert, 2000; Mason & Pauleen, 2003). For example, Lam and Chua (2005) report that one KMS project failed due to a dearth of technical and business knowledge required to sustain the programme, the implication here is that it would have been a success had there been a high level of IT and user/business participation throughout.

Organisational CSFs

KM researchers highlight the important influence that organisational actors have in relation to KMS (Moffett et al., 2003). It is hardly surprising then that Bhatt (2001) reports that

56% of executives believe that changing people factors such as behaviour are the most critical elements in KMS implementations (cf. Hackett, 2000). Hislop (2003), for example, states that "personnel issues are now arguably regarded a THE key factor most likely to effect the outcome of knowledge management initiatives" (p. 3).

Alavi and Leidner (1999) argue that culture-based teamwork is a required KM capability; more recently, Wong (2005) emphasises the importance of teamwork at various levels in an organisation, both in the KM implementation team and KMS users. In their study of KM practice, Alavi and Leidner (1999) also note the cross-functional nature of KM teams, with members of relevant business units and the IS function; however, in a general context, practitioners in Hackett's (2000) study illustrate that the "teaming" of knowledge workers and the existence of a culture of teamwork played a critical role in KM success—this has been a recurrent theme in the literature, as Table 4 indicates.

Another major cultural factor is that of trust: Chua and Lam (2005) observe in one organisation, for example, that "[s]taff did not share knowledge within the organisation due to reasons such as the lack of trust and knowledge-hoarding mentality" (p. 12). Similarly, according to Wong (2005), the development of trust relationships among staff members is essential in order to enable knowledge sharing, this in turn means overcoming the scepticism surrounding the intentions and behaviours of others.

The importance of user training is emphasized across a number of studies (see Table 4); in their analysis of CSFs for KMS, Jennex and Olfman (2004, 2006), for example, include training in two of the CSFs cited. However, even if training is provided, Hasanali (2002) suggests that after the deployment of a KMS, the central KM group should spend most of its time teaching, guiding, and coaching users on how to use the KMS.

Davenport et al. (1998) underline the need for motivational incentives for KM users. There is broad agreement in the literature on the need for incentives in the implementation of KMS; indeed Jennex and Olfman (2004, 2006) underline the need for motivated users who are committed to KMS use—the provision of incentives

Table 4. Organisational CSFs

Critical Success Factor	Source
Focusing on people factors	Bhatt (2001); Butler et al. (2006); Davenport and Prusak 1998; Hackett (2000); Hansen et al. (1999); Hislop (2003); Malhotra and Galletta (2003); McDermott and O' Dell (2001)
Developing a team-oriented culture	Alavi and Leidner (1999); Chua and Lam (2005); Hackett (2000); Davenport et al. (1998); Roth (2003); Wong (2005)
Engendering trust among knowledge workers	Davenport and Prusak (1998); Hansen et al. (1999); Hislop (2003); McDermott and O'Dell (2001)
Ensuring comprehensive user training	Damodaran and Olphert (2000); Hasanali (2002); Storey and Barnett (2000); Malhotra and Galletta (2003), Wong (2005)
Introducing monetary and/or non-monetary incentives and rewards	Davenport et al. (1998); Hislop (2003); Jennex and Olfman (2004, 2006); McDermott and O'Dell (2001); Wong (2005)
Changing organisational structures and processes	Alavi and Leidner (1999); Damodaran and Olphert (2000); Gold et al. (2001); Hackett (2000); Malhotra and Galletta (2003); McDermott and O' Dell (2001); Roth (2003)

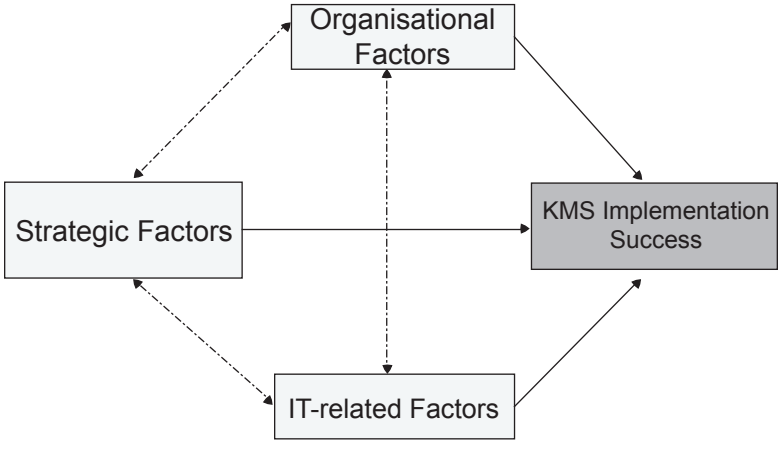
and training are important factors in achieving this. Accordingly, Wong (2005) points out that "one of the important factors is to establish the right incentives, rewards or motivational aids to encourage people to share and apply knowledge. Giving incentives to employees helps to stimulate and reinforce the positive behaviours and culture needed for effective KM" (p. 271). Malhotra and Galletta (2003) report, however, that in some organisations where formal incentives existed, knowledge sharing was not stimulated. The views of practitioners reported in Hackett (2000) reflect this point, and while monetary incentives are associated with centrally led and driven KM initiatives, non-monetary incentives and intrinsic rewards are linked with "skunk works" type projects. Thus, it may be concluded that the application of incentives, formal or informal, monetary and non-monetary, is contingent on the context of the KMS implementation.

Organisational structures are intended to rationalise and make efficient individual functions or units within an organisation; however, rigid structures and processes encourage individualistic behaviour in which locations, divisions, and functions are rewarded for "hoarding" information and inhibiting successful KM across the organisation (McDermott & O' Dell, 2001). In addition, certain types of organisational structures and processes place limits on communications and can create intentional or unintentional obstacles (Malhotra & Galletta, 2003). Gold et al. (2001) state that a modular organisational design can diminish the costs of coordination and adaptation, thereby increasing flexibility; hence Gold et al. maintain that a non-hierarchical, self-organising organisational structure is the most effective for knowledge sharing. Alavi and Leidner (1999) report that managers worry about managing change around the shift from existing processes to ones that included knowledge sharing: Indeed the change management around structures and process were listed as "key concerns" in their study. Following this line of reasoning it is clear that changing structures and processes, and the management of that change, is important for the successful implementation of KMS.

A Model and Framework of Knowledge Management System Implementation

Based on forgoing arguments, a theoretical model (Figure 1) is proposed to guide the conduct of the present study. Both it, and its associated framework (which is constituted by the CSFs in Tables 2-4 that describe each

Figure 1. A factors model of knowledge management system implementation



of the model's high-level constructs) are based on observations drawn from extant research on KM and KMS. The model captures the manner in which KMS implementation success may be directed and effected by: (1) strategic factors, (2) IT factors, and (3) organisational factors. The interaction of these groups of factors is argued to determine KMS success. Benbya (2006) indicates that KMS effectiveness (i.e., the success construct) is indicated by knowledge quality, usage, and perceived benefits; similar measures are proposed by Jennex and Olfman (2006) viz. perceived benefit and use/user satisfaction leading to net benefits. The primary

Table 5. Organisation code, key informant roles sector and KMS characteristics

Organisation Code	Key Informant Roles	Industry Sector	KMS Characteristics (see legend below)
A	E-service and KM Co-Coordinator	Information Management and Storage (IMS)	II, III, IV
B	IT helpdesk Manager and Local KM Manager	Mobile Technology (MT)	II, III, IV
C	Learning and Leadership Manager	Mobile Technology (MT)	II, III, IV
D	IT Development Manager	Professional Services (PS)	II, III, IV
E	Knowledge and Information Manager Assistant Information Manager	Professional Services (PS)	I, III, IV
F	KM Group Manager	Professional Services (PS)	I, III, IV
G	Development Manager Automation Manager	Pharmaceutics (P)	I, II, III, IV
H	Knowledge Management Supervisor	Pharmaceutics (P)	II, III, IV
I	Knowledge Management Consulting Community Leader Communications Manager for Learning and Knowledge	Global Consulting and Outsourcing (CGO)	I, II, III, IV
J	Senior Partner	Global Consulting and Outsourcing (CGO)	I, II, III, IV
K	Knowledge Management Program Manager	Manufacturing Sector (M)	I, II, III, IV
L	Section Manager and manager of KM initiatives in the Product Development Department	Manufacturing Sector (M)	I, II, III, IV

KMS Characteristics Legend (Adapted from Benbya, 2006; Jennex & Olfman, 2006)	I. Highly accessible Intranet-based KMS that integrates knowledge among general communities of practice II. Highly accessible Intranet-based KMS that integrates knowledge among specific communities of practice III. Knowledge creation and sharing using task/process IV. Knowledge creation and sharing generic/infrastructure approaches

objective of this study, therefore, is to validate the three groups of CSFs that affect the successful implementation of KMS and the strategic change surrounding the introduction and use of such systems.

RESEARCH APPROACH

In order to examine the factors that affect the implementation of KMSs in several organisations, an interpretive field study approach was adopted (Walsham, 1995). The application of this approach was informed by the CFSs concept and method (Butler & Fitzgerald, 1999; Rockart, 1979).

Twelve organisations that had successfully implemented KMSs were purposively selected to participate in this interpretive field study and application of the CSFs method: these included EMC², Deloitte, Motorola, KPMG, Siemens Corp., Pfizer Corp., IBM, Hewlett Packard, Schering-Plough, Analog Devices Inc., Accenture, and two world-renowned consultancy/professional services organisations. It must be noted, however, that some of these organisations achieved less in the way of success in terms of subsequent use of their KMS. Important selection criteria were that each of these organisations are recognised leaders in KM within their respective industry sectors; furthermore, all had successfully implemented intranet-based KMS based on Web technologies more than one year preceding the study. A recent study by Benbya (2006) adopted similar selection criteria in purposively selecting organisations for study. Purposive sampling was also applied in each organisation to choose the most knowledgeable subject-matter experts (Patton, 1990). Thus 15 interviews were conducted with KM practitioners, with interviewees being purposively chosen using the key informant approach (Patton, 1990)—see Table 5. While organisational anonymity was a requirement for some of the organisations participating in this research, the researchers adopted an approach to effectively anonymize all—Table 5 lists the organisation code employed, while also indicating the sector in which the organisations operate. In addition the table provides a brief analysis of the characteristics of each organisational KMS using criteria adapted from Benbya (2006) and Jennex and Olfman (2006).

Given the exploratory and interpretive nature of the study, and the use of the CSF method, each interview was semi-structured, with structure being provided by the application, as an interview guide, of the research framework of "collective" CSFs presented in Tables 2-4. As the KM practitioners interviewed were generally familiar with the CSF concept, or similar approaches such as key performance indicators and so forth, its use permitted a common ground to be established between researchers and researched (Butler & Fitzgerald, 1999). It is consistent with interpretive field research to have social actors narrate their own perspectives of the phenomenon of interest (Walsham, 1995). Researchers therefore encouraged KM practitioners to identify additional CSFs or modify those in the framework. Each interview was taped and up to two hours in duration.

This study's theoretical model and CSF research framework also guided the data analysis, with CSFs acting as "seed categories" to analyse the "content" of each interview transcript and all documentation: This permitted the CSFs for each organisation to be identified in context. Indeed, having interviewees directly validate the a-priori "collective set" of CSFs for KMS implementation, while also nominating additional organisation-specific CSFs, greatly aided the data analysis phase: Hence, CSF-related themes were readily identified in the data. The subsequent comparative analysis of interview transcripts and company documentation confirmed a collective set of CSFs for the organisations studied (cf. Butler & Fitzgerald, 1999; Patton, 1990).

FIELD STUDY FINDINGS

As indicated, the 12 organisations participating in this study had all successfully implemented KMS, but some had subsequent problems with KMS use, as the following sections indicate. That said, the KMS could not be described as failures. Table 6 provides an analytic matrix listing the collective CSFs for all 12 organisa-

Table 6. Collective CSFs found to influence KMS implementation in the organisations studied-Field Study Findings

Collective CSFs/Companies	A	B	C	D	E	F	G	H	I	J	K	L	Total
Sectors	**IMS**	**MT**	**MT**	**PS**	**PS**	**PS**	**P**	**P**	**GCO**	**GCO**	**M**	**M**	**6**
Strategic Factors													
Having a close alignment of KM Strategy with Corporate Strategy	X	X	X	X	X	X	X	X	X	X		X	11
Possessing a comprehensive definition of and communicating KM Objectives	X		X		X	X	X	X	X	X		X	9
Having a diverse, cross-functional KM Team	X	X	X	X		X	X	X		X	X	X	10
Adopting a suitable Taxonomy of Knowledge				X	X		X	X		X		X	6
Having an Adequate KM budget							X			X			3
Having the project driven by Top/Middle Management	X					X		X					3
Top Management Commitment	X	X	X	X	X	X	X	X	X	X	X	X	12
New Roles & Responsibilities			X	X	X			X				X	5
IT-related Factors													
The KMS must be designed so as to be easy to use	X	X	X	X		X	X	X	X	X	X	X	12
Build the KMS with Web Technologies						X	X	X					3
Ensure the KMS presents accurate and appropriate results				X		X	X					X	4
Security concerns must be balanced with the need for openness			X				X		X				3
Having a high degree of IT Participation and Involvement	X								X		X		3
Having an evolving level of IT Participation and Involvement				X		X	X	X		X		X	6
Having a minimal degree of IT Participation and Involvement		X	X		X								3
Having a high degree of user Participation and Involvement		X	X	X	X	X	X	X	X	X	X	X	11
Organisational Factors													
Focusing on People Factors											X	X	2
Developing a Team-oriented Culture	X	X							X		X	X	5
Engendering trust among knowledge workers				X				X	X				3
Ensuring comprehensive user training		X	X		X	X	X	X			X	X	8
Introducing monetary incentives and rewards	X		X					X		X			4
Introducing non-monetary incentives and rewards		X		X	X	X	X		X		X	X	8
Changing organisational structures and processes			X	X		X	X						4
Total CSFs per Org	9	10	12	12	10	14	15	14	10	10	9	14	

tions (entries A-L), which emerged from the research data. The factors are grouped under the related high-level headings of strategy, IT, and organisation. The organisational sectors are also identified to help comparison (the legend for each is presented in Table 5). An X signifies whether the CSF was manifested during the KMS implementation process in the organisations (A-L) studied. The following sections provide a descriptive analysis of these CSFs and the influence they exerted on KMS deployment and use in each of the organisations.

Some 23 collective CSFs are presented in Table 6—hence, an additional 7 CSFs were identified in addition to those cited in the literature and appearing in Tables 2-4. The difference arises from claims/observations made by KM practitioners on the existence of additional CSFs (four strategic CSFs) and the need to refine and elaborate on particular CSFs (three additional CSFs emerged from the analysis on IT participation and involvement in IT-related factors and incentives and rewards in the organisational factors). This approach is wholly consistent with the application of an interpretive research approach involving the CSFs method (see Butler & Fitzgerald, 1999).

Strategic CSFs

Practitioners in all but one of the organisations studied (Company L) indicated that it was vital to have KM strategies aligned with corporate business strategies; the reason why Company L differed is due to the application of the KMS to operational processes. The practices of defining, aligning, and communicating KM benefits and goals were present in each of the organisations studied, except Company L. In the majority of firms, KM objectives were formally linked to corporate goals: for example, innovation, attaining competitive advantage, and so on. In Company D, for example, the main objective of KM (capturing solutions to reoccurring problems) was linked to the corporate goal of preventing the "reinvention of the wheel." Organisations adopted similar approaches (e.g., meetings, coffee mornings, workshops, user involvement, and establishing KM slogans) to actively communicate the goals and benefits of KM to the target groups. The e-service and KM Co-Coordinator of Company A stated, for example, that "you must have clear objectives and goals before you implement the system or else it will not work. Employees must be able to see the clear goals and benefits of a KMS." Company A scheduled team meetings and coffee room sessions to communicate KM goals, while also advertising KM on their intranet and making users actively involved in the KM process. The Information Manager of Company E echoed this view and stated: "There has to be a vision, a goal, and you have to see the benefits that you can get out it. If we do x, y, z, and implement it this way then we will get a, b, c out of it." However, in the KM practitioner in Company L viewed that their KMS implementation was not aligned to any corporate goal and stated that as a result KM became largely decentralised with many divisions undertaking their own KM initiatives. This decentralisation resulted in each division setting their own goals for KM and following their own guidelines; he explained, "the local initiatives for KM did not centrally co-ordinate for the maximum benefit across the organisation. Each division went about making their own provision and meeting their own needs in terms of KM, as a result on a global level KM has yet to take off. Currently, it is like ten small companies working in one company." In 9 of the 12 organisations the objectives of the KMS implementation were explicitly defined, whereas in the cases where there was poor communication of benefits (Companies B and D, for example) practitioners recommended increased awareness to improve system use and success.

Five of the organisations established new roles and responsibilities to monitor and support KMS content. Practitioners considered these roles as a "must have" for KM success. The new roles created within the organisations studied varied little, mainly in titles assigned to key personnel (e.g., Knowledge Manager, Knowledge Champion, etc.). In addition, the responsibility assigned (e.g., maintenance, support, and so on) to these roles seldom varied between the

organisations studied. In addition, 10 of the 12 organisations established a cross functional KM team. The make-up and responsibilities of the KM teams varied across the organisations studied. In Company H, for example, the KM team was responsible for establishing user needs, prioritizing such needs, implementing the technology, and supporting the users. The team actively sought user feedback on the system and was in constant communication with the IT department when changes were required.

The use of appropriate knowledge taxonomies was identified by six of the KM practitioners as also being key to the success of a KMS. As the Communications Manager for Learning and Knowledge in Company I explained, "creating a taxonomy makes it easier for users to find and submit knowledge." Company I uses a combination of human interaction and technical tools in their KMS (e.g., Lotus Notes) to implement their taxonomy. Company D classifies its organisational knowledge according to the business functions (tax, finance, and consulting) within the organisation and it has designed the KMS to model this structure. Company J, on the other hand, created a detailed level of classifications to store their knowledge. These knowledge categories are further broken down to the time phases of different projects and different processes, for example, sales forecast, project planning, project delivery, and so forth. This KM Practitioner stated that this approach was identified in the user requirements phase to help users navigate to the knowledge captured in the KMS. Other organisations studied went about this by identifying what knowledge they wanted to capture and also the knowledge gaps within the organisation. However, all 15 KM practitioners identified a need for a process to cleanse and categorise captured knowledge. In each of the organisations, this process was assigned to the relevant KM roles (e.g., knowledge champions/managers).

In the majority of the organisations, KM initiatives were implemented as organisational-wide programs requiring input from all levels and functions of the organisation. Organisations achieved this through the establishment of diverse (i.e., in terms of level), cross-functional KM teams that drove the implementation of KM strategies. A distinct overlap arose between establishing heterogeneous, multi-level KM teams and the involvement of top, middle, and lower-level management. KM practitioners in these organisations involved different management levels into the KM teams. They agreed that a successful KM team relied heavily on users who were positioned to have good contact with the different levels within their respective function or community of practice. In essence, members of the KM team represented their function levels (top to lower management).

All KM practitioners emphasised the importance of top management commitment and support. The interviewee from Company I put it thus: "People respond to what their immediate manager asks them to do. If managers are a part of KM and are committed to KM, this will be passed to lower-level management and employees." KM practitioners strongly linked top management to driving required cultural and systems changes. Top management also emerged as having some bearing on budget allocation and employee acceptance of the system. In Companies F, G, and J it was reported that where top management were committed to the KM project, budget did not arise as a barrier (only three organisations identified KM budget as an inhibitor to the project). However, where the KM practitioners questioned the level of top management commitment, they also felt insufficient budget was allocated.

The Role of Information Technology in KM

KMS ease of use was, in the opinion of KM practitioners, the sine qua non for KMS success. All 12 organisations identified that ease of use (e.g., user interface navigation, flexibility, user-friendliness, usability, and speed) was crucial to the success (or effectiveness) of their KMS. The term ease of use, as employed by practitioners, extended to all stages of the knowledge lifecycle from submitting, reviewing, distributing, and searching/locating relevant knowledge. Ease of use was generally established through

approaches that incorporated simulated test environments, user involvement, deploying Web technologies, and returning appropriate and accurate results. In Company E, for example, the design phase involved users testing for ease of use in simulated test systems. A number of the systems also replicated their organisational structures to provide categorisation for the knowledge repository. In addition, organisations developed KM roles to monitor data input and categorisation. The importance of this activity was commented upon by a KM practitioner in Company G, who stated that "the knowledge returned must be precise, current and accurate to be of any use to employees"—thereby ensuring accurate and appropriate results.

The dual requirements of security and openness were also identified by three organisations as important factors in the design of a KMS. Users "must have access to as much knowledge as possible but only access to knowledge that is relevant to their needs" (KM Practitioner, Company C). In the case of Companies A, B, C, D, E, F, G, I, J, and L, KM practitioners stated that access to the knowledge repositories and sub-systems belonging to other functional units or departments was typically achieved by obtaining permissions and access rights from the departmental head though e-mail or telephone.

User participation and involvement in KMS implementation was seen as crucial, with 11 out of the 12 companies highlighting it as a critical factor, both in defining user requirements and in creating awareness among users. Many of the organisations achieved user involvement through the establishment of the cross-functional KM teams and by assigning responsibility to key users to link back feedback and developments to the business. Significantly, it emerged from the findings that the stronger the user participation and involvement was in the analysis, design, and testing of KMS the higher the degree of KM success (cf. Cavaye [1995] for evidence of this in traditional IS). For example, the Communications Manager for Learning and Knowledge in Company I pointed out: "Users were involved in giving input in designing the system. They were involved in testing and prototyping the system. Once the system was running they were involved in giving any feedback on the system." Many of the organisations established user groups or steering groups for their respective KM project. Company F, for example, established an organisation-wide KM team where employees were rotated on a constant basis through user groups to gain extensive feedback. Company E set up a global team to monitor user feedback and to interface with developers user requirements. The Assistant Information Manager in Company E stated that the system "has to come from the users, it has to be what they like and need." The KM Practitioner from Company A identified the outcomes related to a lack of user involvement: he stated that his firm did not get sufficient users involved in the design and development of its KMS, consequently, key functionality was not added to the system. This practitioner argued that this was a major reason users did not see any benefit from using the system.

The IT function's role varied across the organisations studied: For example, three organisations identified that they had strong IT support throughout the duration of the project; Companies B, C, and E had minimal IT involvement; while the role of the IT function evolved over the course of the project for the remaining six organisations. According to the KM Group Manager in Company F, the IT function was brought in at different stages when required to support the KM decision-making process. The IT function also performed the "taken for granted role" of ensuring that the technological infrastructure was in place to allow efficient sharing and access to knowledge. In contrast, in Company K, the IT function was involved in an early stage matching the technology with users' needs. The role of the IT function included introducing the technological capabilities in terms of managing organisational knowledge, while also limiting the user requirements to a certain degree. According to the Automation Manager in Company G, the IT function was involved from the start and contributed to each stage of the KM design, implementation, and

support process: Also, the IT function was actively involved in the decision-making process and had a strong presence on the KM team. Equally at Company H, the IT function played a lead role in the design and development of its KMS. A KM team was set up and was led by a software programmer and a financial manager. The various departments submitted their requirements and both the software programmer and the financial manager had the final say in the design of the system. The Development Manager in Company G supported the case for a strong IT presence. He explained: "If knowledge management was mainly driven by IT then, it would not adequately capture the user requirements. However if IT is not part of Knowledge Management, then you are probably going to see the wrong infrastructure, poor development, and poor roll out."

As indicated, three of the respondents supported the view that the IT function should play no part in the KM decision process (Companies B, C, and E): these KM practitioners stated that the IT function was, and should be, restricted to the delivery of the IT infrastructure and in supporting KMS users. However, even though each of these respondents stated that the IT function played little or no role in the design process, it was reported that the IT function had a representative on the KM team. This would indicate that the IT function, even though not visibly seen in the KM decision process, would have been consulted when required and IT professionals were background contributors to the decision-making processes. It is clear then that the IT function played a supporting role in KM in all 12 organisations, but in the pharmaceutical sector (Companies G and H) IT played an important role in the decision-making processes surrounding KMS implementation. Many of the KM practitioners viewed the IT function as being directed by the KM strategy, while feeding into this strategy with IT architecture plans, technical advances and knowledge of any previous systems implementations. Table 6 indicates that what worked best in the majority of organisations was an evolving, but strong participation, by the IT function, as opposed to little or no participation, or having IT lead the KMS project.

Organisational Factors and Their Impact

Creating a knowledge sharing culture was seen by all KM practitioners as being imperative to embedding knowledge sharing in employees. KM practitioners repeated mantra-like that: "People made it happen: They have the knowledge, and they make the decision to share their knowledge" (KM Practitioner Company F). The researchers found that all organisations were progressing to team-oriented and high-trust cultures prior to the introduction of KM. KM practitioners saw this as a fundamental cultural change and the key to knowledge sharing, regardless of the need to implement a KMS. KM practitioners from companies A and K, however, noted that knowledge sharing appeared to be problematic across and between teams—this issue was linked to the absence of KM-related roles in their organisations. This finding points to the importance of new roles and responsibilities as one of the key drivers of knowledge sharing cultures; it also highlights the importance of the link between KM strategy and organisational dimensions.

User training was highlighted by eight of the organisations as a vital factor in KMS implementation. Several organisations implemented comprehensive programmes and conducted KM workshops, held training courses, provided online tutorials, and formed open discussion groups to deliver user training. The leader of the Knowledge Management Consulting Community of Company I explained: "User training is imperative, it's key. It's got to be comfortable for users and one way of making it comfortable is training. If is doesn't integrate well with people, then you got to have more training." Additionally, the Information Manager in Company E stated since "the system is continuously being improved all the time; employees have to be trained to use the system to gain maximum benefit from the system." The KM practitioner from Company B viewed the lack of success of this company's KMS as being

directly related to absence of formal training and indicated that the user training associated with the implementation of this firm's global KMS was minimal. They expected that the users would learn through a trial and error approach, the only user training delivered was a one-day demonstration by a knowledge manager to all employees. He believed the lack of user training has led to users finding it difficult "to do simple tasks such as logging solutions or finding knowledge." He noted that as a result of people not being able to use the system, "they became frustrated with the system and could not see the benefit from using the system." He added it was not uncommon to meet employees saying, "I never knew the system could do this." He explained that as a result the system had functionality which many users were unaware of and did not use.

All 12 organisations offered either monetary or non-monetary rewards for knowledge sharing. In the pharmaceutical organisations, monetary incentives were not formally instituted to promote KMS use; however, knowledge sharing was incorporated into each employee's roles. It is significant that both professional services organisations (Company D and F) were attempting to move away from incentives and establish knowledge sharing as a core element in job descriptions. In contrast, KM practitioners from Companies A, C, I, and K revealed that rewards were offered to employees who actively share knowledge. The Leader of the KM Consulting Community in Company I supported the use of monetary rewards and stated "you will always need rewards. Rewards and incentives will make it a bit more interesting, in what's in it for me, and what they are going to get out of it for participating." It is significant that organisations which had poorly developed knowledge sharing cultures (e.g., Company A, C, I) relied heavily on the use of incentives and rewards. The e-service and KM Co-Coordinator in Company A stated that they have established monetary rewards based on "the usage of knowledge." These companies established a "usage count" within the system, (e.g., metering how often a knowledge item is accessed) and the employees are rewarded based on the usage count of the knowledge they have entered. The pharmaceutical organisations, which had well-established knowledge sharing cultures, did not use monetary incentives and rewards. The Development Manager in Company G stated, "sharing knowledge is part of our organisational culture, there is no need to use rewards or incentives. It now has become part of their daily routine." The Automation Manager in Company G commented that "[knowledge sharing] is part of their day-to-day job like any other role they have to carry out." Also the local KM Supervisor in Company H stated that KM "is part of employee's job description. It is embedded in their role to record and share the knowledge about their experiences."

Change to organisational structures and processes did not arise in this study as a barrier to, or critical factor for, KMS implementation. However several KM practitioners reported that the logical design of their KMS reflected closely the structure of their organisation. The KM Group Manager of Company F explained: "Our Knowledge Management System mirrors where the knowledge is physically stored in the organisation by aligning the layout of the Knowledge Management System to the organisational structure." Also, the knowledge taxonomy of Company F's KMS maps readily to core functions in their organisational structure (e.g., tax, finance, etc.). The IT Development Manager of Company D pointed out that his company designed their KMS around audit, tax, management consulting, and financial advisory consulting, which reflects this company's logical structure and key processes. The Learning and Leadership Manager in Company C stated the organisational structure is mirrored in the design of the system: He explained that "our knowledge management strategy embraces structure by how the knowledge is captured and shared. Different functions have different knowledge needs and this must be represented in the Knowledge Management System." The Automation Manager in Company G commented that designing a KMS on the basis of the organisational structure "gives clarity on where

to find knowledge." These observations give support for the use of a knowledge taxonomy that can be mapped onto an organisation's structure.

A REFINED THEORETICAL MODEL AND FRAMEWORK FOR KMS IMPLEMENTATION

It is outside the scope of this article to present a fully working theory of KMS implementation. Following Teng and Galletta (1991), it presents a "pre-theory" framework to guide research activities enroute to theory development. As Chervany (1973) argues, empirical investigations of IS-related problems require "a research framework that identifies variables (or propositions) to be examined and provides a structure for correlating and synthesizing independent research studies" (p. 181). The CSFs/capabilities model presented here (see Figure 2) attempts to meet these prescriptions and is now formally proposed.

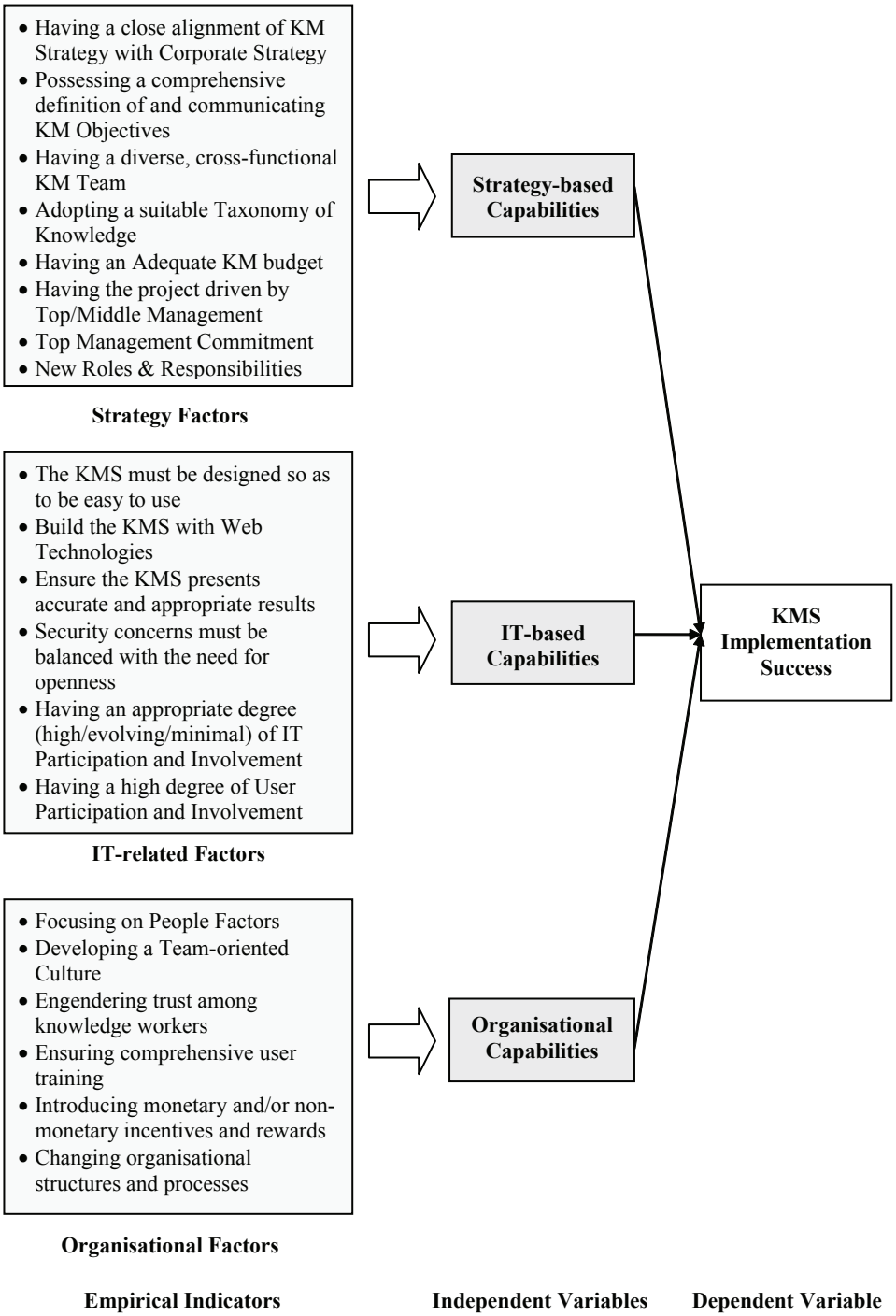
In reflecting on the findings, it was apparent that the link between CSFs and KMS success was mediated by the abilities of organisations and organisational actors to realize the factors. This is an important observation in terms of the proposed model's (Figure 1) explanatory power. Hence, following Wheeler (2002), this article proposes to extend the model presented in Figure 1 by proposing the strategic, IT-related, and organisational factors as indicators of strategic, IT, and organisational dynamic capabilities (see Figure 2). Twenty CSFs are included in Figure 2, down from the 23 presented in Table 6, as 3 "repeating" CSFs were consolidated (i.e., those dealing with IT participation and involvement and incentives and rewards). In a general context Kangas (1997) argues that organisational "capabilities are developed by combining and using resources with the aid of organizational routines, which are a specific way of doing what the organization has developed and learned" (p. 972). The following broad definition of business and IT capabilities is drawn from Eisenhardt and Martin (2002) conceptualization of dynamic capabilities and Rockart's (1979) CSF concept: business and IT capabilities are the organisational routines that ensure success in the few key areas where "things must go right" for a KMS implementation. The modified model presented in Figure 2 posits that if an organisation is seeking to implement a KMS successfully, then organisational routines (i.e., dynamic capabilities) must be in place to ensure that each of the CSFs are achieved: The failure to succeed in these key areas may result in the failure to implement a KMS, and/or generate user dissatisfaction with the KMS that influences its subsequent use and effectiveness. This constitutes the model's variance theory prediction. The realization of the CSFs are posited as empirical indicators of related strategic, IT, and organisational capabilities (independent variables); the dependent variable of interest, KMS success, may be measured by knowledge quality, usage, and perceived benefits (i.e., KMS effectiveness, Benbya [2006]) or by measures proposed by Jennex and Olfman (2006) viz. perceived benefit and use/user satisfaction leading to net benefits.

CONCLUSION

The evidence provided from KM practitioners participating in this study indicates that the key to the successful deployment of a KMS draws on a range of closely related factors that operate at all levels and functions within an organisation. Nevertheless, there is evidence from the findings that the successful implementation of a KMS does not guarantee ongoing success in the use of the KMS. Indeed, user satisfaction with an implemented KMS may be associated with a lack of success in pre-implementation activities; for example, one of the organisations studied decided not to undertake formal, intensive user training, with poor outcomes for subsequent KMS use.

The findings of this study permitted the theoretical model presented in Figure 1 to be refined and extended to that illustrated in Figure 2. It is significant for the model's validity and the practical relevance of its associated framework (Tables 2-4 and 6) that it was the focus of debate in each of the 15 interviews conducted.

Figure 2. A critical success factors and capabilities-based model of KMS implementation



KM practitioner feedback helped confirm and identify "collective" CSFs for the successful implementation of KMS. The empirical data suggested the inclusion of additional factors not delineated in the original model; accordingly, these were presented in Table 6 and integrated into the refined model in Figure 2. It is significant that the CSFs identified herein confirm and extend those reported in recent studies (see, for example, Jennex and Olfman, 2004, 2006; Lam and Chua, 2005), while also capturing those reported in reviews of "traditional" IS implementation (see Kwon & Zmud, 1987). The refined model presented in Figure 2 may, therefore, be employed to guide future research (i.e., be tested and confirmed/elaborated) and inform practice (highlight important factors to KM practitioners) on the challenges faced in implementing KMS.

It is accepted within the CSFs literature that not all factors will exert the same influence on related outcomes; some will exert a stronger influence than others, within and across phenomena of interest. In addition, the collective set of CSFs presented in Table 6 warrant further consideration by practitioners and researchers, as the analysis conducted in the Field Study Findings section, along with previous research on CSFs, indicates that relationships exist between CSFs (cf. Butler & Fitzgerald, 1999). In addition, the implication for the model presented in Figure 2 is that there are also relationships between strategic, IT, and organisational capabilities.

In conclusion, this study identified a range of factors deemed to be critical for the implementation of KMS in organisations. The findings on KMS implementation provide further support for the observation that a number of collective CSFs associated with traditional IS development and implementation hold for the implementation of KMS (compare, for example, the factors identified herein with those articulated by Kwon & Zmud, 1987); this observation is congruent with Chua and Lam's (2005) conclusion that "it is meaningful to draw comparisons between KM project abandonment and IS project abandonment" (p. 738) (cf. Davenport et al., 1998). This is to be expected, as Butler (2003) illustrated that "wicked problems" that beset the development of traditional IS also impact Web-based intranet systems. Thus, researchers into KMS implementation should, perhaps, look beyond the KM literature for solutions to enduring problems in business and IS practice; that said, it is also clear that the implementation of a KMS brings its own particular challenges for business and IS practitioners. The challenge for IS researchers will be to progress research into the design, development, implementation, and use of KMS from the foundations provided by the cumulative body of research in the IS field and not fall prey to the temptation to reinvent the wheel in a research context.

REFERENCES

Alavi, M., & Leidner, D. (1999). Knowledge management systems: Issues, challenges and benefits. *Communications of the Associations for Information Systems, 1*(2), 1-36.

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly, 25*(1), 107-136.

Alavi, M., & Leidner, D. E. (2002). Knowledge management systems: Issues, challenges and benefits. In S. Barnes (Ed.), Knowledge management systems: Theory and practice. London: Thomson Learning.

Benbya, H. (2006). Mechanisms for knowledge management systems effectiveness: Empirical evidence from the silicon valley. In *Proceedings of the Academy of Management Conference* (pp. 1-6).

Bhatt, G. (2001). Knowledge management in organisations: Examining the interaction between technologies, techniques and people. *Journal of Knowledge Management, 5*(1), 68-75.

Butler, T. (2003). An institutional perspective on the development and implementation of intranet- and Internet-based IS. *Information Systems Journal*, *13*(3), 209-232.

Butler, T., Feller, J., Pope, A., Murphy, C., & Emerson, B. (2006, June 12-14). An action research

study on the design and development of core it artifacts for knowledge management systems. In *Proceedings of the 14th European Conference on Information Systems*, University of Göteborg, Sweden.

Butler, T., & Fitzgerald, B. (1999). Unpacking the systems development process: An empirical application of the CSF concept in a research context. *Journal of Strategic Information Systems,* 8, 351-371.

Butler, T., & Murphy, C. (2007). Understanding the design of information technologies for knowledge management in organizations: A pragmatic perspective. *Information Systems Journal, 7*(2), 143-163.

Cavaye, A. L. M. (1995). User Participation in System Development Revisited, *Information and Management* (28), 311-323.

Chervany, N. L. (1973). Discussion comments for empirical studies of management information systems. *Data Base, 5*(2-4), 180-181.

Chua, A. (2004). Knowledge management system architecture: A bridge between KM consultants and technologies. *International Journal of Information Management*, 24, 87-98.

Chua, A., & Lam, W. (2005). Why KM projects fail: A multi-case analysis. *Journal of Knowledge Management, 9*(3), 6-17.

Damodaran, L., & Olphert, W. (2000). Barriers and facilitators to the use of knowledge management systems. *Behaviour and information Technology, 19*(6), 405-413.

Davenport, T. H., De Long, D. W., & Beers, M. C. (1998). Successful knowledge management projects. *Sloan Management Review, 39*(2), 43-57.

Davenport, T. H., & Prusak, L. (1998). Working knowledge: How organisations manage what they know. Boston: Harvard Business School Press.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal, 21*(10/11), 1105-1121.

Gold, H., Malhotra, A., & Segars, H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems, 18*(1), 215-233.

Gray, P. H., & Durcikova, A. (2006). The role of knowledge repositories in technical support environments: Speed versus learning in user performance. *Journal of Management Information Systems, 22*(3), 159-190.

Hackett, B. (2000). *Beyond knowledge management: New ways to work and learn* (Research Rep. No. 1262-00-RR). The Conference Board Inc.

Hansen, M., Nohria, N., & Tierney, T. (1999). What's your strategy for managing knowledge? *Harvard Business Review, 77*(2), 106-116.

Hasanali, F. (2002). *Critical success factors of knowledge management.* Retrieved from http://www.kmadvantage.com/docs/km_articles/Critical_Success_Factors_of_KM.pdf

Hislop, D. (2003). Linking human resource management and knowledge management via commitment: A review and research agenda. *Employee Relations, 25*(2), 182-202.

Holsapple, C., & Joshi, K. (2000). An investigation of factors that influence the management of knowledge in organizations. *Journal of Strategic Information Systems, 9*(2-3), 235-261.

Iivari, J. (1990). Implementability of in-house developed v. application package based information systems. *Data Base*, 1-10.

Iivari, J., & Ervasti, I. (1994). User information satisfaction: IS implementability and effectiveness. *Information & Management*, 27, 205-220.

Jennex, M. E., & Olfman, L. (2004). Assessing knowledge management success/effectiveness models. In *Proceedings of 35th Hawaii International Conference on System, Sciences, HICSS35, IEEE Computer Society* (pp. 1-10).

Jennex, M. E., & Olfman, L. (2006). A model of knowledge management success. *International Journal of Knowledge Management, 2*(3), 51-68.

Kangas, K. (1997). A resource-based analysis of perceived core competencies: Applying the VRIO framework in a case of the Russian trade of a Finnish corporation. In R. Galliers, C. Murphy, S. Carlsson, H. R. Hansen, C. Loebbecke, & R. O'Callaghan (Eds.), *Proceedings of the 5th*

European Conference on Information Systems, (Vol. 2, pp. 965-980).

Kwon, T. H., & Zmud, R. W. (1987). Unifying the fragmented models of information systems implementation. In R. J. Boland & R. A. Hirschheim (Eds.), *Critical issues in information systems research*. New York: John Wiley and Sons.

Lam, W., & Chua, A. (2005). Knowledge management project abandonment: An explanatory examination of root causes. *Communications of the Association for Information Systems*, 16, 723-743.

Malhotra, Y., & Galletta, D. F. (2003). The role of commitment and motivation in knowledge management systems: Theory, conceptualisation and measurement of success. In *Proceedings of the 36th Hawaii Conference on Systems Sciences* (pp. 1-10).

Markus, L., & Robey, D. (1988). Information technology and organisational change: Causal structure in theory and research. *Management Science, 34*(5), 583-598.

Mason, D., & Pauleen, D. (2003). Perceptions of knowledge management: A qualitative analysis. *Journal of knowledge Management, 7*(4), 38-48.

Massey, A. P., Montoya-Weiss, M. M., & O'Driscoll, T. M. (2002). Knowledge management in pursuit of performance: Insights from Nortel Networks. *MIS Quarterly, 26*(3), 269-289.

McDermott, R., & O'Dell, C. (2001). Overcoming cultural barriers to sharing knowledge. *Journal of Knowledge Management, 5*(1), 76-85.

Moffett, S., McAdam, R., & Parkinson, S. (2003). An empirical analysis of knowledge management applications. *Journal of Knowledge Management, 7*(3), 6-26.

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.

Rockart, J. F. (1979). Chief executives define their own data needs. *Harvard Business Review, 57*(2), 81-93.

Roth, J. (2003). Enabling knowledge creation: Learning from an R&D organization. *Journal of Knowledge Management, 7*(1), 32-48.

Skyrme, D., & Amidon, D. (1997). The knowledge agenda. *Journal of Knowledge Management, 1*(1), 27-37.

Stenmark, D. (2002). Information vs. knowledge: The role of intranets in knowledge management. In *Proceedings of the 35th Hawaii International Conference on System Sciences* (pp. 1-10).

Storey, J., & Barnett, E. (2000). Knowledge management initiates: Learning from failure. *Journal of Knowledge Management, 4*(2), 145-156.

Sunassee, N. N., & Sewry, D. A. (2002). A theoretical framework for knowledge management implementation. In *Proceedings of SAICSIT 2002* (pp. 235-245).

Teng, J. T. C., & Galletta, D. F. (1991). MIS research directions: A survey of researcher's views. *Data Base*, 53-62.

Walsham, G. (1995). Interpretive case studies in IS research: Nature and method. *European Journal of Information Systems, 4*(2), 74-81.

Wheeler, B. C. (2002). NEBIC: A dynamic capabilities theory for assessing net-enablement. *Information Systems Research, 13*(2), 125-146.

Wong, K. Y. (2005). *Industrial Management and Data Systems, 105*(3), 261-279.

Zack, M. H. (1999a). Developing a knowledge strategy. *California Management Review, 41*(3), 125-145.

Zack, M. H. (1999b). Managing codified knowledge. *Sloan Management Review, 40*(4), 45-58.

Zmud, R. W., & Cox, J. F. (1979). The implementation process: A change approach. *MIS Quarterly, 3*(2), 35-43.

ENDNOTE

[1] The approach adopted in this study to identifying CSFs was to cite those that had been explicitly identified as such in the literature and introduce supportive references where identification was implicit.

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