Back to the Source: A Knowledge Management Reference Analysis

by

W. Heath Landrum Auburn University 401 Lowder Hall Auburn, AL 36849-5266 landrwh@auburn.edu Phone: 334 844-6443

Fax: 334 844 4927

Dianne Hall, PhD Auburn University 401 Lowder Hall Auburn, AL 36849-5266 halldia@auburn.edu Phone: 334 844-6443

Phone: 334 844-6443 Fax: 334 844 4927

Teresa Lang, PhD
Auburn University at Montgomery
314D Clement Hall
Montgomery, AL 36124
tlang@aum.edu

Phone: 334 244-3495 Fax: 334 244-3792

Zach Jourdan, PhD
Auburn University at Montgomery
310H Clement Hall
Montgomery, AL 36124
sjourdan@aum.edu

Phone: 334 244-3122 Fax: 334 244-3792

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Abstract

This paper presents a comprehensive reference analysis of the knowledge management discipline in which 15,342 references were reviewed from 356 articles published in selected Information Systems (IS) journals. Authors, articles, books, and book chapters are presented based on their impact on IS KM (Knowledge Management) research, as well as an overall contribution ranking. From this data a comprehensive guide of journal articles, books, and chapters is created that IS KM researchers will find useful. This guide lays a foundation for future IS KM researchers.

Introduction

Today's organizations exist largely in a knowledge-based economy and operate in knowledge intensive venues. Information management, knowledge management, knowledge resource management and the like are all terms that indicate management of an elusive, yet critical, asset. Information may reside in artifacts throughout the organization, may be embedded within organizational members, or may be dispersed among organizational partners. This makes its management of particular importance, as technology is an important facilitator in that endeavor.

Knowledge and its associated benefits are often touted as giving a strong competitive advantage to organizations moving forward in today's environment (e.g., Tallman et al. 2004). Information systems are considered not only to be a source of competitive advantage (e.g., Santhanam and Hartono 2003) but also a way of facilitating knowledge management (Holsapple and Joshi 2000). This research contends that the importance of knowledge to the modern organization, combined with the interdependency of knowledge management (KM) and information systems (IS), will lead IS researchers to incorporate facets of KM into their research, regardless of the context or domain of their study. Therefore, it is prudent at this time to understand what reference materials are used by IS researchers who have studied KM in the past. Which researchers are routinely referenced? Which works appear consistently in published literature? What conclusions may be drawn from such an analysis? Answering these questions allows IS researchers to gain an understanding of KM research and its supporting literature as seen through the eyes of fellow IS researchers.

This study examines KM research that appears in IS journals from 1998 through 2009. By using a reference analysis methodology, this research elucidates those articles, books, and chapters that researchers who publish in IS journals use extensively as bases for their own studies. This research also reports and analyzes reference patterns specific to the discipline of KM through an IS lens, answering the questions of who are the referent authors, and what are the referent works in KM as perceived by researchers publishing in IS journals.

Background

Knowledge Management as a Competitive Advantage

Generally defined, KM is the process of maintaining an organization's knowledge in a way that allows for a continuous process of acquiring, organizing, and using it to move the organization forward. Organizational learning is a large component of KM (Davenport and Prusak 2000), as is the facilitation of information sharing and integration (Grant 1996). These not only require appropriate infrastructure such as information technology, but also an appropriate strategy (Hansen, et al. 2006) and culture. KM is a synthesis of organizational sciences such as the management, strategy, and behavioral disciplines combined with the technological principles of management information systems (Holsapple and Joshi 2002, Nonaka 1994). Maintaining employees' knowledge and experience within an organization has been linked to success both in academic as well as practitioner circles (Brown and Woodland 1999, Davenport and Prusak 2000).

Knowledge management literature is diverse. Terminology ranges from the generic umbrella of KM to knowledge process specific terms such as transfer, application, creation, or integration. There are also correlated terms, such as knowledge work, knowledge worker, knowledge-based, or knowledge economy. Related terms include collaboration, cooperation, and learning. The intent here is not to provide a complete analysis of KM literature; rather, to provide a basis for its importance as a competitive advantage that will continue to be critical in the future by reviewing current literature in the area.

In 1991, Ikujiro Nonaka published "The Knowledge Creating Company" in *Harvard Business Review* (Nonaka 1991). This oft-cited work lays the foundation for knowledge as a competitive advantage in a world where "the only certainty is uncertainty" (p. 21). Nonaka describes the differences between Eastern and Western cultures, and how managerial changes can manifest in knowledge creation and ultimately into innovation. In 1999, Peter Drucker discusses knowledge workers, stating that they should be allowed the freedom to manage themselves, be provided opportunities for continuous learning and teaching, be allowed to innovate, and be viewed as an asset. It was in this vein that he concluded that knowledge worker productivity is a vital part of organizational adaptation. He states: "It is on their productivity, above all, that the future prosperity – and indeed the future survival – of the developed economies will increasingly depend" (p. 83). From these, the idea of KM as a competitive advantage became part of the KM literature.

Knowledge transfer was argued to be a competitive advantage by Argote and Ingram (2000). Their proposition was that knowledge transfer can be managed such that it is successfully transferred between individuals within a firm because of the inherent similarities among organizational members. These similarities enhance knowledge transfer intra-organizationally, but impede it inter-organizationally, effectively creating a competitive barrier for that knowledge. This concept was again used by Lubit (2001), who discussed how knowledge is, without proper management, simply a transient competitive advantage as products and services

are duplicated by competitors. He contends that proper management of tacit knowledge (knowledge embedded within individuals), including proper organizational culture and management support, can spread tacit knowledge internally to increase its internal value while keeping it safe from external transfer. Another internal knowledge sharing study found that participation of the CIO in the business planning process influenced IT competitiveness through the content of the IT plan during IT/business plan strategy alignment (Kearns and Lederer 2003).

While some researchers looked at facilitating knowledge within the organization, others have looked at its competitive advantage when shared between or among organizations. Tallman et al. (2004) examined the competitive role of regional clusters and the interactions among cluster firms. They proposed that, much as in the studies in intra-organizational knowledge transfer, competitive advantage is attained when the knowledge stays within the cluster, that firms must be cluster members to be competitive outside the cluster, but that organizations should develop both firm and cluster specific knowledge. Lavie (2006) proposed an extension of the resource-based competitive advantage view of the firm that incorporates network resources important not only to alliance formation, but also to interconnected firms involved in alliances. That work focuses on equitable methods for developing and accessing complementary resources when the firms may not be independent.

The studies outlined above indicate that KM is a continuing area of study in organizations. Earlier, this research contended that there continues to be a mix of KM and IS research as it will be difficult to separate the knowledge and information aspects of organizations from the technical aspect of facilitating them. Alter (2007), speaking of work systems, suggests that better information quality, availability, and presentation are ways to improve decision quality in organizations. As the basis of KM is to provide information in a timely manner to assist in decision-making, Alter's call to energize research to support work systems, and ours to support knowledge-based IS research, are similar.

Beginning in the early 2000's published studies combine elements of KM with other areas of IS research. Nemati et al. (2002) use the concept of a knowledge warehouse to develop a decision support system (DSS) that captures and codes knowledge. Importantly, they suggest that DSS will take a different direction in the future and move toward supporting knowledge improvement. Cil et al. (2005) developed a collaborative system to support group decision-making (GDSS) and KM. Another application of KM in a decision setting is in the work of Ayed et al. (2010) who used the concept of knowledge discovery in a system that incorporated data mining (DM) and information extraction. It is important to note that these are not KM studies per se; rather, they are diverse IS studies (DSS, GDSS, DM) that include elements of KM.

While brief, this overview indicates that knowledge processes are critical to organizations and are becoming part of the fabric of IS research. To be most effective, it would be beneficial to have a foundation of what IS researchers who have worked in the KM area consider to be referent material. This work begins that foundation.

Moving Forward as a New KM/IS Researcher

How does one begin to include KM research, theory, and framework into a stream of IS research? As with any new study, a researcher must first look to the literature to find relevant material. When that researcher's primary study area is one thing, perhaps social media, with a necessary tangent to KM, an in-depth review of KM literature is likely unnecessary. As well stated by Delen and Crossland (2008), "Trying to ferret out relevant work that others have reported may be difficult at best, and perhaps even near impossible if traditional, largely manual reviews of published literature are required" (p. 1707). This research contributes to that effort by analyzing KM literature published by IS researchers in fifteen IS journals through a comprehensive reference analysis. Because this research is not concerned with whether a particular KM article is viewed as seminal by the research community in general, it was decided to look from within the KM literature to see what literature in general is referenced by IS KM researchers. This narrows the field to that of current interest, building the referent literature of importance to IS researchers in the KM context.

Knowledge Management Literature Analyses

One of the earlier studies of KM literature was a bibliometric study to determine the intellectual structure and interdisciplinary breadth of KM literature using the *Science Citation Index* and the *Social Science Citation Index* (Ponzi 2002). This study employed a co-citation frequency analysis and a subject category codes ranking analysis. It identified active authors whose work falls primarily within four areas (strategy, organizational learning, tacit knowledge, and KM), and confirms KM's standing as an interdisciplinary domain. Serenko and Bontis (2004) conducted a manual review of KM/intellectual capital (IC) literature in the Journal of Intellectual Capital, the Journal of Knowledge Management, and Knowledge and Process Management to determine citation impact and research productivity rankings. Looking specifically for the most frequently cited KM/IC publications and authors, they used individual paper citations, individual author citations, and a normalized citation impact index.

Global knowledge management research was investigated by Gu (2004) who investigated the spread of KM publications, in addition to the size of a KM research team, active contributors, and core journals. Also using the *Social Sciences Citation Index* and the *Science Citation Index* (expanded), and including the *Arts and Humanities Citation Index*, Gu found that publication frequency increased in the early 2000s, and suggested that new researchers were playing roles in the discipline, with many publications authored by teams of two.

A different type of study was conducted in 2005 that focused on KM books and doctoral dissertations rather than the traditional focus on journal articles. Harman and Koohang (2006) used Amazon.com and the ProQuest database to select KM-related books and dissertations. They found that both types of publications increased equally during the latter 1990s and again in the early 2000s. However, the primary topic for books was leveraging information technology, whereas the primary topic for dissertations was KM-based business strategy. A study of the Institution of Engineering and Technology bibliographic database for computing, control technology, and information technology (INSPEC) was conducted to look for KM literature.

Those results indicated that the most preferred channels of communication at the time were conferences, seminars, and workshops, followed by journals (Prakasan et al. 2006).

A large scale analysis of KM/IC literature was performed in 2009 (Serenko et al.). This study was designed to ascertain country productivity, institutional productivity, and individual productivity in KM/IC literature. In addition, the authors performed an analysis of Lotka's law, and reflected on research methods in the KM/IC field. Results of the study indicate that multiple-authored publications are on the rise. The leading countries to contribute to KM/IC literature are the United States, the United Kingdom, Australia, Spain, and Canada, and academic institutions outnumber non-academic institutions two to one. Recently a study was conducted (Serenko et al. 2011a) identifying whether traditional academic literature (i.e., journal articles) are referenced in books and textbooks. The findings suggest that while book content comes from a variety of sources, academic articles are well represented. Although the Serenko et al. study was not a citation analysis, it brings forth the importance of considering the value of books as reference material.

A recent study of KM/IC literature examined whether there are superstars within the discipline and whether those individuals are skewing the number or types of publications appearing in KM/IC venues (Serenko et al. 2011b). Their findings suggest that the superstar effect does not exist in the KM/IC literature, indicating that the field is open to experienced, as well as new researchers.

All of the above studies are important ones that help foster an understanding of extant literature in the general domain of KM. Each has contributed important information; however, each concentrated on the general body of KM literature throughout its many publication venues. This study focuses only on KM literature published in traditional IS journals as the intent is to inform the general IS researcher about the material considered important by KM researchers publishing in IS journals.

This study does not specifically seek to find seminal KM works, although those have also come to light. It is the intent of this research to find the oft-referenced works for the KM/IS researcher, regardless of content or domain. Thus, this study expands previous analyses by reporting and analyzing reference patterns specific to the discipline of KM through an IS lens, including books, articles, and edited book chapters. This type of analysis will provide a comprehensive picture of the KM discipline in IS, where it has been, and directions in which it may be moved forward (Webster and Watson 2002).

Methodology

This study is unique to most publication analyses in KM and IS because journal articles, authored books, and edited book chapters were included in this analysis. Books and edited book chapters are often overlooked in such studies because most concentrate on the impact of particular journals or include only article contributions (e.g., Grover et al. 2006, Hansen et al. 2006, Lim et al. 2009, Wade et al. 2006). However, analyses may suffer when these references are not included because a complete picture of the field cannot be established without all references which can often be attributed to books. This is particularly true in a relatively new

domain that is currently establishing maturity. New domains are often dominated early by practitioners and books rather than academics and journal articles. This is true of KM (Serenko et al. 2011a).

Second, this study examined KM literature published in IS venues, rather than KM literature in general, given the desire to create a reference material foundation for IS researchers. Third, all references contained within journal articles used in the analysis are analyzed to ascertain that reference foundation is used rather than citation indices available online. This type of thorough analysis of a body of research should lead to an indication of the perceived experts and referent works for the field (Pilkington and Meredith 2009), and this method has been used in prior publication analysis. For example, a study by Grover and colleagues details the influences of other key fields on the MIS field (2006). They tested their hypotheses with data gathered during a citation analysis whereby they manually examined the references from all their selected articles.

Data Selection

The goal of this study was to collect an extensive body of KM research from top IS journals. To achieve that goal, it was determined which journals were appropriate and which timeframe was best, then the KM research articles were extracted from those journals. Finally, the references were retrieved from each article according to the research criteria.

Selecting the journals. In general, when a researcher is investigating a new or existing stream of research, he or she gravitates to the leading journals in the area. Several studies have been published that list the leading journals for information systems research. A representative list was selected of IS journals based on a list of fifteen journals ranked by total weighted perceived value rating from the research by Peffers and Ya (2003) (see Table 1). This list contains a variety of IS journals. Once the IS journals were selected, the search space was limited by timeframe. The goal of selecting the years under investigation was to create a time period large enough to capture an extensive look at KM research through the IS lens, so the search was conducted for articles in the time frame from January 1998 through December 2009.

Table 1. Top 15 IS Journals and KM article count

Journal Title	Acronym	Count
Communications of the Assoc. for IS	CAIS	26
DATABASE for Advances in IS	DBAIS	9
Decision Support Systems*	DSS	74
European Journal of IS*	EJIS	24
Information and Management	landM	39
Information Resources Management Journal	IRMJ	20
Information Systems Journal	ISJ	9
Information Systems Research	ISR	7
Information Technology and People*	ITP	13
International Journal of Electronic Commerce	IJEC	2
Journal of Computer Information Systems	JCIS	41
Journal of Database Management	JDBM	11
Journal of MIS*	JMIS	33
Journal of the Assoc. for Information Systems	JAIS	9
MIS Quarterly*	MISQ	39
Total		356

^{*}Journals published special issues on KM. (Peffers and Ya, 2003)

Collecting the articles. The articles were located by choosing a journal and using the "Search within this publication" feature built into the ABI/INFORM database. In addition to the term "knowledge management," the search terms "knowledge acquisition" (Ryu et al. 2005), "knowledge sharing" (Bock et al. 2005, Wasko and Faraj 2005), and "knowledge transfer" (Ko et al. 2005, Lin et al. 2005) were used to search for relevant KM research. These terms were chosen because the initial issue-by-issue article search in MIS Quarterly showed that these terms are frequently used in addition to knowledge management in the keywords section of the journal articles found. Because the search was for research articles in the topic area of KM, any result that was a book review or an editorial was eliminated. Table 1 also shows the findings of articles (n=356) for each journal using this methodology.

All journal article, book (standard or edited), or book chapter references from each of the 356 articles collected were gathered into a database. Data collected included names of all authors, year of publication, publication title, book or journal title, names of editors, and type of publication. Other references, which included things such as conference proceedings, web articles, news articles, etc., were not collected. Next, for each publication, author credit was determined.

According to Serenko and Bontis (2004) author credit is generally assessed using one of four point-assigning methods: 1) one may attribute one point per author per publication, 2) assign points based on author position, 3) assign points based on page count, or 4) used the inverse of

the number of authors to assign points. Given that the main objective is to establish a list of works perceived to be important to KM researchers in the IS domain, authorship order and page count do not apply. However, to establish some level of perceived importance of individual authors, assigning a score of one per work, regardless of number of authors, seems to favor those who routinely publish with colleagues. Thus, the choice was to calculate the inverse of the number of authors (Erkut 2002, Serenko and Bontis 2004). For example, a sole-author publication received a score of 1.0, each author of a two-author piece received one half of a point, each author of a three-author piece received one third of a point, and so on. This approach rewards authorship credit equally regardless of authorship order and recognizes single authorship as well.

Algorithms were used to cleanse and match the citations collected and stored in the database. The algorithms ensured that data were in the correct format and that similar authors and titles were not duplicated. For example, "Smith, Jim W." is the same person as "Smith, James W." Because the format of a reference differs among publication sources, relying on a computerized algorithm sped up the process and reduced the number of errors that may be made by humans. All punctuation and marks were removed to preserve consistency of text only, given that different word processors and languages can often generate differing symbols. The system generated reports in the cases where it was unable to verify a match. These were manually corrected as needed. The majority of the citation errors detected by the system were resolved by improving the code to the system. The rest of the errors were manually corrected as they were detected. Iterative runs of the data were performed until the error rate was less than 5%.

Results and Discussion

In total, 15,344 references were examined. This number includes articles, books, and book chapters. This number includes 10,387 unique authors, 8,298 unique articles, 2,702 unique books, and 905 unique book chapters. Only the most significant findings from the sample are included herein.

Journal Articles

Table 2 shows the top 15 referenced articles from the journal articles sampled (with ties). The top article was referenced 90 times. Twenty-five percent of the articles reviewed considered this to be an important reference. The next article was referenced 84 times, or by 23.5% of the articles reviewed. Clearly, these articles represent important referent works in the KM field as perceived by those publishing in IS journals. In addition, they are both KM articles, indicating that they are likely seminal works in KM as well, at least as perceived by IS researchers. The next three most referenced articles are referenced by 10-15% of the articles sampled. These articles include KM strategy, KM projects, and one of the correlated areas of KM, learning. The authors of the top 5 referenced articles include well-known names in KM—Alavi and Leidner appear twice on the list of most cited articles; Davenport is well known for the practitioner side of KM; and Nonaka is a founding father of knowledge as a competitive advantage, and the others developed early foundational work in specific areas of the domain.

Table 2. 15 most referenced articles ranked by number of times referenced (with ties).

1 Knowledge Management And Knowledge Management 2001 90 Systems: Conceptual Foundations And Research Issues MISQ 2 A Dynamic Theory Of Organizational Knowledge Creation 1994 84 Org. Sci. 3 What's Your Strategy For Managing Knowledge? 1999 55 H	Alavi, Leidner Nonaka Hansen, Nohria, Tierney
2 A Dynamic Theory Of Organizational Knowledge Creation 1994 84 Org. Sci.	Hansen, Nohria,
Org. Sci.	Hansen, Nohria,
-	
3 What's Your Strategy For Managing Knowledge? 1999 55 H	
	Tierney
HBR	
4 Successful Knowledge Management Projects 1998 43	Davenport,
Sloan	DeLong, Beers
5 Absorptive Capacity: A New Perspective On Learning And 1990 39	Cohen,
Innovation ASQ	Levinthal
6 Toward A Knowledge Based Theory Of The Firm 1996 32	Grant
SMJ	
7 The State Of The Notion: Knowledge Management In Practice 1998 30	Ruggles
CMR	
7 Knowledge Management: An Organizational Capabilities 2001 30 0	Gold, Maholtra,
Perspective JMIS	Segars
9 Exploring Internal Stickiness: Impediments To The Transfer Of 1996 29	Szulanski
Best Practice Within The Firm SMJ	
10 Knowledge Of The Firm: Combinative Capabilities And The 1992 28	Kogut, Zander
Replication Of Technology Org. Sci.	
11 The Role Of Tacit Knowledge In Group Innovation 1998 27	Leonard,
CMR	Sensiper
11 Toward A Theory Of Knowledge Reuse: Types Of Knowledge 2001 27	Markus
Reuse Situations And Factors In Reuse Success JMIS	
13 Knowledge Management Systems: Issues, Challenges, And 1999 26	Alavi, Leidner
Benefits CAIS	
14 The Eleven Deadliest Sins Of Knowledge Management 1998 24	Fahey, Prusak
CMR	
14 The Knowledge Creating Company 1991 24	Nonaka
HBR	

(ABI/INFORM database, 2011)

Generally, the top referenced articles by KM researchers publishing in IS journals are broken down into three categories. The first category is that of foundational knowledge literature. This primarily includes the works by Nonaka and his colleagues. Arguably, the beginnings of the KM interest stems from the article "The Knowledge Creating Company" which was published in

1991. This article, along with Nonaka's related works in 1994 and 1998 provide the foundation of knowledge as asset that can be grown often without capital outlay. Included in this category are research and review papers such as the issues and challenges article by Alavi and Leidner that leads the list with the highest number of references, and theory type articles such as those by Grant (knowledge-based theory), Cohen and Levinthal, and others.

The second category is that of work in knowledge processes. Knowledge processes are those within the KM domain. Depending on the framework being used, these are generally knowledge generation/creation/acquisition, knowledge sharing, knowledge transfer, knowledge integration, and knowledge application/use. In the list of top articles, these would include works such as those by Kogut and Zander, Grant, Markus, and Leonard and Sensiper. These articles are more focused toward specific elements of KM.

The third general category are those that are more practitioner or advice-oriented. These include examples such as the articles by Fahey and Prusak; Ruggles; Davenport, DeLong, and Beers; and Hansen, Nohria, and Tierney. These represented the fewest articles among the top referenced works.

It is interesting to note the age of the articles that have been referenced the most. Obviously newer articles take some time to circulate and gain influence. At present, the newest articles in this list are ten years old while the oldest is about 20 years old. The top articles were published from the mid- to late-1990s. The articles from 1990-1991, centering on knowledge creation and organizational learning, seem to be the spark of KM as a field of study. After that, it seems researchers began to develop theory, which is published from roughly 1994-1999, culminating in the most referenced article on conceptual foundations and research issues. It seems from the data that the field has not developed a great deal in mainstream IS journals. The more modern research has apparently gone back to these early works and built from there, rather than creating new theory. This is consistent with the suggestion made by Alavi and Leidner (2001) that KM research should both preserve and build upon current work.

This does not indicate, however, that research in KM itself has stagnated. Several KM oriented journals are active; in that least two have achieved Journal Citation Report impact status in the last two report years (Journal of Knowledge Management, Knowledge Management Research and Practice). Given the need for information systems to work with and support KM, it would seem reasonable to suggest that IS researchers reach assimilate ongoing KM research from other venues into traditional IS journals. Such a crossover would not only allow KM to flourish under both the KM and IS umbrellas, but would allow KM to become a more evident element of IS research.

As future researchers strive to build on and extend extant work, they are well-served to gain an understanding of these most referenced journal articles. However, this is not to say that research focused in an area correlate to new research should be ignored. Rather, a broad foundation of the basics, along with a specialized foundation, is necessary to move research forward.

Journals

Researchers getting to know a new area are always interested in those journals that publish works in the area. Of the journals that were identified, it is very clear that most references in the sample articles come from what are perceived to be high quality journals in the IS and management fields. Researchers interested in finding KM referent material can do so by looking in the journals listed in Table 3. They demonstrate that IS oriented KM referent material is drawn from a variety of sources, both academic and practitioner oriented. The top five journals in this list all had special issues in KM, no doubt contributing somewhat to their position.

Table 3. The top fifteen KM journals from referenced articles.

Rank	Title	# Ref.			
1	MIS Quarterly	828			
2	Organization Science	681			
3	Journal of Management Information Systems	505			
4	Strategic Management Journal	410			
5	Management Science	369			
6	California Management Review	367			
7	Information Systems Research	345			
8	Harvard Business Review	334			
9	MIT Sloan Management Review	314			
10	Communications of the ACM	298			
11	Information and Management	259			
12	Academy of Management Review	252			
13	Decision Support Systems	232			
14	Administrative Science Quarterly	224			
15	Academy of Management Journal	188			

(ABI/INFORM database, 2011)

The most referenced article, Alavi and Leidner (2001), was published in MISQ. In fact, five of the top 15 most referenced articles were published in IS journals (MISQ, JMIS, and CAIS). This indicates a strong showing of KM reference material that is attributed to IS journals. This is encouraging given the strong cross-disciplinary nature of knowledge management. It is hopeful that future IS-based KM research will continue to be published in IS journals, but will incorporate or extend research being published in KM specific journals.

Books (standard)

Table 4 shows books referenced 12 or more times. The highest ranked book was authored by Nonaka (referenced by 27.5% of the sample articles). The second highest ranked book was authored by Davenport (referenced by 27.25% of the sample articles).

Table 4. 16 top referenced books (with ties).

#	Book Title	Year	# Ref.	Authors
1	The Knowledge Creating Company: How Japanese Companies	1995	98	Nonaka,
	Create The Dynamics Of Innovation			Takeuchi
2	Working Knowledge: How Organizations Manage What They Know	1999	97	Davenport,
				Prusak
3	The Tacit Dimension	1966	37	Polanyi
4	Situated Learning: Legitimate Peripheral Participation	1991	26	Lave, Wenger
4	Wellsprings Of Knowledge: Building And Sustaining The Source Of	1995	26	Leonard
	Innovation			
6	Psychometric Theory	1978	21	Nunnally
6	The Fifth Discipline: The Art And Practice Of The Learning	1990	21	Senge
	Organization			
8	Case Study Research: Design And Methods	1994	17	Yin
9	An Evolutionary Theory Of Economic Change	1982	16	Nelson, Winter
9	Personal Knowledge: Towards A Post Critical Philosophy	1962	16	Polanyi
11	Organizational Learning: A Theory Of Action Perspective	1978	15	Argyris, Schon
11	Post Capitalist Society	1993	15	Drucker
13	Intellectual Capital: The New Wealth Of Organizations	2000	14	Stewart
13	The Social Construction Of Reality: A Treatise In The Sociology Of	1967	14	Berger,
	Knowledge			Luckmann
15	Talking About Machines: An Ethnography Of A Modern Job	1996	13	Orr
16	Communities Of Practice: Learning, Meaning, And Identity	1998	12	Wenger

(ABI/INFORM database, 2011)

Authored books represent 20.20% of the total references collected during this study. The top two books, which are referenced far more times than any other books, represent 37.64% of the 518 references in the table. It is clear that these books are regarded as important and relevant to the field of KM from an IS perspective. The first book was published around the time when the bulk of the theory for KM was being published in the journals, 1995. This is one year after Nonaka published his highly referenced article in the field. The book and the article are of course heavily related, with the book going into significant detail of the concepts in the article.

Davenport is the author of the second most referenced book. His book was published a few years later, but it also seems to be regarded as important to the field. It is practitioner oriented and speaks to practical knowledge management.

Generally, books break into two categories, practitioner and methodological/theoretical. These two categories can be seen in this list. While most are practitioner oriented (e.g., the books by Davenport and Nonaka), a few are methodological books (e.g., *Case Study Research: Design and Methods*). Several books appearing in Table 5 were published in the 1960s and 1970s. These are highly theoretical works that explore more psychological aspects of the mind or behavior that led to the development of theory used in KM.

Edited Book Chapters

Generally, edited books are compilations of works from different authors, put together by editors who are familiar with the field. Table 5 lists the top referenced chapters referenced by the sample articles, along with their associated book. This is a shorter list because the number of references quickly falls to one per chapter. Overall, there are 1,161 references to chapters, and this list represents 7.67% of those references. Most of the chapters referenced were published slightly later than the articles or books previously mentioned, but still are not current research.

Table 5. Six most referenced chapters from edited books. (with ties).

#	Chapter Title	Book Title	Yr.	# Ref.	Authors
1	Infrastructure And Organizational Transformations: Classifying Nurses' Work	Information Technology And Changes In Organizational Work	1996	46	Bowker, Timmerman s, Star
2	The Partial Least Squares Approach To Structural Equation Modeling	Modern Methods For Business Research	1998	11	Chin
3	Knowledge Management: Dealing Intelligently With Knowledge	Knowledge Management And Its Integrative Elements	1997	10	van der Spek, Spijkervet
4	Managing Organizational Knowledge	Framing The Domain Of It Management: Projecting The Future Through The Past	2000	8	Bollinger, Smith
5	Why Organizations Don't "Know What They Know": Cognitive And Motivational Factors Affecting The Transfer Of Expertise	Sharing Expertise Beyond Knowledge Management	2003	7	Hinds, Pfeffer
5	Knowledge And Competence As Strategic Assets	Handbook On Knowledge Management: Knowledge Matters	2003	7	Winter

(ABI/INFORM database, 2011)

Like authored books, edited book chapters are often difficult to categorize as they may take on any type of domain from methodological to theoretical, academic or practical. The subject of the most referenced book chapter is not immediately obvious from its title or the name of the book from which it was taken, but it is actually an often cited work that uses grounded theory as its basis. The second most referenced chapter is a data analysis chapter that underscores the number of journal articles that use Partial Least Squares (PLS) analysis. Virtually no published work that uses PLS goes without referencing this chapter. While these are arguably referent chapters for IS KM researchers, they have applicability only to those using these particular research or analysis methods. This does not in any way diminish their importance as referent chapters. The other chapters on the list are more KM domain specific and also function as reference material for the IS KM researcher. However, the relatively low number of edited chapter references makes solid conclusions difficult to draw.

Authors

The author index was calculated by evenly distributing a weighted score to each author of a work. As an example, the fictitious article "The Importance of KM" was authored by Jim Smith, Jane Jones, and Dan Doe. It was referenced by seven of the 356 sample articles. It was the only work for each of these authors. Each author received an author index of 2.33 (.3333 x 7) (Serenko and Bontis, 2004). Indexes were calculated for all authors separately by article, by book, and by chapter, and then summed to create a total reference index.

Table 6 shows the 20 most referenced authors from our study, ranked by their total reference index. The total number of references for each author for articles, books, and chapters is shown along with the index for each, as is total references and total index. The goal of this research is not necessarily to rank authors but to trace the influences of the most important contributors to KM referent material from the IS perspective. When sorted by article index rather than total index, this data changes very little (see the last column in Table 6). Although individuals may move up or down the list, their relative place at the top or bottom of this list remains relatively stable. The middle positions, particularly 8-14, are most volatile. This is mostly the result of the top index authors having multiple outlets, and the lower index authors having primarily one outlet, while the mid-range index authors have a mix of outlets. Still, most authors remain in the top or bottom half of the table whether sorted by total or article index.

Table 6. Top 20 contributors to KM referent work (ranked by total index).

Name		Α	rticle	Book		Chapter		Total		
# Last	First	#	Index	#	Index	#	Index	#*	Index	**
1 Davenport	T.H.	118	34.75	224	79.60	33	33	375	147.35	5
2 Nonaka	l.	152	66.41	206	66.77	20	10.00	378	143.17	1
3 Markus	M.L.	57	23.33	25	9.17	35	25.00	117	57.50	10
4 Alavi	M.	118	39.38	0	0	10	10	128	49.38	3
5 Leidner	D.E.	133	44.37	0	0	0	0	133	44.37	2
6 Grant	R.M.	66	32.17	6	3.00	5	4.33	77	39.50	6
7 Orlikowski	W.J.	81	34.86	0	0	2	2.00	83	36.86	4
8 Holsapple	C.W.	63	21.10	33	8.24	8	5.00	104	34.34	13
9 Zmud	R.W.	52	16.78	12	4.00	15	12.00	79	32.77	19
10 Hansen	M.T.	92	29.41	3	0.75	0	0	95	30.16	7
11 Brown	J.S.	73	24.64	8	2.67	1	0.50	82	27.81	9
12 Teece	D.J.	53	22.25	6	3.00	2	2.00	61	27.25	12
13 Huber	G.P.	54	25.50	0	0	0	0	54	25.50	8
14 Zack	M.H.	46	22.83	0	0	1	1.00	47	23.83	11
15 Duguid	P.	57	19.23	8	2.67	1	0.50	66	22.40	15
16 Eisenhardt	K.M.	48	19.16	2	0.67	3	1.50	53	21.33	16
17 Kogut	B.	58	19.98	0	0	0	0	58	19.98	14
18 Szulanski	G.	38	18.67	1	0.50	0	0	39	19.17	17
19 Zander	U.B.	54	17.90	0	0	0	0	54	17.90	18
20 Ruggles	R.L.	33	16.50	0	0	0	0	33	16.50	20

^{*}ranking by total index; **ranking by article index

Stability of the index rankings indicates that there is a core set of contributors to the KM referent literature. These are the researchers driving the field of KM, and their work is obviously perceived to be relevant to researchers publishing in IS journals given that so many articles are referencing them.

It is interesting to note that the top two authors ranked by total index have a high percentage of their total references from books, but also have high rankings by article index. This indicates that both Davenport and Nonaka are well rounded referent material contributors who, despite having authored top books in the KM field, contribute to KM referent material across the board. Ranked fifth and first by article index, they rank first and second respectively by total index. Although his place is driven largely by his book, it is also interesting to note that, if Davenport's

book index was removed from his total, he would still be ranked as the second highest contributor to KM, with Nonaka rising to first. Removing the book index from both of these authors would, in fact, have no impact on the standings. They would still remain in the top two positions, with Nonaka in first (76.4) and Davenport in second (67.75). Thus, with or without the impact of their respective books, these two authors are undoubtedly the top perceived authors of important referent material for KM researchers in the IS domain.

After Davenport and Nonaka, the total index drops considerably. Next on the total list is Lynne Markus, whose placement on the list is the result of well-rounded contributions to the KM domain. Contributions in the forms of journal articles and edited book chapters form a large part of her total index, with some contribution from the book index. Alavi and Leidner are in places four and five respectively, and their 2001 MISQ article tops the most referenced articles list in Table 2. In addition, these two authors have a second article on the most referenced articles list in position 13, Table 2. At number six both for total index and article index, Robert Grant is well known for his work on a knowledge-based theory of the firm (1996).

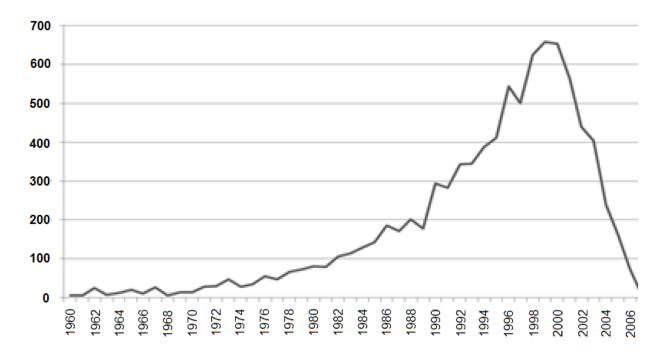
Orlikowski ranks high on both total index (7) and article index (4) despite not having an individual article, book, or chapter in previous listings. She is well known for her research in correlate areas to KM, and thus is often referenced. For example, her research on information technology use in organizations is often the foundation for applying organizational theory to IT research as is her work in collaboration (e.g., Orlikowski 2000, Orlikowski and Gash 1994, Orlikowski and Schultze 2010). Holsapple and Zmud, in places 8 and 9, respectively, in the total index ranking, are in similar situations. Holsapple has written frequently about KM (e.g., Holsapple and Joshi 1998, 2000, Holsapple and Joshi 2001, 2002) generally, and Zmud is known for aspects of knowledge sharing (e.g., Zmud et al. 2005a, Zmud et al. 2005b, Zmud et al. 2001). Hansen, in tenth position, also has a number of referenced articles, but of course is an author of the third most referenced article in Table 3 above. Authors in positions 11-20 have contributed important articles to the reference base of material for KM researchers from the IS perspective.

Publication Trend in Selected IS Journals

Figure 1 presents a timeline of the sample articles gathered in this analysis from 1998 through 2009, and a cyclical pattern is evident. Included in this trend line are those events that may have contributed to the rise or decline of KM articles published in the selected journals over the timeframe. Generally, there is a five year lag from conception of idea to publication of research results. Beginning in 1994, KM became somewhat main stream. A dedicated journal was launched (Knowledge and Process Management) and Nonaka's organizational knowledge creation article was published (1994). By 1996, non-KM oriented journals were beginning to issue calls for special issues on KM. In 1997, the Journal of Knowledge Management was established.

Given these events, one would expect to see elevated activity 3-5 years later. Even though these events were not in the main stream of IS and IS journals, this research shows that, by 2001, KM research in IS journals had increased. Nine journals published special issues on KM in 2001; of those, three were in the target list of this research (DSS, EJIS, and JMIS) (Holsapple and Wu, 2008). Of the 36 articles reviewed from 2001, 23 were from those special issues. This indicates

that KM had begun to be well accepted by IS researchers and journals, but not only for the purposes of special issues. In addition to those three journals, seven other target journals contained at least one KM article in 2001. The numbers drop only slightly in 2002, although there were no special issues in the target journals. There were, however, special issues in three other well established academic journals, including Organization Science. This does not appear to have substantially pulled IS KM researchers away from IS journals. It also does not appear that the establishment of dedicated KM journals is affecting IS KM research at this point. Numbers of articles published in the journals targeted in this research continued to decline in 2003 and 2004. Looking at the trend line, there is nothing substantial 3-5 years previous to spur research activity.



Another spike occurs in 2005. This is possibly the result of research inspired by special issues from 2001, 2002, and possibly 2003. In addition, the number may be somewhat inflated by the two special issues of KM in MISQ. Of the 49 articles pulled from 2005 journals, 13 came from the MISQ special issues. Research again declines until the next spike in 2008, which is likely the next cycle following the proliferation of publications in 2005. No evidence is seen that this cyclical behavior is likely to change. The 2008 spike is likely to lead to a spike in 2011 or 2012.

Limitations and Future Directions

As with any study, the present research has limitations. The choice of IS journals limits one to the type and quantity of KM articles found therein. Although appropriate given this research direction, it is acknowledged that the use of IS journals limited the scope. The desire to use ranked IS journals may also have limited the results. The use of terms may also have limited the inclusion of articles despite manual scanning of several issues to reduce the impact.

This is not the type of research from which future directions are normally derived. However, the comprehensiveness of the data allows one to pursue other interests. For example, this research is interested in tracing the development of KM theory from the IS perspective from conception to present, noting how it was developed and pivotal works that changed the direction of the field. In addition, it is possible to analyze the current results in different ways; such as, with and without review-based articles, separating "true" KM articles from supporting articles, and breaking out the number of references in a specific journal to the specific articles referenced there from. While the current research question has been answered, and the foundational referent base has been created, it is believed there are more stories to tell.

Conclusions

This is the first analysis of KM referent material from an IS perspective. It has clearly brought forth the "who" and the "what" of the referent material that KM researchers who publish in IS journals find relevant. Not only has KM oriented material been captured and analyzed, but also methodological material, tangent theoretical material, and practitioner material has been as well. Certainly, this data indicate that even in modern and recently published KM works, researchers still find the referent classics of the field the most relevant. Despite the numerous sources for KM works that now exist, there also exists a core of referent classics on which new IS KM researchers may build a foundation. Authors of these referent works are passing the torch to a new generation of KM researchers with an IS perspective.

The current research makes no determination as to the quality of the works found during this analysis, nor claim that each of these referent works are applicable to all KM researchers seeking to investigate KM with an IS lens. That is up to the individual researcher. Rather, a comprehensive guide has been created of journal articles, books, and chapters that IS KM researchers will find useful. Each work is often referenced; each author often read. The articles, books, chapters, and authors found here truly form the foundation of KM research from the perspective of those researchers publishing in IS journals. With this foundation, future researchers are encouraged to weave the many facets of KM into IS research.

References

- Alavi, M. and Leidner, D. E. (2001) Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS Quarterly* (25) 1, 107-136.
- Alter, S. (2007) A Work System View of DSS in its Fourth Decade. *Decision Support Systems* (38) 3, 319-327.
- Argote, L. and Ingram, P. (2000) Knowledge Transfer: A Basis for Competitive Advantage in Firms. *Organizational Behavior and Human Decision Processes* (82) 1, 150-169.
- Ayed, M. B., Ltifi, H., Kolski, C., and Alimi, A. M. (2010) A User-Centered Approach for the Design and Implementation of KDD-Based DSS: A Case Study in the Healthcare Domain. *Decision Support Systems* (50) 1, 64-78.
- Bock, G.-W., Zmud, R. W., Kim, Y.-G., and Lee, J.-N. (2005) Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate. *MIS Quarterly* (29) 1, 87-111.
- Brown, R. B. and Woodland, M. J. (1999) Managing Knowledge Wisely: a case study in organisational behaviour. *Journal of Applied Management Studies* (8) 2, 175.
- Cil, I., Alpturk, O., and Yazgan, H. R. (2005) A New Collaborative System Framework Based on a Multiple Perspective Approach: InteliTeam. *Decision Support Systems* (39) 4, 619-641.
- Davenport, T. H. and Prusak, L. (2000) Working Knowledge: How Organizations Manage What They Know (Paperback). In: *Harvard Business School Press Books*, pp. 1.
- Delen, D. and Crossland, M. D. (2008) Seeding the Survey and Analysis of Research Literature with Text Mining. *Expert Systems with Applications* (**34**) 3, 1707-1720.
- Drucker, P. (1999) Knowledge-Worker Productivity: The Biggest Challenge. *California Management Review* (41) 2, 79-94.
- Erkut, E. (2002) Measuring Canadian Business School Research Output and Impact. *Canadian Journal of Administrative Sciences* (19) 2, 97.
- Grant, R. M. (1996) Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal* (17) Winter, 109-122.
- Grover, V., Ayyagari, R., Gokhale, R., Jaejoo, L. et al. (2006) A Citation Analysis of the Evolution and State of Information Systems within a Constellation of Reference Disciplines. *Journal of the Association for Information Systems* (7) 5, 270-324.
- Gu, Y. (2004) Global Knowledge Management Research: A Bibliometric Analysis. *Scientometrics* (**61**) 2, 171-190.
- Hansen, S., Lyytinen, K., and Markus, M. L. (2006) The Legacy of "Power and Politics" in Disciplinary Discourse: A Citation Analysis. *International Conference on Information Systems*, *Milwaukee*, 2006.
- Harman, K. and Kooohang, A. (2006) Frequency of Publication and Topical Emphasis of Knowledge Management Books Versus Doctoral Dissertations: 1983-2005. *Journal of Computer Information Systems* (46) 2, 64-69.
- Holsapple, C. W. and Joshi, K. D. (1998) In Search of a Descriptive Framework for Knowledge Management: Preliminary Delphi Results, in *Kentucky Initiative for Knowledge Management*, vol. KIKM Reserach Paper No. 118, pp. 30. Lexington, KY: Gatton College of Business and Economics.

- Holsapple, C. W. and Joshi, K. D. (2000) An Investigation of Factors that Influence the Management of Knowledge in Organizations. *Strategic Information Systems* (9) 2-3, 235-261.
- Holsapple, C. W. and Joshi, K. D. (2001) Organizational Knowledge Resources. *Decision Support Systems* (31) 1, 39-54.
- Holsapple, C. W. and Joshi, K. D. (2002) Knowledge Management: A Threefold Framework. *The Information Society* (**18** 47-64.
- Holsapple, C. W. and Wu, J. (2008) In Search of a Missing Link. *Knowledge Management Research and Practice* (6) 1, 31-40.
- Kearns, G. S. and Lederer, A. L. (2003) A Resource-Based View of Strategic IT Alignment: How Knowledge Sharing Creates Competitive Advantage. *Decision Sciences* (**34**) 1, 1-29.
- Ko, D.-G., Kirsch, L. J., and King, W. R. (2005) Antecedents of Knowledge Transfer From Consultants to Clients in Enterprise System Implementations. *MIS Quarterly* (**29**) 1, 59-85.
- Lavie, D. (2006) The Competitive Advantage of Interconnected Firms: An Extension of the Resource-Based View. *Academy of Management Review* (**31**) 3, 638-658.
- Lim, A., Ma, H., Wen, Q., Xu, Z. et al. (2009) Distinguishing Citation Quality for Journal Impact Assessment. *Communications of the ACM* (**52**) 8, 111-116.
- Lin, L., Geng, X., and Whinston, A. B. (2005) A Sender-Receiver Framework for Knowledge Transfer. *MIS Quarterly* (**29**) 2, 197-219.
- Lubit, R. (2001) Tacit Knowledge and Knowledge Management: The Keys to Sustainable Competitive Advantage. *Organizational Dynamics* (**29**) 4, 164-178.
- Nemati, H. R., Steiger, D. M., Iyer, L. S., and Herschel, R. T. (2002) Knowledge Warehouse: An Architectural Integration of Knowledge Management, Decision Support, Artificial Intelligence, and Data Warehousing. *Decision Support Systems* (33) 2, 143-161.
- Nonaka, I. (1991) The Knowledge-Creating Company. *Harvard Business Review* (**69**) 6, 96-104.
- Nonaka, I. (1994) A Dynamic Theory of Organizational Knowledge Creation. *Organization Science* (5) 1, 14-37.
- Orlikowski, W. J. (2000) Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations. *Organization Science* (11) 4, 404-428.
- Orlikowski, W. J. and Gash, D. C. (1994) Technological Frames: Making Sense of Information Technology in Organizations. *ACM Transactions on Information Systems* (2) 2, 174-207.
- Orlikowski, W. J. and Schultze, U. (2010) Virtual Worlds: A Performative Perspective on Globally Distributed, Immersive Work. *Information Systems Research* (21) 4, 810-821.
- Peffers, K. and Ya, T. (2003) Identifying and evaluating the universe of outlets for information systems research: Ranking the journals. *Journal of Information Technology Theory and Application* (5) 1, 63.
- Pilkington, A. and Meredith, J. (2009) The evolution of the intellectual structure of operations management 1980 2006: A citation/co-citation analysis. *Journal of Operations Management* (27) 3, 185-202.
- Ponzi, L. J. (2002) The Intellectual Structure and Interdisciplinary Breadth of Knowledge Management: A Bibliometric Study of its Early Stage of Development. *Scientometrics* (55) 2, 259-272.

- Prakasan, E. R., Sagar, A., Kumar, A., Kalyane, V. L. et al. (2006) "INSPEC Database Analysis for Knowledge Management Records," Bhabba Atomic Research Centre, http://eprints.rclis.org/bitstream/10760/7263/1/km_for_e-lis_modified.pdf (11-11, 2011).
- Ryu, C., Yong Jin, K., Chaudhury, A., and Rao, H. R. (2005) Knowledge Acquisition via Three Learning Processes in Enterprise Information Portals: Learning-By-Investment, Learning-By-Doing, and Learning-From-Others. *MIS Quarterly* (**29**) 2, 245-278.
- Santhanam, R. and Hartono, E. (2003) Issues in Linking Information Technology Capability to Firm Performance. *MIS Quarterly* (27) 1, 125-153.
- Serenko, A. and Bontis, N. (2004) Meta-review of knowledge management and intellectual capital literature: citation impact and research productivity rankings. *Knowledge and Process Management* (11) 3, 185-198.
- Serenko, A., Bontis, N., and Hull, E. (2011a) Practical Relevance of Knowledge Management and Intellectual Capital Scholarly Research: Books as Knowledge Translation Agents. *Knowledge and Process Management* (18) 1, 1-9.
- Serenko, A., Bontis, N., Sadeddin, K., and Hardie, T. (2009) A Scientometric Analysis of Knowledge Management and Intellectual Capital Academic Literature. *Journal of Knowledge Management* (14) 1, 3-23.
- Serenko, A., Cox, R. A. K., Bontis, N., and Booker, L. D. (2011b) The Superstar Phenomenon in the Knowledge Management and Intellectual Capital Academic Discipline. *Journal of Informetrics* (5) 3, 333-345.
- Tallman, S., Jenkins, M., Henry, N., and Pinch, S. (2004) Knowledge, Clusters, and Competitive Advantage. *Academy of Management Review* (29) 2, 258-271.
- Wade, M., Biehl, M., and Kim, H. (2006) Information Systems is 'Not a Reference Discipline (And What We Can Do About It). *Journal of the Association for Information Systems* (7) 5, 247-268.
- Wasko, M. M. and Faraj, S. (2005) Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice. *MIS Quarterly* (**29**) 1, 35-57
- Webster, J. and Watson, R. T. (2002) Analyzing the past to prepare for the future: writing a literature review. *MIS Quarterly* (26) 2, xiii(11).
- Zmud, R., Bock, G., Kim, Y., and Lee, J. (2005a) Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Pyschological Forces and Organizational Climate. *MIS Quarterly* (29) 1, 87-111.
- Zmud, R., Jasperson, J., and Carter, P. (2005b) A Comprehensive Conceptualization of the Post-Adoptive Behaviors Associated with IT-Enabled Work Systems. *MIS Quarterly* (**29**) 3, 525-557.
- Zmud, R., Purvis, R., and Sambamurthy, V. (2001) The Assimilation of Knowledge Platforms in Organizations: An Empirical Study. *Organization Science* (12) 2, 117-135.