

In Search of the Knowledge Management Practices in Organisations: A Review

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(Received 10 September 2012; Revised 19 December 2012; Accepted 06 January 2013)

Abstract: *There has been extensive research on knowledge and knowledge management (KM) in the past two decades. KM has progressed from an emergent concept to an increasingly common function in industrial enterprises. As evidence of its maturity as an area of academic study, an increasing number of journals devoted to KM have been created. This paper presents a review of the literature addressing the KM concepts, approaches and frameworks, and the factors affecting the KM practices in organisations. The review covers the publicly available KM literature through library catalogue and electronic search over a period from 1997 to 2010. The distribution of KM literature and articles in regard to the scope of the research is presented. It explores the multi-disciplinary nature of KM and discusses the components of the KM process in organisational settings. Several dominant KM approaches, and selected frameworks and models in industrial application domains are also discussed along with the need for future research on investigating the KM competence at both firm's and industry's levels.*

Keywords: *Knowledge management, approaches, frameworks, factors, performance*

1. Introduction

The foundation of organisational competitiveness in the contemporary economy has shifted from tangible resources to knowledge. Organisations are beginning to recognise the need to tap into knowledge assets diffused around the organisation in order to remain agile (Khatibian, Hasan ghohoi pour, and Jafari 2010). Knowledge has now become a kind of strategic resource in enterprises, and therefore, the management of this strategic resource shows its explicit importance (Ho 2009). The ability to create knowledge and interact it with people in organisations has been recognised as a strategic capability (Armistead 1999). Wei, Choy, and Yew (2009) also regard knowledge as the nucleus of global economic transformation and competitive advantage of an organisation.

Knowledge management (KM) is a relatively new and evolving discipline that has garnered interest from both academicians and practitioners (Migdadi 2009; Ma and Yu 2010). This is a strategic management concept drawing from various disciplinary areas (Pillania 2009) and has emerged as a phenomenon with wide-ranging implications for organisational performance and competitiveness (Carneiro 2000; Chourides, Longbottom, and Murphy 2003). There has been an abundance of published research related to KM since the

1990s (Yiu 2006; Serenko and Bontis 2009; Heisig 2009; Ma and Yu 2010). Besides, initiatives carried out by standardisation bodies in Australia (Standards Australia 2001, 2003, 2005), Britain (BSI 2001, 2003a, 2003b, 2005a, 2005b) and Germany (DIN 2006), as well as on the European Level (CEN 2004) have tried to achieve a common understanding about KM.

KM has been gaining momentum as the means toward organisational survival and growth. As investments in various KM initiatives inflate, the call for coherent and comprehensible principles and practices to guide KM implementation efforts has increased (Khatibian, Hasan ghohoi pour, and Jafari 2010). KM implementation remains an enigma and a source of frustration in many organisations irrespective of their size, business nature and locations (Wang and Ahmed 2005). There has been a growing concern about the KM adoption and its impact on performance measurements in organisations (Zack, McKeen, and Satyendra 2009; Pun and Nathai-Balkissoon 2011). This paper explores the KM concepts and practices by examining the recent studies conducted in different countries and published in journals from 1997 to 2010. A review of these articles was made to investigate the state of contemporary KM concepts, various models and frameworks of KM practices, as well as the trends in KM studies.

2. A Review of KM Literature

2.1 Method of literature search

KM research has significantly grown since its inception in the 1990s. However, Maqsood, Walker, and Finegan (2007) argue that researchers and the academic community struggle to explicate a realistic KM philosophy that can be readily put into practice and successfully implemented. KM is an evolving discipline that had become increasingly popular, judging from the large number of papers submitted in the past decade (Yiu 2006; Pun and Nathai-Balkissoon 2011). Despite the wide reach of the discipline, difficulty persists in implementing KM practices within organisations.

Gordon and Grant (2005) performed an analysis of KM literature from 1986 to 2004, and found that the publications were minimal prior to 1996, but began increasing steadily thereafter. Pun and Nathai-Balkissoon (2011) conducted a similar literature search on KM and organisational learning (OL) largely through the use of multiple ProQuest databases spanning the period from 1996 to 2009 and found that there were an uneven dispersion and diverse range of KM/OL applications. The wide-ranging fields indicate that many researchers and practitioners are aware of the theories of KM and OL and have been integrating them into organisational practices.

In order to identify the determinants of KM practices and performance in organisations, an initiative was made to search academic peer-reviewed journal articles in KM and related areas over a period of 1997 to March 2006 initially (Yiu 2006) and then extending to 2010. For the purpose of data acquisition, the scientific publications relevant to KM were investigated. A similar method as advocated by Gordon and Grant (2005) and Pun and Nathai-Balkissoon (2011) was adopted. Online databases, mainly ProQuest (2010) and Emerald Insight (2010), were hired and the search tactics are described as follows:

- The term ‘knowledge management’ was searched in citations and abstracts;
- A review of the categorised list of results was then performed, and the search was narrowed to results in the sub-category ‘Knowledge’, ‘Performance’, ‘Frameworks’, ‘Models’, ‘Tools’ and ‘Factors’;
- Each paper listed from the ProQuest database search

was evaluated for relevance to the objectives of the study i.e. to identify the determinants of KM practices and performance in industries;

- Further searches were performed within the Emerald Insight database to locate academic and scientific journal articles. KM conference documentations and various internet sources were also accessed.

The searches yielded over a thousand articles. With respect to the objectives of the study, each of the articles was examined to ensure that the content was relevant. Many articles had a holistic and/or pragmatic approach to KM while others focused few specific aspects of KM such as processes, policy, performance issues, tools and techniques were also included if they were written in the KM context (Yiu 2006; Yiu, Sankat, and Lewis 2007). Eventually, a total of 588 articles were selected from 82 journals under six categories, namely: Case studies, Conceptual paper, General/ literature review, Research paper, Technical paper, and Viewpoint. In addition, the examination of literature also incorporated materials that were abstracted from other published sources including KM texts, conference proceedings and technical reports.

2.2 Examination of articles by year and categories

All searched journal articles were grouped by their nature according to the classification of articles advocated by Emerald Insight (2010). Table 1 depicts a summary of the article searches by year and categories. It is shown that out of 588 articles, about 55.8 per cent (i.e. 328 articles) were research papers in the KM domains. The second and third largest groups of articles were 84 conceptual papers (i.e. 14.3 per cent) and 71 general/literature review type of papers (i.e. 12.1 per cent), respectively. Record shows that only 9.7 per cent (i.e. 57 articles) were case studies. Both viewpoint (i.e. 28 articles) and technical papers (i.e. 20 articles) together accounted for only 8.1 per cent of article searches over the studied period (i.e. from 1997 to 2010). While examining the 588 journal articles published by year, there has generally been an increasing trend with up-and-down pattern. Throughout the studied period, the trend started from less than 10 articles published in 1997/98 towards the peak of 93 articles in 2008 and 82 articles in 2009. Another 40 publicly available articles in 2010 that fulfilled the search criteria were included.

Table 1. The articles searches by year and categories, 1997-2010

Categories	Numbers of Articles Searched per Year [®]														Total	Percentage (%)
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
1) Case Study	1	-	1	4	-	2	6	2	4	4	11	9	7	6	57	9.7
2) Conceptual Paper	2	3	2	5	-	1	11	10	17	2	12	9	6	4	84	14.3
3) General/Literature Review	2	-	1	3	-	3	8	4	13	6	7	9	9	6	71	12.1
4) Research Paper	3	3	9	12	7	10	34	27	36	23	36	56	52	20	328	55.8
5) Technical Paper	-	-	1	3	5	1	1	1	1	-	-	2	3	2	20	3.3
6) Viewpoint	-	-	-	-	-	2	3	1	3	2	2	8	5	2	28	4.8
Total:	8	6	14	27	12	19	63	45	74	37	68	93	82	40	588	100
Percentage (%):	1.4	1.0	2.4	4.6	2.0	3.2	10.7	7.7	12.6	6.3	11.6	15.8	13.9	6.8	100	

Remarks: [®] Journal articles searched for databases of both Pro Quest (2010) and Emerald Insight (2010)

* Data updated to June 2010.

Table 2 depicts a list of 82 refereed journals in KM and related areas. It showed that the theme-searched articles published in *Journal of Knowledge Management* accounted for some 34.9 percent of searched articles (i.e. 205 papers) for the period, followed by *VINE (The Journal of Information and Knowledge Management)*, i.e., 52 papers, 8.8 per cent), *The Learning Organisation* (i.e., 43 papers, 7.3 per cent) and *Industrial Management and Data Systems* (i.e., 32 papers, 5.4 per cent). These four journals have included some 56.4 per cent of articles in the searched-theme areas. Other more common journals with the numbers of 10-16 KM articles published were *Strategic Direction*, *Business Process Management Journal*, *Management Decision*, *Journal of Manufacturing Technology Management*, and *Kybernetes*.

Besides, a sum of 109 KM articles were published in sixteen journals (i.e. Ref. 10-29 in Table 2) and each of which published 4-9 articles. Another 53 articles were published in 14 journals (i.e. Ref. 30-53) and each of which published 2-3 articles. The rest of 28 articles were published in non-main steam journals (Ref. 54-82). With respect to the diverted nature of 82 journals, it has revealed that KM is multi-disciplinary in nature. With its domains on knowledge identification, acquisition, creation, storage, dissemination, refinement and application, KM cuts across different disciplines and organisational settings from business management, marketing, education management, information and library management, learning organisation, engineering and so on.

Table 2. Searched journal articles in KM and related areas, 1997-2010

Ref	Name of Journals	No. of Articles	Percent (%)
1.	<i>Journal of Knowledge Management</i>	205	34.9
2.	<i>VINE (The Journal of Information and Knowledge Management)</i>	52	8.8
3.	<i>The Learning Organisation</i>	43	7.3
4.	<i>Industrial Management and Data Systems</i>	32	5.4
5.	<i>Strategic Direction</i>	16	2.7
6.	<i>Business Process Management Journal</i>	14	2.4
7.	<i>Management Decision</i>	14	2.4
8.	<i>Journal of Manufacturing Technology Management</i>	12	2.0
9.	<i>Kybernetes</i>	10	1.7
10.	<i>Journal of Intellectual Capital</i>	9	1.5
11.	<i>Journal of Management Development</i>	8	1.4
12.	<i>International Journal of Manpower</i>	7	1.2
13-17.	5 Journals and each with six articles (including: <i>Aslib Proceedings</i> ; <i>Journal of Workplace Learning</i> ; <i>International Journal of Productivity and Performance Management</i> ; <i>Library Management</i> and <i>Measuring Business Excellence</i>)	30	5.1
18-24.	7 Journals and each with five articles (including: <i>Development and Learning in Organisations</i> ; <i>Engineering, Construction and Architectural Management</i> ; <i>European Business Review</i> ; <i>Information Management & Computer Security</i> ; <i>Information Technology and People</i> ; <i>Journal of Enterprise Information Management</i> and <i>Management Research News</i>)	35	6.0
25-29.	5 Journals and each with four articles (including: <i>Benchmarking: An International Journal</i> ; <i>Handbook of Business Strategy</i> ; <i>Human Resource Management International Digest</i> ; <i>International Journal of Quality and Reliability Management</i> ; and <i>Journal of European Industrial Training</i>)	20	3.4
30-36.	7 Journals and each with three articles (including: <i>Business Strategy Series</i> ; <i>European Journal of Marketing</i> ; <i>Journal of Technology Management in China</i> ; <i>Leadership & Organisational Development Journal</i> ; <i>Library Review</i> ; <i>International Journal of Educational Management</i> ; and <i>Managerial Auditing</i>)	21	3.6
37-53.	16 Journals and each with two articles (including: <i>Aircraft Engineering and Aerospace Technology</i> , <i>Construction Innovation</i> ; <i>Employee Relations</i> ; <i>Facilities</i> ; <i>Industrial and Commercial Training</i> ; <i>International Journal of Energy Sector Management</i> , <i>International Journal of Service Industry Management</i> ; <i>International Journal of Operations and Production Management</i> ; <i>Journal of Business Strategy</i> ; <i>Journal of Organisational Change Management</i> ; <i>Journal of Small Business and Enterprise Development</i> ; <i>Management Research Review</i> ; <i>Marketing Intelligence and Planning</i> ; <i>Structural Survey</i> ; <i>Supply Chain Management: An International Journal</i> ; and <i>The Electronic Library</i>)	32	5.4
54-82	Other 28 Journals with an article (including: <i>European Journal of Innovation Management</i> ; <i>Human Humanomics</i> ; <i>International Journal of Emerging Markets</i> ; <i>International Journal of Entrepreneurial Behaviour and Research</i> ; <i>International Journal of Public Sector Management</i> ; <i>International Marketing Review</i> ; <i>Internet Research</i> ; <i>Journal of Business & Industrial Marketing</i> ; <i>Journal of Documentation</i> ; <i>Journal of Engineering, Design and Technology</i> ; <i>Journal of European Training</i> ; <i>Journal of Facilities Management</i> ; <i>Journal of Financial Regulation and Compliance</i> ; <i>Journal of Management History</i> ; <i>Journal of Modelling in Management</i> ; <i>Journal of Systems and Information Technology</i> ; <i>Leadership in Health services</i> ; <i>Library Hi Tech</i> ; <i>Library Management</i> ; <i>Management Development Review</i> ; <i>New Library World</i> ; <i>Online Information Review</i> ; <i>On the Horizon</i> ; <i>Pacific Accounting Review</i> ; <i>Qualitative Market Research: An International Journal</i> ; <i>Records Management Journal</i> ; <i>Team Performance Management</i> ; and <i>The TQM Journal</i>)	28	4.8
Total:		588	100

* Remarks: Data updated to June 2010.

KM is thus a strategic management concept because knowledge is recognised as a key strategic resource and also because, like strategic management, it is a unifying concept drawing from various disciplinary areas like information systems, human resource management, economics, operations management (Yiu 2006; Pillania 2009). The wide-ranging fields indicate that many researchers and practitioners are aware of the theories of KM and have been integrating them into organisational practices. Nevertheless, most of the literature on KM and its application has, until recently, been centered on large organisations. Pertinent issues in small businesses have to a large extent been neglected. However, Wong and Aspinwall (2005) argue that small businesses do not necessarily share the same characteristics and ideals as large ones. There are certain unique features of small businesses that need to be understood before KM is implemented in their environment.

The literature search findings show that a majority of selected articles categorised as ‘research’ type fell into empirical studies. Other articles were conceptual or theoretical in nature, and were geared towards the development of theories related to KM practices. The ensuing sections present the findings from the review, and discuss their implications on the KM adoption and performance measurements in organisations. These include: 1) the notion of knowledge, 2) the concepts of KM, 3) historical developments of KM, 4) the KM process and components, 5) the approaches of KM adoption and implementation, and 6) some KM frameworks in applications.

3. Notion of Knowledge

The term ‘knowledge’ signifies an area of conflict for many years. Diakoulakis et al (2004) contend that this is attributable to the existence of resemblant concepts, such as data and information, which can easily approximate some forms of knowledge. Knowledge as defined by the Oxford Dictionary is familiarity gained by experience. It is product of human reflection and experience, while data is raw observations of the past, the present or the future and information is the pattern(s) that individuals instil on data (Davenport 1997). It is generally accepted that there is a hierarchical relationship between data, information, knowledge, and wisdom, with data seen as a primary or raw form, information being a processed form that gives usefulness to data, and knowledge being the result of judicious application of information (Bajaria 2000; Rowley 2006).

Polyani (1958) firstly defined tacit and explicit categorisations of knowledge. According to Roth (2003), knowledge has two dimensions; firstly, it exists on the individual, group and organisational levels of a firm; and secondly, it is either explicit or tacit. Explicit knowledge is observable and can be embedded in tools, processes and rules. This type of knowledge is more tangible and can be found in written documents. For instance, some of

the knowledge involved in the use and improvement of technologies can be written down in detail in procedures manuals and use instructions (Gupta, Iyer, and Aronson 2000). On the other hand, tacit knowledge is difficult or impossible to be articulated in written documents (Herschel, Nemati, and Steiger 2001), and is tacitly transmitted and learned (Carneiro 2000). Tacit knowledge resides innately in people and tends to be embedded by way of their experiences, values, intuition, values, and contextual information (Davenport and Prusak 1998; Gupta, Iyer, and Aronson 2000). This type of knowledge is highly subjective and difficult to capture or convey in a straightforward manner.

In its most basic form, knowledge can be thought of as information that is “contextual, relevant and actionable” (Bose 2004). Knowledge allows the making of predictions, casual associations, or descriptive decisions about what to do (del-Rey-Chamorro et al 2003). Beyond the ascertainment of the proper terminology about knowledge, Nonaka and Takeuchi (1995) contend that a thorough analysis of all possible types of conversion between tacit and explicit knowledge is useful as this fact plays a critical role in the efficient and effective management of knowledge at an organisational level. There are conflicting opinions about the role and value of knowledge in organisations, with some supporting the view that knowledge is an ‘object’ for capture and transfer, and others proposing that knowledge must be managed as a process as it is impacted by people and systems within the organisations (Hara and Schwen 2006).

Knowledge is complex, multidimensional and gleaned and imparted in different ways to different people (Bose 2004). In organisations, knowledge often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms. In other words, corporate culture, best practices, core competencies, skills, or strategic visions are critical parts of the total stocks of knowledge in an organisation (Bose 2004; Diakoulakis et al 2004). It becomes essential to continue developing and managing company’s knowledge in order to keep abreast of continuing change from the internal and external environment (Davenport and Prusak 1998) and to gain advantages (Lee 2000).

4. KM and Its Historical Developments

4.1 The KM Concepts

Knowledge management is both a science and an art (Pun and Nathai-Balkissoon 2011). Sallis and Jones (2002) regard KM as a systematic method for managing individual, group and organisational knowledge using the appropriate means and technology. Lytras and Pouloudi (2003) describe KM as a holistic approach to management studies and practice. Hung et al (2005) regard KM as a managerial activity that develops, transfers, transmits, stores and applies knowledge.

According to Malhotra (2005), KM embodies organisational processes that seek synergistic combination of data and information-processing capacity of information technologies, and the creative and innovative capacity of human beings. KM continues to evolve as a discipline, yet even basic features that define a discipline have to be established (Cavaleri 2004, 2008).

Earl (1999) argues that no universally accepted definition of KM exists despite there is a great deal of interest in it. Some selected connotations of KM in the literature are given in Table 3. The examination of existing definitions of KM shows a wide spectrum of viewpoints ranging from more mechanistic one to more socially orientated.

Table 3. Selected connotations of KM

Authors	Connotations of KM
Wigg (1993)	KM deals with the process of creating value from an organisation's intangible assets.
APQC (1996)	KM is getting the right information to the right people at the right time, helping people create knowledge and sharing and acting on information.
Quintas, Lefrere, and Jones (1997)	KM is to discover, develop, utilise, deliver and adsorb knowledge inside and outside the organisation through an appropriate management process to meet current and future needs.
Davenport, De Long, and Beers (1998)	KM is managing the corporation's knowledge through a systematically and organisationally specified process for acquiring, organising, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to enhance organisational performance and create value.
Liebowitz (1999)	KM is an amalgamation of concepts borrowed from the artificial intelligence/knowledge-based systems, software engineering, business process re-engineering (BPR), human resources management, and organisational behaviour.
Gupta, Iyer, and Aronson (2000)	KM is a process that helps organisations find, select, organise, disseminate and transfer important information and expertise necessary for activities.
Bhatt (2001)	KM is a process of knowledge creation, validation, presentation, distribution and application.
Horwitch and Armacost (2002)	KM is the creation, extraction, transformation and storage of the correct knowledge and information in order to design better policy, modify action and deliver results.
Wong and Aspinwall (2004)	KM is the management of knowledge-related processes or activities, based on realistic resources in order to create competence, value and continual success for the organisation.
Hung et al (2005)	KM is a systemised and integrated managerial strategy, which combines information technology with the organisational process.
Yiu and Sankat (2007)	KM comprises a range of practices used by organisations to identify, create, represent, and distribute knowledge for reuse, awareness and learning.
Pillania (2009)	KM is defined as a systematic, organised, explicit and deliberate ongoing process of creating, disseminating, applying, renewing and updating the knowledge for achieving organisational objectives.
Sbarcea (2010)	KM is an integrated approach of creating, sharing and applying knowledge to enhance organisational productivity, profitability and growth.

Pillania (2009) adds that KM is a comprehensive concept and draws from various disciplines including information systems (IS), information technology (IT) and human resource management (HRM). Malhotra (2005) also argues that KM is concerned with building databases, measuring intellectual capital, building intranets, sharing best practices, leading cultural change, fostering collaboration and creating virtual organisations. Moreover, the concepts of KM are integrally linked with OL (Pemberton and Stonehouse 2000; Bennet and Tomblin 2006), and both play a role in the operation or establishment of a learning organisation (LO) and a chaordic organisation (CO) or chaordic enterprise (CE) (van Eijnatten and Putnik 2004a, 2004b). Review of literature shows that there had been a wider practice of KM/OL integration for the enhancement of organisational performance (Ajmal, Kekale, and Takala 2009; Theriou and Chatzoglou 2009).

McAdam and McCreedy (1999) argue that a rapidly increasing body of knowledge relating to KM covers many different disciplines and areas of interest to academics and practitioners. Nevertheless, there has been a lack of clarity regarding the KM concept for them

(Pillania 2009). For instance, data management, information management, IS/IT, HRM, intellectual property (IP) rights management are all associated with the KM concept. However, they are not KM or cannot be termed as KM. In practice, they serve as facilitating systems/practices and/or just the components of KM process (Yiu 2006; Pillania 2008a, 2008b). For example, KM is used to codify as much tacit knowledge as possible and document into explicit form, so that, if the concerned employee leaves the company, some part of his/her knowledge still remains with the company. However, if the KM concept is used in its true spirit, it can lead to sustainable competitive advantage.

Many studies regard KM as a valuable strategic tool for decision-making (Malhotra 2005). KM is an emerging field that has commanded attention and support from much of the industrial community. It is a trans-disciplinary approach to improving organisational outcomes through maximising the use of knowledge (Standards Australia 2005). With KM as the strategic intent, the current management focus is on how to leverage knowledge faster and better than competitors (Thite 2004). As greater numbers of firms in virtually

every industry sector engage in KM practices, this will likely become a strategic necessity.

4.2 Historical Developments of KM

According to Metaxiotis, Ergazakis, and Psarras (2005), knowledge management has its origins in a number of related business improvement areas, such as business process re-engineering (BPR), total quality management (TQM), information systems (IS) and human resources management (HRM). Pillania (2009) adds that the KM concept historically emerged from three different continents in different ways. The focus of KM in Europe was on measuring intangibles and intangible accounting. The focus in Japan was on creating new knowledge. The focus in the United States (US) was on exploiting existing knowledge and information using information systems. As time passed, the US model became more prominent. For instance, many authors (e.g. Lin and Lee 2005; Shah, Eardley, and Wood-Harper 2007) regard KM as primarily technology-centred and driven.

Moreover, Metaxiotis, Ergazakis, and Psarras (2005) contend that three KM generations could chronologically be identified. During the period of 1990-1995, many initiatives focused on defining KM, investigating the potential benefits of KM for businesses, and designing specific KM projects (Nonaka and Takeuchi 1995; Wiig 2007). First-generation KM was characterised by the development of electronic databases that stored bits of knowledge inputted by employees (Sasson and Douglas 2006). Much research has been focused on the utilisation of digital and electronic technology to capture critical knowledge and integrate KM capabilities in organisations (Lytras and Pouloudi 2003). Besides, progress was on artificial intelligence research in the direction of knowledge representation and storing (Metaxiotis, Ergazakis, and Psarras 2005).

As reflected in literature, KM has moved from being technology dependent in the mid 1990s to a greater emphasis on socialisation in the late 1990s and early 2000s (Sasson and Douglas 2006). The second generation started from the mid 1990s with many corporations setting up new jobs for KM specialists. The different sources of KM became combined and also quickly absorbed to everyday organisational discourse.

During this generation, KM research touched knowledge-definitional issues, business philosophies, systems, frameworks, operations and practices, and advanced technologies (Metaxiotis et al 2003). Besides, this generation emphasised systemic organisational change where management practices, measurement systems, tools and content management needed to be co-developed.

The third generation of KM emerged around the mid-2000s with new insights, practices, methods and results (Paraponaris 2003; Metaxiotis, Ergazakis, and Psarras 2005). The third generation fostered the link between knowing and action with greater integration into the enterprise's philosophy, strategy, goals, practices, systems and procedures.

4.3 The KM Process and Its Components

Recent literature shows that firms use a variety of means and approaches to combine, sort, and process the environmental data to produce timely and relevant information for forming, monitoring, evaluating, and modifying organisational strategy (Carneino 2000; Khatibian, Hasan gholoi pour, and Jafari 2010). In such context, Wong and Aspinwall (2005) contend that KM is an emerging set of organisational design and operational principles, processes, organisational structures, applications and technologies. In particular, knowledge-related processes or activities (or in short, the KM process) are about knowledge creation, validation, presentation, distribution and application activities (Bose 2004; Wong and Aspinwall 2004). Diakoulakis et al (2004) argue that the focus of KM is on the integration and coordination of individuals' knowledge, that is, the appropriate "application/management" of current organisational knowledge, and the "creation" of knowledge. Pillania (2009) adds that KM basically involves three things – knowledge creation, knowledge dissemination and knowledge implementation.

The KM processes are divisible into a number of inter-connected activities that depend on the particular industry, the nature of the firm and the strategy it adopts (Ahmed, Lim, and Zairi 1999; Wang 2002; Wang and Ahmed 2005). Table 4 depicts the eight components of the knowledge value-adding process.

Table 4. Components of the knowledge value-adding process

KM Processes	Descriptions
1. Knowledge Identification	Searching for, and locating new information, ideas and knowledge that are relevant to the organisation.
2. Knowledge Acquisition	Acquiring knowledge identified to be relevant, and absorbing such knowledge in the specific organisational context.
3. Knowledge Codification	Codifying tacit knowledge, categorising knowledge acquired and labelling knowledge.
4. Knowledge Storage	Recording knowledge, retaining and maintaining knowledge, and clearly signposting the knowledge directory.
5. Knowledge Dissemination	Retrieving knowledge stored, making it available to knowledge seekers and users.
6. Knowledge Refinement	Improving, transferring and adapting existing knowledge to changed situations, or using existing knowledge in a new way.
7. Knowledge Application	Putting knowledge into action, utilising knowledge to produce organisational outcomes.
8. Knowledge Creation	Nurturing, seeding and incubating new ideas, and generating new knowledge that leads to major breakthroughs.

Source: Taken from Wang and Ahmed (2005)

According to Diakoulakis et al. (2004), KM is considered to encompass the processes of “retention-systemisation of knowledge”, “sharing-access of knowledge”, “combination-creation of knowledge”, “exploration of the external environment”, “scanning of the internal context” and the “use of knowledge”. The constituent elements are assumed to possess various cause-effect relationships between them, which are all positive but their strength differs significantly. Moreover, the strengths of these relationships vary when examining organisations with divergent characteristics. The causal nature supposed to exist among the KM processes, as presented in Figure 1, has an operational and basically strategic impact on organisations.

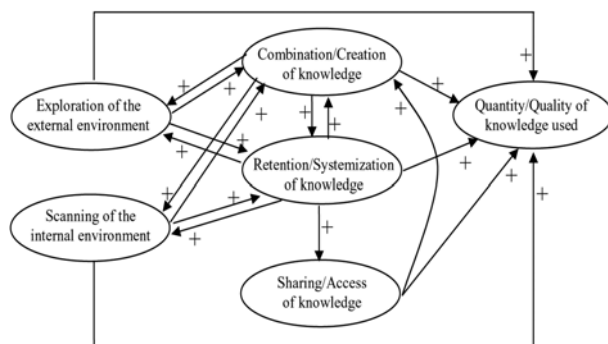


Figure 1. The causal link of the KM process
Source: Taken from Diakoulakis et al (2004)

KM processes depict the primary activities of the KM value adding chain and are inter-linked. In order to ensure effective KM processes, Bose (2004) argues that organisations must dedicate effort to building infrastructures that enhance knowledge systems, knowledge culture, organisational memory, knowledge sharing, and knowledge benchmarking. Diakoulakis et al (2004) add that KM processes and their enabling capabilities do not automatically lead to performance outcomes. Good inter-linkage and alignment of KM processes would underlie the building of enhanced capabilities, and facilitate the delivery of expected performance outcomes (Diakoulakis et al 2004; Wang and Ahmed 2005).

4.4 Factors Affecting KM Practices

Factors underpinning the success of KM can be identified by authors who have researched and written directly on this subject. For instance, Liebowitz (1999) proposed six key ingredients for making KM successful, and suggested the need for a KM strategy with support from senior management, a chief knowledge officer (CKO) or equivalent, a KM infrastructure, knowledge ontologies and repositories, KM systems and tools, incentives to encourage knowledge sharing and a supportive culture.

Lee and Choi (2003) identified seven factors, including collaboration, trust, learning, centralisation, formalisation, skills and IT support that interconnected KM practices. Jennex and Olfman (2004) argued in their study that typical success factors included leadership, investing in people, and developing supporting organisational conditions like technical infrastructure and secured knowledge structure. Besides, Yu, Kim, and Kim (2004) studied a group of 66 Korean firms and found that learning orientation, knowledge-sharing intention, KM system quality, reward, and KM team activity were significantly related to the organisational KM performance. Similarly, Koh, Ryan, and Prybutok (2005) also identified three critical factors, namely 1) strategic alignment and focus; 2) system and data integration; and 3) security and privacy policies.

Another research study conducted by Hariharan (2005) acknowledged that KM would help share knowledge and eliminate reinvention, and proposed seven enablers of KM. These are: 1) strategic focus; 2) alignment with objectives; 3) KM organisation and roles; 4) standard KM processes; 5) culture and people engagement; 6) content under scrutiny; and 7) technology enablement. Moreover, Chong et al (2006) have identified five preliminary success factors for KM implementation and tested them among the Malaysian telecommunication industry. They are business strategy, organisational structure, KM team, K-Map and K-Audit. According to a recent study conducted by Anantatmula and Kanungo (2010), the results show that top management involvement, KM leadership, and the culture of the organisation are the main driving factors based on which one can build a successful KM effort.

The effective implementation of KM is governed and facilitated by certain factors. Organisations can certainly benefit from a more thorough understanding of the factors that are critical to the success of KM. In this context, four categories of KM success factors (namely Environmental/ Market, Company/Operational, People and Technical) are identified (Yiu 2006; Yiu, Sankat, and Lewis 2007). Table 5 contrasts the KM success factors versus related problematic areas under these categories.

5. Frameworks of KM Adoption and Implementation

Reviewing the literature, studies on KM practices have been plentiful, but have varied widely in their location, focus, application and depth (Yiu 2006; Heisig 2009; Pun and Nathai-Balkissoon 2011). Reason and Bradbury (2001) argue that organisations need to assess their KM competence and examine how to integrate both technical and human aspects of knowledge acquisition, development and applications. The implementation of KM requires 1) an organisational strategy, 2) processes to carry out the strategy, and 3) measurements to evaluate how well those processes are working (Bose 2004; Yiu and Sankat 2007).

Table 5. KM success factors versus problematic areas

Categories	KM Success Factors	Related Problematic Areas	References
1. Environmental /Market	1. Accessibility to markets 2. Company location 3. Competitive advantage 4. Market positioning 5. Strategic alliance with business partners	1. Dramatic changes in the marketplace 2. Few current and/or potential markets 3. Few suppliers and/or vendors 4. Local competition 5. Overseas competitors	O'Dell and Grayson 1998; APQC, 1999; Elliott and O'Dell 1999; Gold, Malhotra, and Segars 2001; Lang 2004; Hariharan 2005; Koh Ryan, and Prybutok 2005; Robbins 2005; Yiu, Sankat, and Lewis 2007; Wei, Choy, and Yew 2009; Anantatmula and Kanungo 2010
2. Company/ Operational	6. Availability of funds and capitals 7. Company's culture and mission 8. Company's strategies 9. Costs of production and operation 10. Product and service quality	6. Cash flow problems 7. Conflicting company's goals and strategies 8. Improper management system and procedures 9. Increasing production/ operations costs 10. Inconsistent strategic planning	APQC 1999; Liebowitz 1999; Ryan and Prybutok 2001; Wild, Griggs, and Downing 2002; Moffett, McAdam, and Parkingson 2003a, 2003b; Lee and Choi 2003; Hariharan 2005; Koh, Ryan, and Prybutok 2005; Walczak 2005; Chong, Chong, and Yeow 2006; Yiu, Sankat, and Lewis 2007; Wei, Choy, and Yew 2009; Anantatmula and Kanungo 2010
3. People	11. Management leadership 12. People communication 13. People involvement 14. Positive human dynamic 15. Workforce skills and abilities	11. Low productivity 12. High employee turnover 13. Lack of people training and motivation 14. People's resistance to change 15. Fragmented people efforts	APQC 1999; Verespey 1999; Ryan and Prybutok 2001; Lee and Choi 2003; Moffett, McAdam, and Parkingson 2003a, 2003b; Koh Ryan, and Prybutok 2005; Sarker, Nicholson, and Joshi 2005; Chong, Chong, and Yeow 2006; Yiu, Sankat, and Lewis 2007; Wei, Choy, and Yew 2009; Anantatmula and Kanungo 2010
4. Technical	16. Capturing and creating knowledge 17. Information infrastructure 18. Organisational learning 19. R&D and Innovation capabilities 20. Sharing of knowledge	16. Incomplete knowledge of explicit and tacit data 17. Increasing sophistication of KM technologies 18. Insufficient research and development 19. Lack of appropriate IT supports 20. Unavailability of timely Information	APQC 1999; Elliott and O'Dell 1999; Liebowitz 1999; Ryan and Prybutok 2001; Hsieh, Yang, and Lin 2002; Lee and Hong 2002; Paiva, Roth, and Fensterseifer 2002; Wang 2002; Moffett, McAdam, and Parkingson 2003a, 2003b; Hariharan 2005; Chong, Chong, and Yeow 2006; Yiu, Sankat, and Lewis, 2007; Wei, Choy, and Yew 2009; Anantatmula and Kanungo 2010

Change through successful KM implementation requires a review of the traditional dictum that implementation follows formulation. Having regards the interdisciplinary nature of KM implementation, Dufour and Steane (2007) contend that the multiple processes (i.e., rational, structural, behavioural, and political) are operating concurrently, and the emerging of new theoretical models and practical approaches would invite a fundamental reassessment of KM implementation and the formulation of KM strategy. Maqsood, Walker, and Finegan (2007) conclude that culture, leadership, and vision issues are becoming more important to KM philosophical underpinnings.

According to Weber et al (2002), a framework is defined as a holistic and concise description of the major elements, concepts and principles of a domain. It aims to explain a domain and define a standardised schema of its core content as a reference for future design implementations. A KM framework explains the world of KM by naming the major KM elements, their relationships and the principles of how these elements interact. It provides the reference for decisions about the implementation and application of KM.

McAdam and McCreedy (1999) conducted a critical review of KM frameworks/models, and classified them into three main categories, namely intellectual capital

models, knowledge category models, and socially constructed models for the KM process (Demarest 1997). Malhotra (2005) contends that there are two main categories of KM frameworks, namely 'technology-push' versus 'strategy-pull' models. The focus of the technology-push model is on mechanistic information processing that relies upon a single-loop response to received stimulus, while the strategy-pull model has built in double-loop process that facilitates organic sense making in organisations (Malhotra 2001, 2005).

Heisig (2009) conducted a quantitative and qualitative analysis of 160 KM frameworks from different origins worldwide. These frameworks are published in the scientific literature, presented at specialised conferences or used in knowledge management initiatives by companies from 1998 to 2003. The result shows that despite the wide range of terms used in the KM frameworks an underlying consensus was detected regarding the basic categories used to describe the KM activities and the critical success factors of KM. Moreover, Pun and Nathai-Balkissoon (2011) reviewed 18 studies reported in publicly available journals from 1996 to 2009 and studied 14 KM/OL frameworks and models, focusing on recognition of major approaches and contributions of KM and OL practices in industry. Systems approaches,

culture, and the LO and CO/CE concepts are among the most popularly cited factors for the development of KM/OL frameworks.

In search of the KM competencies in practices, this paper attempted to review ten (10) selected KM frameworks and models from literature. Table 6 presents a comparison among them with respect to their strengths (or success factors) and weaknesses (or obstacles) in applications. These frameworks and models are:

- 1) Lee (2000)'s Knowledge Sharing Framework –

This framework identifies 5 stages of knowledge requirements experienced by workers depending on their respective stage or 'lifecycle' within a company. It caters to various employee knowledge needs, determines the maturity of a company's knowledge sharing system, and identifies areas for improvement of that system. However, the framework does not provide a guide or any stepwise approach for company to measure/monitor the improvement in KM practice.

Table 6. Comparisons of selected KM frameworks and models, 2000-2010

Author, Year	Model/Framework	Strengths or Success Factors	Weaknesses or Obstacles
Lee (2000)	Knowledge Sharing Framework	· The framework illustrates various employee knowledge needs, determines the maturity of a company's knowledge sharing system, and identifies areas for improvement of that system.	· The framework does not guide a company as to how improvement can be brought about; no stepwise approach proposed.
Szulanski (2000)	Model for Knowledge Transfer	· The collection of empirical data from 122 knowledge transfer processes within 8 firms, and data collected was applied within the model.	· The knowledge transfer processes and factors are subject to further verification of empirical evidence.
Argote, McEvily, and Reagans (2003)	Integrative KM Framework	· The framework stresses the importance of building the integrative relationships between the KM outcomes and context.	· Variations could exist in the interpretation of contents for the framework, and no clear definition of terms to facilitate the analyses.
Siemieniuch and Sinclair (2004)	Process Framework for Knowledge Management	· This is an independently developed framework parallel to the sub-processes of Social Learning Cycle. It promotes acceptability of the framework.	· The process framework is rather complex and may be intimidating to first-time users. More financial demands and guidance are needed from KM experts and consultants.
Diakoulakis et al (2004)	Holistic Knowledge Management Model	· The model raises an innovative approach in strategic thinking, shifting the interest from the processes, the measures and the objectives in isolation to an integrated network of cause-effect relationships, so as to investigate core competencies and develop competitive advantages.	· The cause-effect relationships have to be quantified. The inference process is not a straightforward task, and the related costs of the applied actions/strategies cannot be easily estimated. Some "environmental" factors may be unavoidably excluded.
Zuber-Skerritt (2005)	Personal Knowledge Management Model	· This Action research approach recognises personal learning that impacts organisational KM. and promotes application of a systematic approach to knowledge capture, documentation, and sharing.	· The emphasis of action learning approaches looks intensively at situations, practices, and outcomes. The application of this approach would limit work to one or a very few cases at a time.
de Barros Campos (2008)	Knowledge Life Cycle Model	· The double-loop process begins with a problem leading to a solution attempt, which is then tested, evaluated, and possibly refuted so as to eliminate errors. New knowledge is generated for the purpose of adjustment to actions. New problems motivate other cycles and the continuous re-evaluation of knowledge.	· The process does not present problems. The same does not occur in double-loop learning, when error correction calls for adjustment of norms, strategies, and presuppositions.
Mahmoodzadeh Jalalnia, and Nekui Yazdi (2009)	KM-Business Process Outsourcing Framework	· The framework focuses on BPO and its lifecycle and risks. It helps reduce the risks and pitfalls of BPO as evidenced in the case company.	· There is a lack of empirical evidence to validate the pragmatism and applicability of the framework.
Kang and Kim (2010)	Integrative Framework on KM and NPD	· The framework explains the interaction between tacit and explicit knowledge and how knowledge is created, and allows business practitioners to better understand complex cross-functional activities and to focus their resources for NPD.	· The applicability of the framework needs further verification of empirical evidence.
Massingham (2010)	Knowledge Risk Management Framework	· The framework has 3 steps. Step 1 calculates the level of risk associated with each of the organisation's main activities. Step 2 calculates the level of risk associated with the knowledge necessary to manage the risk factors for each activity. Step 3 prioritises risks for action.	· This is a conceptual framework. Its application needs further verification of empirical evidence.

2) Szulanski (2000)'s Model for Knowledge Transfer – This identifies various stages of knowledge transfer and factors affecting ease of transfer at each stage. This is a structured model comprised of a comprehensive list of 122 identifiable processes of knowledge transfer in different stages. However, these knowledge transfer processes and factors are subject to verification of empirical evidence.

3) Argote, McEvily, and Reagans (2003)'s Integrative KM Framework – There are two dimensions advocated in the framework. The first dimension deals with the KM outcomes (namely, knowledge creation, retention, and transfer), while the second deals with the KM context (i.e., individuals, groups or organisations). The framework stresses the importance of building the relationships between the KM outcomes and context. However, variations could exist in the interpretation of integrative contents for the framework, and no clear definition of terms to facilitate the analyses.

4) Siemieniuch and Sinclair (2004)'s Process Framework for Knowledge Management – This is a four-stage framework that assists companies in managing knowledge across multiple projects. Three categories of knowledge are considered within projects (i.e., intra-project), between projects (i.e., inter-project), and across sectors (i.e., cross-sectoral). It defines KM problems empirically and helps organisations to address them. This is an independently developed framework parallel to the sub-processes of Social Learning Cycle. However, more guidance from KM experts and consultants is needed that helps users to work along with the four-stage methodology.

5) Diakoulakis et al (2004)'s Holistic Knowledge Management Model – This identifies the use of systems thinking logic to examine structures underlying complex phenomena and consolidate the various KM approaches. The model draws its strengths on the development of an integrated network of cause-effect relationships that could help determine core competencies and develop competitive advantages. However, the inference process is not a straightforward task. Some “environmental” factors may be unavoidably excluded in quantifying the relationships during the process.

6) Zuber-Skerritt (2005)'s Personal Knowledge Management Model – This is an action learning and action research model which links values and action approaches, and promotes personal-level learning. The model recognises seven (7) types of personal knowledge through reflection, collaboration, feedback and teamwork, visioning, openness to self-criticism, learning from others, and recognition and celebration. The strengths of the model are to recognise personal learning that impacts organisational KM, and encourages action learning whereby people interact, share, and learn from one another's actions and experiences, and reflect on what is learned. However, its weakness lies significantly on the constraints of action learning that would limit work to one or a very few cases at a time.

7) de Barros Campos (2008)'s Knowledge Life Cycle Model – This model envisages a double-loop Decision Execution Cycle (DEC) that is composed of planning, acting, monitoring, and evaluation stages. The double-loop process begins with a problem leading to a solution attempt, which is then tested, evaluated, and possibly refuted to eliminate errors. Adopting this model could generate new knowledge for the purpose of adjustment to actions. New problems motivate other cycles and the continuous re-evaluation of knowledge. However, the process itself does not identify or present problems. The same does not occur in double-loop learning, when error correction calls for adjustment of norms, strategies, and presuppositions.

8) Mahmoodzadeh, Jalalinia, and Nekui Yazdi (2009)'s KM-Business Process Outsourcing (BPO) Framework – This provides a pragmatic BPO methodology with KM for performing each step of BPO lifecycle and reducing associated risks and pitfalls. The framework focuses on BPO and its lifecycle and associated risks, and helps reduce them as evidenced in the case company. However, there is a lack of empirical evidence to validate the applicability of the framework.

9) Kang and Kim (2010)'s Integrative Framework on KM and NPD – This explains the interaction between tacit and explicit knowledge and how knowledge is created, and allows business practitioners to better understand complex cross-functional activities and to focus their resources for new product development (NPD). The major strength of the framework is of its integrative nature without losing distinctive features of KM and NPD. However, its applicability is subject to verification of empirical evidence.

10) Massingham (2010)'s Knowledge Risk Management Framework – This framework intersects risk management (RM) with KM, and addresses the problem of environmental complexity by using KM tools and techniques to reduce uncertainty and make the risk “learnable”. It has 3 distinct steps. Step 1 calculates the level of risk associated with each of the organisation's main activities. Step 2 calculates the level of risk associated with the knowledge necessary to manage the risk factors for each activity, and Step 3 prioritises risks for action. However, this conceptual framework lacks of evidences on its pragmatism in industry applications.

It was found that conceptual knowledge transfer, knowledge acquisition and creation, and learning models underlie much of the work being done in the field. Despite being holistic in nature, most of these KM frameworks and models tend to emphasise different aspects of KM. Some frameworks focus on the knowledge cycle (e.g., Siemieniuch and Sinclair 2004; de Barros Campos 2008), and integrate with other management disciplines/processes, such as BPO (Mahmoodzadeh, Jalalinia, and Nekui Yazdi 2009), NPD (Kang and Kim 2010), and RM (Massingham 2010). Several KM frameworks were sought to capture the way that knowledge processes worked in very narrow fields

such as knowledge acquisition and knowledge supply (e.g. Lee 2000) or specific knowledge process (e.g. Szulanski 2000). The majority of KM frameworks do not address in an equal way on technical aspects (such as technology and organisational structures) versus non-technical aspects (such as culture and human resources management).

Moreover, conceptual knowledge transfer (Lee 2000) and learning models (Argote, McEvily, and Reagans 2003; Diakoulakis et al 2004; Siemieniuch and Sinclair 2004; Zuber-Skerritt 2005) underlie considerable amount of the recent work in KM, regardless of the specifics of practice, sector, or country. Many authors (e.g., Diakoulakis et al 2004; de Barros Campos 2008; Massingham 2010) also indicate the need for further research on several fronts, to conceptually propose and/or empirically investigate how KM could be encouraged or maximised. The identification of the strengths and weaknesses/obstacles of these models/frameworks could help derive a host of determinants (or enablers) for KM practices.

7. Discussions and Conclusion

Nowadays, many industry leaders are engaging in KM in order to leverage knowledge both within their organisation, and externally, to their shareholders and customers. The embedding and embracing of KM within an organisation requires attention to objectives, types of knowledge, technologies, and organisational roles.

Okes (2005) advocates that questions to be addressed in KM include: 1) what knowledge is critical to the organisation? 2) Where and how does the organisation gain that knowledge? 3) What does the organisation do with it? 4) How is it used, distributed and stored? 5) To whom does the organisation go for help, and who comes to the organisation for help? and 6) what metrics are used to track the management of knowledge? The challenges for today's organisations are to 1) match and align performance measures with business strategy, structures and corporate culture, 2) deploy the measures so that the results are used and acted upon, and 3) integrate KM with performance measurement (PM) to attain sustainable competitive performance (del-Rey-Chamorro et al 2003; Pun and White 2005). Without measurable success, enthusiasm and support for KM is unlikely to continue. Bose (2004) contends that the best and most logical approach to measuring the impact of KM on an organisation's performance is to tie-in measurement of KM with the organisation's overall PM systems. However, it has not been unusual to find many of these systems sending confusing and occasionally contradictory signals to organisations (Kennerley and Neely 2002).

There had been an increasing trend of publications with less than ten (10) articles in 1997/98 towards 93 and 82 articles in 2008 and 2009, respectively. Of 588 searched articles in 82 journals, research papers have

been dominating the scene, followed by conceptual papers and general/literature reviews. The diverted nature of journals has revealed that KM is multi-disciplinary in nature and cuts across different disciplines and organisational settings. Core themes of KM process relate to: 1) the creation of knowledge repositories; 2) the improvement of knowledge acquisition; 3) the enhancement of the knowledge environment; and 4) the management of knowledge as an asset. This paper also reports the review of common approaches and frameworks/models that govern KM adoption and implementation in organisations. Some studies have forwarded the call for systems integration and organisational effectiveness. The findings provide an understanding of implementation from a holistic perspective, which allows divergent paradigms and perspectives to co-exist.

This paper sheds an effort on reviewing KM literature that leads to a clarification of the ways in which the field of KM can yield synergistic results in organisations, and an appreciation of further avenues for studies that can benefit the field of KM. Reviews show that the impact of KM on an organisation's performance is strongly tied to the ability of an organisation to identify where KM will be of most value. The future usage of KM is heavily dependent on both the quality of the metrics and whether output generated by these metric management would provide tangible value addition to the organisations. This necessitates research efforts to investigate the determinants of KM practices, examine the effectiveness of various measures on organisational performance, and devise an integrated paradigm that aligns KM to performance measures with validation of empirical evidences and results at both firm's and industry's levels.

References:

- Ahmed, P.K., Lim, K.K. and Zairi, M. (1999), "Measurement practice for knowledge management", *Journal of Workplace Learning*, Vol.11, No.8, pp.304-311.
- Ajmal, M.M., Kekale, T. and Takala, J. (2009), "Cultural impacts on knowledge management and learning in project-based firms", *VINE*, Vol.39, No.4, pp. 339-352.
- Anantatmula, V.S. and Kanungo, S. (2010), "Modeling enablers for successful KM implementation", *Journal of Knowledge Management*, Vol.14, No.1, pp.100-113.
- APQC (1996), *The Knowledge Management Assessment Tool: External Benchmarking Version*, The American Productivity and Quality Center/Arthur Andersen Business Consulting, Houston, TX
- APQC (1999), *Knowledge Management: Executive Summary, Consortium Benchmarking Study Best-Practice Report*, The American Productivity and Quality Center, Houston, TX
- Argote, L., McEvily, B. and Reagans, R. (2003), "Managing knowledge in organisations: An integrative framework and review of emerging themes", *Management Science*, Vol.49, No.4, pp.571-582.
- Armistead, C. (1999), "Knowledge management and process performance", *Journal of Knowledge Management*, Vol.3, No.2, pp.143-157.
- Bajaria, H.J. (2000), "Knowledge creation and management:

- Inseparable twins”, *Total Quality Management*, Vol.11, No.4/5/6, pp. 562-657.
- Bennet, A., and Tomblin, M.S. (2006), “A learning network framework for modern organisations: Organisational learning, knowledge management and ICT support”, *VINE*, Vol.36, No.3, pp.289-303.
- Bhatt, G.D. (2001), “Knowledge management in organisations: Examining the interaction between technologies, techniques, and people”, *Journal of Knowledge Management*, Vol.5, No.1, pp.68-75.
- Bose, R. (2004), “Knowledge management metrics”, *International Journal of Technology Management*, Vol.24, No.4, pp.457-468.
- BSI (2001), *PAS 2001:2001 Knowledge Management*, British Standards Institution, London
- BSI (2003a), *PD 7502:2003 Guide to Measurements in Knowledge Management*, British Standards Institution, London
- BSI (2003b), *PD 7501:2003 Managing Culture and Knowledge: Guide to Good Practice*, British Standards Institution, London
- BSI (2005a), *PD 7504:2005 Knowledge Management in the Public Sector: A Guide to Good Practice*, British Standards Institution, London
- BSI (2005b), *PD 7506: 2005 Linking Knowledge Management with Other Organisational Functions and Disciplines: A Guide to Good Practice*, British Standards Institution, London
- Carneiro, A. (2000), “How does knowledge management influence innovation and competitiveness?” *Journal of Knowledge Management*, Vol.4, No.2, pp.87-89.
- Cavaleri, S.A. (2004), “Principles for designing pragmatic knowledge management systems”, *The Learning Organisation*, Vol.11, No.4/5, pp.312-321.
- Cavaleri, S.A. (2008), “Are learning organisations pragmatic?” *The Learning Organisation*, Vol.15, No.6, pp.474-485.
- CEN (2004), *European Guide to good Practice in Knowledge Management. CWA 14924, Parts 1-5*, European Committee for Standardisation, Brussels
- Chong, C. ., Chong, S.C. and Yeow, P.H.P. (2006), “KM implementation in Malaysian telecommunication industry: An empirical analysis”, *Industrial Management and Data Systems*, Vol.106, No.8, pp.1112-1132.
- Chourides, P., Longbottom, D. and Murphy, W. (2003), “Excellence in knowledge management: An empirical study to identify critical factors and performance measures”, *Measuring Business Excellence*, Vol.7, No.2, pp.29-45.
- Davenport, T., De Long, D. and Beers, M. (1998), “Successful knowledge management projects”, *Sloan Management Review*, Vol.39, No.2, pp.43-57.
- Davenport, T.H. (1997), *Information Ecology: Mastering the Information and Knowledge environment*, Oxford University Press, New York, NY
- Davenport, T.H. and Prusak, L. (1998), *Working Knowledge: How Organisations Manage What They Know*, Harvard Business School Press, Boston
- de Barros Campos, L.F. (2008), “Analysis of the new knowledge management: Guidelines to evaluate KM frameworks”, *VINE*, Vol.38, No.1, pp.30-41.
- del-Rey-Chamorro, F. M., Roy, R., van Wegen, B. and Steele, A. (2003), “A framework to create key performance indicators for knowledge management solutions”, *Journal of Knowledge Management*, Vol.7, No.2, pp.46-62.
- Demarest, M. (1997), “Understanding knowledge management”, *Long Range Planning*, Vol.30, No.3, pp.374-384.
- Diakoulakis, I.E., Georgopoulos, N.B., Koulouriotis, D.E. and Emiris, D.M. (2004), “Towards a holistic knowledge management model”, *Journal of Knowledge Management*, Vol.8, No.1, pp.32-46.
- DIN (2006), *DIN PAS 1063: 2006-07 Implementing Knowledge Management in Networks of Small to Medium-sized Enterprises*, Beuth-Verlag, Berlin
- Dufour, Y. and Steane, P. (2007), “Implementing knowledge management: A more robust model”, *Journal of Knowledge Management*, Vol.11, No.6, pp.68-80.
- Earl, M.J. (1999), “Opinion: What is a chief knowledge officer?” *Sloan Management Review*, Vol.40, No.2, pp.29-38.
- Elliott, S. and O'Dell, C. (1999). “Sharing knowledge and best practices: The hows and whys of tapping your organisation’s hidden reservoirs of knowledge”, *Health Forum Journal*, Vol.42, No.3, pp.34-37.
- Emerald Insight (2010), *Emerald Insight*. <http://www.emeraldinsight.com/Insight/> [Accessed 01.03.2010]
- Gold, A.H., Malhotra, A. and Segars, A.H. (2001), “Knowledge management: An organisational capabilities perspective”, *Journal of Management Information Systems*, Vol.18, No.1, pp.185-214.
- Gordon, R. and Grant, D. (2005), “Knowledge management or management of knowledge? Why people interested in knowledge management need to consider Foucault and the construct of power”, *Tamara: Journal of Critical Postmodern Organisation Science*, Vol.3, No.2, pp.27-38.
- Gupta, B., Iyer, L.S. and Aronson, J.E. (2000), “Knowledge management: Practices and challenges”, *Industrial Management and Data Systems*, Vol.100, No.1, pp.17-21.
- Hara, N. and Schwen, T.M. (2006), “Communities of practice in workplaces: Learning as a naturally occurring event”, *Performance Improvement Quarterly*, Vol.19, No.2, pp.93-114.
- Hariharan, A. (2005), “Implementing seven KM enablers at Bharti”, *Knowledge Management Review*, Vol.8, No.3, pp. 8-9.
- Heisig, P. (2009), “Harmonisation of knowledge management: Comparing 160 KM frameworks around the globe”, *Journal of Knowledge Management*, Vol.13, No.4, pp. 4-31.
- Herschel, R.T., Nemati, H. and Steiger, D. (2001), “Tacit to explicit knowledge conversion: Knowledge exchange protocols”, *Journal of Knowledge Management*, Vol.5, No.1, pp.107-116.
- Ho, C-T. (2009), “The relationship between knowledge management enablers and performance”, *Industrial Management and Data Systems*, Vol.109, No.1, pp. 98-117.
- Horwitch, M. and Armacost, R. (2002), “Helping knowledge management be all it can be”, *Journal of Business Strategy*, Vol.23, No.3, pp.26-32.
- Hsieh, C., Yang, H. and Lin, B. (2002), “Roles of knowledge management in online procurement systems”, *Industrial Management and Data Systems*, Vol.102, No.7, pp. 65-70.
- Hung, Y.C., Huang, S.M., Lin, Q.P. and Tsai, M.L. (2005), Critical factors in adopting a knowledge management system for the pharmaceutical industry”, *Industrial Management and Data Systems*, Vol.105, No.2, pp.164-183.
- Jennex, M.E. and Olfman, L. (2004), “Accessing knowledge management success/ effectiveness models”, In: *Proceedings of the 37th Hawaii International Conference on System Sciences*. Waikoloa Village, HI.
- Kang, S-W. and Kim, S-W. (2010), “Integrative framework on knowledge management and new product development”, *The Asian Journal on Quality*, Vol.11, No.2, pp.157-164.
- Kennerley, M. and Neely, A. (2002), “A framework of the factors affecting the evolution of performance measurement systems”, *International Journal of Operations and Production Management*, Vol.22, No.11, pp.1222-1245.
- Khatibian, N., Hasan ghooli pour, T. and Jafari, H.A. (2010), “Measurement of knowledge management maturity level within organisations”, *Business Strategy Series*, Vol.11, No.1, pp.54-70.
- Koh, E.C., Ryan, S. and Prybutok, V.R. (2005), “Creating value through managing knowledge in an e-government to constituency (G2C) environment”, *The Journal of Computer Information Systems*, Vol.45, No.4, pp.32-41.
- Lang, J.C. (2004), “Social context and social capital as enablers of

- knowledge integration”, *Journal of Knowledge Management*, Vol.8, No.3, pp. 89-105.
- Lee, H. and Choi, B. (2003), “Knowledge management enablers, processes, and organisational performance: An integrative view and empirical examination”, *Journal of Management Information Systems*, Vol.20, No.1, pp.179-189.
- Lee, J. Sr. (2000), “Knowledge management: the intellectual revolution”, *IIE Solutions*, Vol.32, No.10, pp.34-37.
- Lee, S.M. and Hong, S. (2002), “An enterprise-wide knowledge management system infrastructure”, *Industrial Management and Data Systems*, Vol.102, No.1/2, pp.17-25.
- Liebowitz, J. (1999), “Key ingredients to the success of an organisation's knowledge management strategy”, *Knowledge and Process Management*, Vol.6, No.1, pp. 37-40.
- Lin, H-F. and Lee, G-G. (2005), “Impact of organisational learning and knowledge management factors on e-business adoption”, *Management Decision*, Vol.43, No.2, pp.171-188.
- Lyras, M.D. and Pouloudi, A. (2003), “Project management as a knowledge management primer: the learning infrastructure in knowledge-intensive organisations: Projects as knowledge transformations and beyond”, *The Learning Organisation*, Vol.10, No.4, pp.237-250.
- Ma, Z. and Yu, K.H. (2010), “Research paradigms of contemporary knowledge management studies: 1998-2007”, *Journal of Knowledge Management*, Vol.14, No.2, pp.175-189.
- Mahmoodzadeh, E., Jalalinia, S. and Nekui Yazdi, F. (2009), “A business process outsourcing framework based on business process management and knowledge management”, *Business Process Management Journal*, Vol.15, No.6, pp.845-864.
- Malhotra, Y. (2005), “Integrating knowledge management technologies in organisational business processes: Getting real enterprises to deliver real business performance”, *Journal of Knowledge Management*, Vol.9, No.1, pp.7-28.
- Maqsood, T., Walker, D.H.T. and Finegan, A.D. (2007), “Facilitating knowledge pull to deliver innovation through knowledge management: A case study”, *Engineering, Construction and Architectural Management*, Vol.14, No.1, pp.94-109.
- Massingham, P. (2010), “Knowledge risk management: A framework”, *Journal of Knowledge Management*, Vol.14, No.3, pp.464-485.
- McAdam, R. and McCreedy, S. (1999), “A critical review of knowledge management models”, *The Learning Organisation*, Vol.6, No.3, pp.91-101.
- Metaxiotis, K., Ergazakis, K., Samouilidis, E. and Psarras, J. (2003), “Decision support through knowledge management: The role of the artificial intelligence”, *International Journal of Computer Applications in Technology*, Vol.19, No.2, pp.101-106.
- Metaxiotis, K., Ergazakis, K. and Psarras, J. (2005), “Exploring the world of knowledge management: Agreements and disagreements in the academic/practitioner community”, *Journal of Knowledge Management*, Vol.9, No.2, pp.6-18.
- Migdadi, M. (2009), “Knowledge management enablers and outcomes in the small-and-medium sized enterprises”, *Industrial Management and Data Systems*, Vol.109, No.6, pp.840-858.
- Moffett, S., McAdam, R. and Parkinson, S. (2003a), “Technology and people factors in KM: An empirical analysis”, *Total Quality Management*, Vol.14, No.2, pp.215-224.
- Moffett, S., McAdam, R. and Parkinson, S. (2003b), “An empirical analysis of knowledge management applications”, *Journal of Knowledge Management*, Vol.23, No.3, pp. 6-26.
- Nonaka, I. and Takeuchi, H. (1995), *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, Oxford University Press, New York.
- O'Dell, C. and Grayson, J. (1998), “If only we knew what we know: Identification and transfer of internal best practices”, *California Management Review*, Vol.40, No.3, pp.154-165.
- Okes, D. (2005), “Corral your organisation's knowledge”, *Quality Progress*, October, pp.25-30.
- Paiva, E.L., Roth, A.V. and Fensterseifer, J.E. (2002), “Focusing information in manufacturing: A knowledge management perspective”, *Industrial Management and Data Systems*, Vol.102, No.9, pp.381-389.
- Paraponaris, C. (2003), “Third generation R&D and strategies for knowledge management”, *Journal of Knowledge Management*, Vol.7, No.5, pp.96-106.
- Pemberton, J.D. and Stonehouse, G.H. (2000), “Organisational learning and knowledge assets: An essential partnership”, *The Learning Organisation*, Vol.7, No.4, pp.184-193.
- Pillania, R.K. (2008a), “Information technology strategy for knowledge management in SMEs”, *Knowledge and Process Management*, Vol.15, No.3, pp.203-210.
- Pillania, R.K. (2008b), “Knowledge protection in Indian software industry”, *International Journal of Knowledge and Systems Science*, Vol.5, No.4, pp.11-19.
- Pillania, R. K. (2009), “Demystifying knowledge management”, *Business Strategy Series*, Vol.10, No.2, pp. 96-99.
- Polyani, M. (1958), *Personal Knowledge*, University of Chicago Press, Chicago.
- ProQuest (2010) *ProQuest*, available at: <http://www.proquest.co.uk/en-UK/> [Accessed on 07.06.2010]
- Pun, K.F. and White, A.S. (2005), “A performance measurement paradigm for integrating strategy formulation: A review of systems and frameworks”, *International Journal of Management Reviews*, Vol.7, No.1, pp.25-46.
- Pun, K.F. and Nathai-Balkissoon, M. (2011), “Integrating knowledge management into organisational learning: A review of concepts and models”, *The Learning Organisation*, Vol.18, No.3, pp.203-223.
- Quintas, P., Lefrere, P. and Jones, G. (1997), “Knowledge management: A strategic agenda”, *Long Range Planning*, Vol.30, No.3, pp.385-391.
- Reason, P. and Bradbury, H. (2001), *Handbook of Action Research: Participative Inquiry and Practice*, Sage Publications, London.
- Robbins, S. (2005), “We need a new vocabulary”, *Information Systems Management*, Vol.22, No.1, pp. 89-90.
- Roth, J. (2003), “Enabling knowledge creation: Learning from an R&D organisation”, *Journal of Knowledge Management*, Vol.7, No.1, pp.32-48.
- Rowley, J. (2006), “What do we need to know about wisdom?”, *Management Decision*, Vol.44, No.9, pp.1246-1257.
- Ryan, S.D., and Prybutok, V.R. (2001), “Factors affecting knowledge management technologies: A discriminative approach”, *Journal of Computer Information Systems*, Vol.41, No.3, pp.31-37.
- Sallis, E. and Jones, G. (2002), *Knowledge Management in Education: Enhancing Learning and Education*, Kogan Page, London.
- Sarker, S., Nicholson, D.B. and Joshi, K.D. (2005), “Knowledge transfer in virtual system development teams”, *IEEE Transactions on Professional Communication*, Vol.48, No.2, pp.201-218.
- Sasson, J.R., and Douglas, I. (2006), “A conceptual integration of performance analysis, knowledge management, and technology: From concept to prototype”, *Journal of Knowledge Management*, Vol.10, No.6, pp.81-99.
- Sbarcea, K. (2010), *Overview of Two Knowledge Management Frameworks*, available at: http://www.apotokyo.org/productivity/114_prod.htm [Accessed 01.04.2010]
- Serenko, A. and Bontis, N. (2009), “Global ranking of knowledge management and intellectual capital academic journals”, *Journal of Knowledge Management*, Vol.13, No.1, pp.4-15.
- Shah, H., Eardley, A. and Wood-Harper, T. (2007), “ALTAR in action: Knowledge management”, *European Journal of*

- Information Systems*, Vol.16, No.6, pp.771-779.
- Siemieniuch, C.E. and Sinclair, M.A. (2004), "CLEVER: A process framework for knowledge cycle management", *International Journal of Operations and Production Management*, Vol.24, No.11/12, pp.1104-1125.
- Standards Australia (2001), *Knowledge Management: A Framework for Succeeding in the Knowledge Era*, HB 275-2001, Standards Australia, Sydney.
- Standards Australia (2003), *Knowledge Management*, AS 5037-2003, Standards Australia, Sydney
- Standards Australia (2005), *Knowledge Management - A Guide AS 5037-2005*, Standards Australia, Sydney
- Zsulanski, G. (2000), "The process of knowledge transfer: A diachronic analysis of stickiness", *Organisational Behavior and Human Decision Processes*, Vol.82, No.1, pp.9-27.
- Theriou, G.N. and Chatzoglou, P.D. (2009), "Exploring the best HRM practices-performance relationship: An empirical approach", *Journal of Workplace Learning*, Vol.21, No.8, pp.614-646.
- Thite, M. (2004), "Strategic positioning of HRM in knowledge-based organisations", *The Learning Organisation*, Vol.11, No.1, pp.28-44.
- van Eijnatten, F.M. and Putnik, G.D. (2004a), "Chaordic systems thinking for learning organisations", *The Learning Organisation*, Vol.11, No.6, pp.413-494.
- van Eijnatten, F.M. and Putnik, G.D. (2004b), "Chaos, complexity, learning and the learning organisations: Towards a chaordic enterprise", *The Learning Organisation*, Vol.11, No.6, pp.418-429.
- Verespej, M. (1999), "Knowledge management: system or culture?" *Industry Week*, Vol.248, No.15, pp.20-23.
- Walczak, S. (2005), "Organisational knowledge management structure", *The Learning Organisation*, Vol.12, No.4, pp.330-339.
- Wang, C.L. and Ahmed, P.K. (2005), "The knowledge value chain: A pragmatic knowledge implementation network", *Handbook of Business Strategy*, pp.321-326.
- Wang, S. (2002), "Knowledge maps for managing web-based business", *Industrial Management and Data Systems*, Vol.102, No.7, pp.357-364
- Weber, F., Wunram, M., Kemp, J., Pudlatz, M. and Bredehorst, B. (2002), "Standardisation in knowledge management – Towards a common KM framework in Europe", In: *Proceedings of UNICOM Seminar "Towards Common Approaches and Standards in KM"* UNICOM, London, February 27
- Wei, C.C., Choy, C.S. and Yew, W.K. (2009), "Is the Malaysian telecommunication industry ready for knowledge management implementation?" *Journal of Knowledge Management*, Vol.13, No.1, pp.69-87.
- Wigg, K. (1993), *Knowledge Management Foundation: Thinking about Thinking – How People and Organisations Create, Represent and use Knowledge*, Schema Press, Arlington, VA.
- Wiig, K.M. (2007), "Effective societal knowledge management", *Journal of Knowledge Management*, Vol.11, No.5, pp.141-156.
- Wild, R.H., Griggs, K.A. and Downing, T. (2002), "A framework for e-learning as a tool for knowledge management", *Industrial Management and Data Systems*, Vol.102, No.7, pp.371-380.
- Wong, K.Y. and Aspinwall, E. (2004), "Characterising knowledge management in the small business environment", *Journal of Knowledge Management*, Vol.8, No.3, pp.44-61.
- Wong, K.Y. and Aspinwall, E. (2005), "An empirical study of the important factors for knowledge-management adoption in the SME sector", *Journal of Knowledge Management*, Vol.9, No.3, pp.64-82.
- Yiu, M.Y.R. (2006), *Determinants of Knowledge Management Practices and Performance: A Review of Literature*, University of the West Indies, Trinidad and Tobago, May, 67p.
- Yiu, M.Y.R. and Sankat, C.K. (2007), "Using an AHP paradigm for assessing the performance of knowledge management in organisations", In: *Proceedings of The First International Conference on Management Science and Engineering Management*, Sichuan University, Chengdu, China, July, pp.9-22.
- Yiu, M.Y.R., Sankat, C.K. and Lewis, W.G. (2007), "Determinants of knowledge management practices and performance in organisations", In: *Proceedings of the 23rd International Conference on CAD/CAM, Robotics and Factories of the Future*, Colombia, South America: University of Militar Nueva Granada, August, pp.717-723.
- Yu, S., Kim, Y. and Kim, M. (2004), "Linking organisational knowledge management drivers to knowledge management performance: An exploratory study", In: *Proceedings of the 37th Hawaii International Conference on System Sciences*, IEEE Computer Society, Waikola Village, HI/Piscataway NJ
- Zack, M., McKeen, J. and Satyendra, S. (2009), "Knowledge management and organisational performance: An exploratory analysis", *Journal of Knowledge Management*, Vol.13, No.6, pp.392-409.
- Zuber-Skerritt, O. (2005), "A model of values and actions for personal knowledge management", *Journal of Workplace Learning*, Vol.17, No.1/2, pp.49-64

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