

ARTICLE

Methodological literature review of knowledge management research



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Received 13 September 2013; accepted 7 July 2014

Available online 3 August 2014

KEYWORDS

Knowledge management (KM);
Research;
Literature;
Methodology

Abstract The purpose of this paper is to examine the state of KM research from the standpoint of existing methodologies. The state of KM research is assessed by examining the research design, number of hypothesis testing, research methods, data analysis techniques and level of analysis. The review of KM research is based on 344 published articles where has KM in their title, which is published in seven journals. Major findings show that qualitative research methods such as a case study and conceptual models hold greater credibility. The gaps identified in the review were (a) the research at an inter organizational level is very less, (b) hypothesis testing is being done in very less number of articles and maximum articles have done only conceptual analysis, and (c) mathematical models are used in very limited articles. This methodological review will provide a better understanding of the current state of research in the KM discipline. © 2013 Instituto Politécnico do Cávado e do Ave (IPCA). Published by Elsevier España, S.L.U. All rights reserved.

1. Introduction

Knowledge is recognized as an important instrument for sustaining competitive advantage and improving performance (Chan & Chau, 2006; Cheng, Yeh, & Tu, 2008; Tseng, 2009). The 21st century is the era of knowledge economy, in which most organizations possess knowledge that enables them to improve their performance. Knowledge adds value to an organization through its contribution to products, processes and people, while knowledge management (KM) transforms information, data and intellectual assets into enduring value

by identifying useful knowledge for management actions (Goh, 2006). KM consists of processes that facilitate the application and development of organizational knowledge, in order to create value and to increase and sustain competitive advantage (Kannabiran, 2009; Zhao, Pablo, & Qi, 2012). There is a strong positive relationship between KM, innovation and performance (Pawlowsky & Schmid, 2006).

As one of the contemporary management tools, KM has been increasing in popularity of the tools/techniques used by large organizations and multinational organizations to gain sustainable competitive advantage in the long run (Delen, Zaim, Kuzey, & Zaim, 2013). KM system is required to acquire, store, retrieve and use up-to-date knowledge (Moradi, Aghaie, & Hosseini, 2013). KM consists of processes that facilitate the application and development of organizational knowledge, in order to create value and to increase

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and sustain competitive advantage (Zhao et al., 2012). Organizational learning (OL) is the part of KM. OL focuses on the process, whereas KM focuses on the content, on the knowledge that an organization acquires, creates, processes and eventually uses (Easterby-Smith & Lyles, 2003).

KM is not only a practice under the guidance of science, philosophy, but also a necessary requirement of globalization and knowledge-based society. Further, it is a process, in which the staff continuously transfers personal knowledge into organizational knowledge, and then increases individual knowledge through the organizational knowledge base (Liyanage, Elhag, Ballal, & Li, 2009). According to Robinson (2005), KM relates to unlocking and leveraging different types of knowledge so that it becomes available as an organizational asset. KM was found to have an impact on completion times, innovation, project success, operational efficiency and the generation of new knowledge (Oluikpe, Sohail, & Odhiambo, 2009).

KM implementation enables an organization to learn from its corporate memory, share knowledge and identify competencies in order to become a forward thinking and learning organization. Since the business situation is likely to remain competitive, it appears that KM will remain relevant in the days to come (Boumarafi & Naceur, 2011; Zack, McKeen, & Singh, 2009). KM is one of the emerging topics of academic and professional discourse in many fields of knowledge, including cognitive sciences, sociology, management science, information science (IS), knowledge engineering, artificial intelligence and economics (Bjornson & Dingsoyr, 2012; Dalkir, 2005; Metaxiotis & Psarras, 2006; Rowley, 2007; Sinotte, 2004; Wild & Griggs, 2008).

The theory of KM has been discussed by writers in both business and academia (International Labor Organization, 2011; Leibowitz, 1999). KM is recognized as an important source of competitive advantage and hence there has been increasing academic and practitioner interest in understanding and isolating the factors that contribute to effective knowledge transfer. (He, Ghobadin, & Gallear, 2013).

Many researches dealing with the literature review of KM. But only one methodological review has done, that is also up to the year 2004. Hence the need of methodological literature review of KM arises. The primary purpose of this paper is to examine the status of KM in academic research, in terms of methodologies applied as well as to discuss the implications for future research. This paper examines the state of KM research in examining the research design, number of hypothesis testing, research methods, data analysis techniques and level of analysis in a subset of seven academic journals (344 articles).

The next section explains the earlier reviews, on KM and highlights the outcome. Preamble of literature is given in Section 3. Section 4 describes the methodology used in this review. Section 5 presents the summary of different reviews and discussions. Section 6 is the conclusions, which has three subsections presenting the gaps identified in the research, significant findings of the report, and future directions of the research.

2. Earlier reviews of literature on KM

It was found during the current research that nine literature reviews specifically on KM have been made in the past.

It was studied by the authors. These reviews are given in chronological order below:

- (i) Chauvel D., & Despers C. (2002). A Review of Survey research in knowledge Management: 1997–2001. *Journal of Knowledge Management*, 6(3), 207–223.
- (ii) Liao, S. (2003). Knowledge management technologies and applications – literature review from 1995 to 2002. *Expert system with applications*, 25, 155–164.
- (iii) Plessis, M. (2007). Knowledge management: what makes complex implementations successful? *Journal of Knowledge Management*, 11(2), 91–101.
- (iv) Guo Z., & Sheffield. J. (2008). A paradigmatic and methodological examination of knowledge management research: 2000 to 2004. *Decision Support Systems*, 44, 673–688.
- (v) Ma, Z., & Yu, K. H. (2010). Research paradigms of contemporary knowledge management studies: 1998–2007. *Journal Of Knowledge Management*, 14(2), 175–189.
- (vi) Serenko A., Bontis N., Booker L., Sadeddin K., & Hardie T. (2010). A scientometric analysis of knowledge management and intellectual capital academic literature (1994–2008). *Journal of Knowledge Management*, 14(1), 3–23
- (vii) Wallace, D., Fleet C., & Downs, L. (2011). The research core of the knowledge management literature. *International Journal of Information Management*, 31, 14–20.
- (viii) Dwivedi Y., Venkitachalam K., Sharif A. M., Al-Karaghoulis W., & Weerakkody V. (2011). Research trends in knowledge management: Analyzing the past and predicting the future. *Information Systems Management*, 28(1), 43–56.
- (ix) Lee, M. R., & Chen, T. T. (2012). Revealing research themes and trends in knowledge management: From 1995 to 2010. *Knowledge-Based Systems*, 28, 47–58.

Findings from these reviews are shown in Table 1. Further, a comparison between the earlier attempts to review literature on KM is made using certain attributes. The attributes considered for comparisons are:

- (i) Focus and objectives: this refers to a brief coverage of the publications in terms of the content and the applicability.
- (ii) Number and type of publications covered: whether they are textbooks, journal articles, conference proceedings or periodicals.
- (iii) Review methodology: this looks at the way in which the literature has been reviewed and classified.
- (iv) Outcome of the literature review.

Apart from these distinguishing attributes, certain common parameters, namely, the name of publication, author(s), year of publication, journal of publication are also used. This comparison is shown in Table 1.

Keeping the concerns of above reviewers, only one methodological review is published on KM, and it was found necessary for this type of review. The objective of this paper is to examine the state of KM research from the standpoint of methodologies to understand the trends and determine implications for future research. It is essential that the present attempt is different from the earlier reviews and

Table 1 A summary of previous literature reviews on KM.

Title	Authors	Year of publications	Published in	Focus and objectives	Number of publication covered	Type of publication covered	Methodology used	Outcomes
A review of survey research in knowledge management: 1997–2001	Danilele Chauvel and Charles	2002	Journal of Knowledge Management	Author focus on survey, among the various tools that KM deploys to assess its state of development which determine current practice, establish benchmarks and offer a quantitative/qualitative description of what occurs in reality	23	Articles	The articles have been analyzed with the intent of extracting the major organizing themes among the topics, variables and purposes contained therein. This was first accomplished on survey by survey basis in order to generate a thematic database. This thematic database was then analyzed in order to perceive commonalities, differences, patterns and outliers	This article developed a framework of six bipolar dimensions (phenomena, action, level, knowledge, technology, outcomes) that account for all the organizing logics employed in the group of survey
Knowledge management technologies and applications – literature review from 1995 to 2002	Shu-Hsien Liao	2003	Expert system with applications	This article focuses on surveying knowledge management development through a literature review and classification of articles from 1995 to 2002 in order to explore the KM technologies and applications from that period	234	Articles	This article surveys and classifies KM technologies using the seven categories as: KM framework, knowledge-based systems, data mining, information and communication technology, artificial intelligence/expert systems, database technology, and modeling, together with their applications for different research and problem domains	This article indicates future development for KM technologies and applications as the followings: (1) KM technologies tend to develop toward expert orientation and KM applications development is a problem-oriented domain. (2) Different social studies methodologies, such as statistical method, are suggested to implement in KM as another kind of technology. (3) Integration of qualitative and quantitative methods and integration of KM technology studies may broaden our horizon on this subject. (4) The ability to continually change and obtain new understanding is the power of KM technologies and will be the application of future works
Knowledge management: what makes complex implementations successful?	Marina du Plessis	2007	Journal of Knowledge Management	The purpose of this article is to provide an overview of generic KM critical success factors, in conjunction with an overview of the factors that has been found to be critical in implementation journeys in selected South African companies	29	Articles	The articles have been reviewed by the authors, giving details of the factors which contributing successful implementation of KM	The article summaries that most of the success factors are very specific to the organizational context and have had a significant impact on the success of KM implementations. These unique factors include the creation of a shared understanding of the concept of knowledge management, identifying the value of co-creation of the knowledge management strategy, and positioning of knowledge management as a strategic focus area of the organization
A paradigmatic and methodological examination of knowledge management research: 2000 to 2004	Zining Guo, James Sheffield	2008	Decision Support Systems	The article provides an insight to KM theoretical perspectives, research paradigms, and research methods. Journals for the period 2000–2004 in order to KM research as a whole	160	Articles	In order to provide the reader with state-of-the-art view of KM author briefly review two aspects of KM research – theoretical perspectives and critical reviews of the KM literature	The article summaries that KM research in information systems journals differ from that in management journals, but neither makes a balanced use of positivist and non-positivist research approaches. KM research in influential journals has always had well-articulated theoretical perspectives, research paradigms, and research methods
Research paradigms of contemporary knowledge management studies: 1998–2007	Zhenzhong Ma and Kuo-Hsun Yu	2010	Journal of Knowledge Management	The purpose of this article is to explore the research paradigms of contemporary knowledge management studies in the past decade using citation and co-citation analysis	1230	Articles	The methods used in this article include citation analysis, co-citation analysis, and social network analysis	The article draws an intellectual map of knowledge flows between knowledge management scholars. Key research themes and concepts as well as their relationships in the field of knowledge management are identified

Table 1 (Continued)

Title	Authors	Year of publications	Published in	Focus and objectives	Number of publication covered	Type of publication covered	Methodology used	Outcomes
A scientometric analysis of knowledge management and intellectual capital academic literature (1994–2008)	Serenko A., Bontis N., Booker L., Sadeddin K., and Hardie T.	2010	Journal of Knowledge Management	The purpose of this study is to conduct a scientometric analysis of the body of literature contained in 11 major KM and intellectual capital (KM/IC) journals	2175	Articles	A total of 2175 articles published in 11 major KM/IC peer-reviewed journals were carefully reviewed and subjected to scientometric data analysis techniques	This article suggests that not only the literature of knowledge management relatively immature methodologically but also the literature may be evolving in a direction that distinguishes it from other literatures
The research core of the knowledge management literature	Danny P. Wallace, Connie Van Fleet, Lacey J. Downs	2011	International Journal of Information Management	The goal was to explore the nature of the scholarly knowledge management literature and the use of research methodologies in the KM literature in a systematic, comprehensive, quantitative manner by examining a broad cross-section of the KM journal literature	21,596	Articles	The basic methodological approaches selected for the study were a series of Bradford analyses of the scatter of the KM literature and a content analysis of the full-texts of articles provisionally identified as being relevant to knowledge Management	In this article number of research questions pertaining to country, institutional and individual productivity, co-operation patterns, publication frequency, and favorite inquiry methods were proposed and answered. Based on the findings, many implications emerged that improve one's understanding of the identity of KM/IC as a distinct scientific field
Research trends in knowledge management: analyzing the past and predicting the future	Dwivedi Y., K., Venkitachalam K., Sharif A. M., Al-Karaghoul W., and Weerakkody V.	2011	Information Systems Management	This aims to provide a review and investigation into the KM field in terms of how the domain is represented along a number of dimensions including unit of analysis, research paradigm employed, and the research topics/issues investigated	1043	Articles	The research presented in this article employed a combination of bibliometric analysis, historical analysis and meta-analysis as a means of categorizing accumulated knowledge on KM research	This article suggest that a combination of positivist, empirical, conceptual/descriptive, and multi-method approaches have been predominantly used in the area. Organizational as well as systems and environmental context-based KM research were found to be the most widely published topics within the KM domain
Revealing research themes and trends in knowledge management: from 1995 to 2010	Lee M. R., and Chen T. T.	2012	Knowledge-Based Systems	This study aims to capture and reveal insightful patterns of intellectual structures that are shared by researchers in the KM field	10,974	Articles	Document co-citation analysis, pathfinder network and strategic diagram techniques are applied to provide a dynamic view of the evolution of KM research trends	Revealing research themes and trends in knowledge management: from 1995 to 2010

Table 2 Attributes used in literature review.

Attributes	Descriptions
<i>Research design applied</i>	
Empirical quantitative	It is survey based research
Empirical qualitative	It is more about the case study and action research approaches
Desk quantitative	It is mathematical model, fuzzy logic, etc.
Desk qualitative	It is conceptual models, archival studies, developing propositions for future research, etc.
Empirical triangulation	It is multi method approach
<i>Hypothesis testing</i>	
A hypothesis is a proposition that attempts to explain a set of facts in a unified way. It generally forms the basis of experiments designed to establish its plausibility	
<i>Research methods</i>	
Survey	Direct or mail based survey
Interviews	Verbal or written, structured interview
Mathematical model	Developing mathematical model for real life situation
Case study	Theoretical or empirical case study
Conceptual model	Theoretical research
Others	Literature review, insights from the organizations, etc.
<i>Data analysis techniques</i>	
It includes descriptive statistics, factor analysis, regression, path analysis, structural equation modeling, MCDM, theoretical development, etc.	
<i>Level of analysis</i>	
Function	The purpose for which KM is designed or exists
Firm	The single organization under study
Dyad	Two individual's organizations regarded as a pair
Chain	It is a system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer
Sector	A part or subdivision of society, area or economy
Others	With respect to theoretical or descriptive development

more broad based on coverage. This paper, besides providing a methodological review of literature on KM also covers the following objectives:

- arranging the publications in an orderly manner to enable easy and quick search;
- classification of literature;
- methodological review; and
- identifying gaps and providing hints for further research.

3. Preamble to literature review

Over the last five years, the authors had several opportunities to collect and study literature pertaining to KM. Two main reasons are:

- interactions with organizations with focus on KM and
- one of the author pursuing doctoral studies in the field of KM.

As a part of the research, it was decided to classify and analyze the literature in detail. The course of action included the following steps:

- As a part of KM research, this paper focuses on surveying KM through a literature review and classification of articles till May 2013.
- A search of the literature has been conducted to identify various KM articles. The search has been carried out in English language and employed the following electronic databases.

Table 3 Reviewed articles distributions according to the research design applied used.

Research design	DSS	ESA	IMD	JKM	KBS	VINE	KMS	Total
Empirical quantitative	6 (25)	6 (17)	5 (29)	34 (18)	2 (13)	9 (21)	4 (21)	62 (19)
Empirical qualitative	2 (8)	6 (18)	1 (6)	29 (15)	3 (19)	11 (26)	6 (31)	52 (16)
Desk quantitative	1 (4)	4 (12)		2 (1)	1 (6)	1 (2)	1 (6)	9 (3)
Desk qualitative	15 (63)	17 (50)	9 (53)	114 (60)	9 (56)	20 (46)	7 (36)	184 (57)
Empirical triangulation		1 (3)	2 (12)	12 (6)	1 (6)	2 (5)	1 (6)	18 (5)
Total	24 (100)	34 (100)	17 (100)	191 (100)	16 (100)	43 (100)	19 (100)	325 (100)

1. ABI/Inform – <http://www.il.proquest.com/pqdauto>
2. EBSCO Databases – <http://search.epnet.com/>
3. Elsevier's Science Direct – <http://www.sciencedirect.com/>
4. Emerald Full-text – <http://iris.emeraldinsight.com/>
5. IEEE/IEE Electronic Library Online (IEL) – <http://ieeexplore.ieee.org/>
6. ProQuest Science (formerly ASTP) – <http://www.il.proquest.com/pqdauto>. While the authors have tried their best to include as many publications as possible, they do not claim that their listing is complete or exhaustive in nature.

- (3) The literature survey is based on a search for the 'knowledge management' in the title of the article in the above mentioned online database, from which 1654 articles were found in 120 journals.
- (4) Developing a classification scheme was the next step. First a bibliographical list of all publications was developed and a file was created in Excel spreadsheet.
- (5) Keeping these observations in mind the authors decided to approach the review process in a different way, as illustrated in the next part of the paper.

4. Methodology

4.1. Selection of articles

During the literature review of KM, 1654 articles having KM in their titles were found in 120 journals. The H index and SJR value (SCImago journal ranking) of all 120 journals were found. The H index gives an estimate of the importance, significance and broad impact of a scientist's cumulative

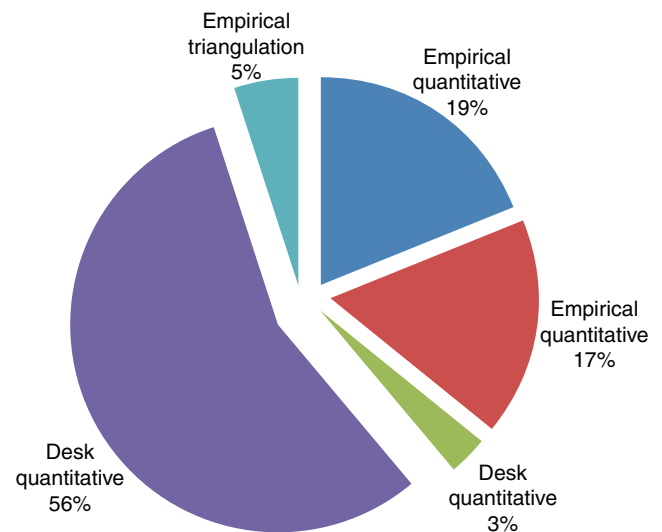


Figure 1 Research design wise distribution of reviewed articles.

research contribution. SJR is the indicator of journals scientific prestige, for ranking scholarly journals based on citation weighting schemes. It uses eigenvector centrality in complex and heterogeneous citation network, such as Scopus. Out of these 121 journals, only seven journals are having a good number of articles having KM in their title as well as SJR value more than 100 and also having an H index. These seven journals are selected for the study. These selected journals are Decision Support Systems (DSS), Expert System with applications (ESA), Industrial Management and Data System (IMD), Journal of Knowledge Management (JKM),

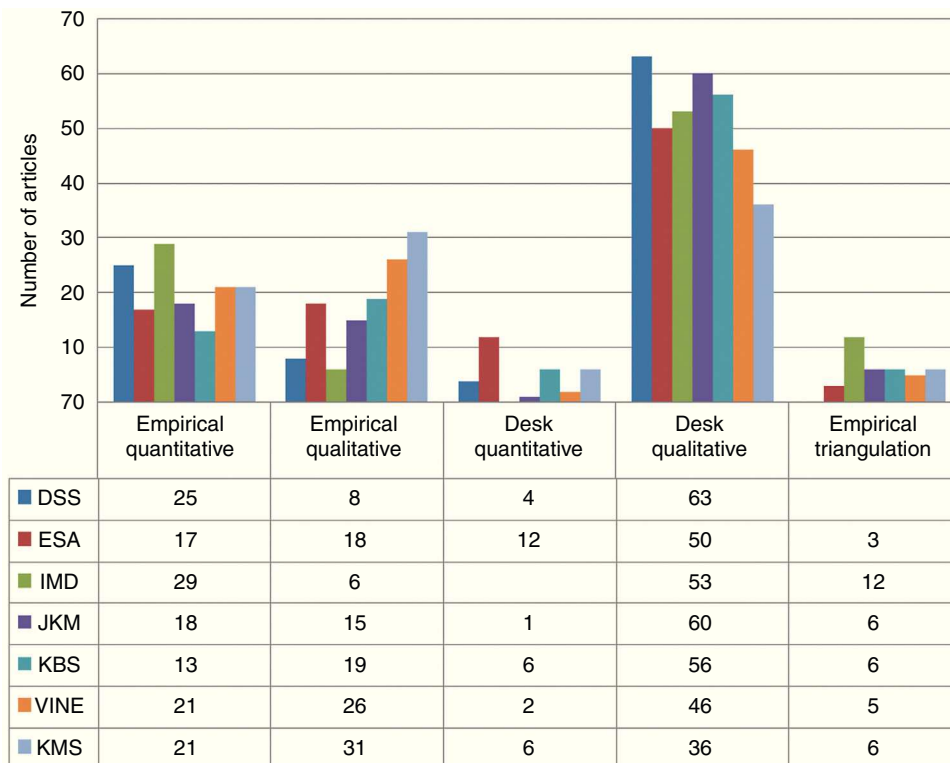


Figure 2 Research design wise comparison of journals with respect to reviewed articles.

Table 4 Reviewed articles distributions according to the percentage of hypothesis testing used.

Journals	Percentage of hypothesis testing
DSS	4.16
ESA	8.82
IMD	11.76
JKM	5.75
KBS	6.25
VINE	4.65
KMS	5.26
Total	6.10

Knowledge-Based System (KBS) and VINE: The journal of Information, Knowledge Management System (VINE) and International journal of Knowledge Management Studies (KMS). In these seven journals 344 articles having KM in their titles were found. This literature review restricted to these articles only.

4.2. Review process

These articles were reviewed with respect to the research design, number of hypothesis testing, research methods, data analysis techniques, and level of analysis. The detail description of this attribute is given in Table 2. The next section presents the summary of review and discussion.

5. Summary of review and discussion

This section contains the summary of the review. The subsequent subsections present the state of research in KM by examining the research design, number of hypothesis testing, research methods, data analysis techniques and level of analysis used in all the 344 articles.

5.1. Research design applied

The research design refers to type of reviewing an article whether it is based on empirical work or desk research. The applied research design is divided into five categories. They are mainly empirical quantitative, empirical qualitative, desk research qualitative, desk research quantitative and empirical triangulation. Table 3 presents a matrix of research design of seven journals. It shows the number of articles in each category of research design in respective journals. It also provides the percentages of each element.

About 70 percent of the articles in DSS use qualitative (empirical and desk) research design. Empirical qualitative is more about the case study and action research approaches. 19 percent of articles are based on empirical quantitative (mail survey based), which indicates that quantitative (empirical and desk) research methods are less popular in this journal. No article in this journal has an empirical triangulation as research design. Desk qualitative (conceptual models, archival studies, developing propositions for future research, etc.) is holding good position (57 percent) compared to other research design used in journals

Table 5 Reviewed articles distributions according to the research methods used.

Research methods	DSS (percent)	ESA (percent)	IMD (percent)	JKM (percent)	KBS (percent)	VINE (percent)	KMS (percent)	Total (percent)
Survey	4 (17)	7 (20)	6 (35)	38 (20)	1 (6)	9 (21)	3 (16)	68 (20)
Interviews		1 (3)	1 (6)	18 (9)	1 (6)	4 (9)	2 (11)	2 (78)
Math. model	2 (8)	5 (15)			1 (6)		1 (5)	9 (3)
Case study	3 (12)	6 (18)	3 (18)	32 (17)	4 (26)	11 (26)	5 (26)	64 (18)
Conceptual model	9 (38)	12 (35)	7 (41)	75 (39)	5 (31)	16 (37)	5 (26)	129 (37)
Others	6 (25)	3 (9)		28 (15)	4 (26)	3 (7)	3 (16)	47 (14)
Total	24 (100)	34 (100)	17 (100)	191 (100)	16 (100)	43 (100)	19 (100)	344 (100)

Table 6 Reviewed articles distributions according to the data analysis techniques used.

Techniques	DSS (percent)	ESA (percent)	IMD (percent)	JKM (percent)	KBS (percent)	VINE (percent)	KMS (percent)	Total (percent)
Descriptive analysis	8 (33)	12 (35)	4 (23)	25 (13)	3 (19)	7 (18)	8 (42)	67 (20)
Regression	4 (17)		1 (6)	14 (7)	1 (6)	3 (9)	1 (5)	24 (7)
factor analysis		2 (6)	2 (12)	9 (5)	4 (25)			17 (5)
Correlation analysis		1 (3)		12 (6)	2 (12)			15 (4)
Cluster analysis			1 (6)	2 (1)				3 (1)
MANOVA		1 (3)	1 (6)	5 (3)				7 (2)
Path analysis								
SEM			2 (12)	3 (2)			1 (5)	6 (2)
Others	12 (50)	18 (53)	6 (35)	121 (63)	6 (38)	33 (67)	9 (48)	204 (59)
Total	24 (100)	34 (100)	17 (100)	191 (100)	16 (100)	43 (100)	19 (100)	344 (100)

(see Fig. 1), while desk quantitative (mathematical model, fuzzy logic, etc.) appears less popular in all journals except DSS. At KMS most of the articles (67 percent) use qualitative methods as their research design. But only one article has uses desk quantitative methods. Overall Empirical triangulation (multi method approach) accounts for 5 percent and desk quantitative accounts for only about 5 percent of the articles (see Fig. 2). About 75 percent articles in a reviewed journal used qualitative (empirical and desk) research design, which shows, that these journals are more inclined toward qualitative research design.

5.2. Hypothesis testing

A hypothesis is a tentative assumption made in order to draw and test its logical or empirical consequences. Researchers' task is to test the hypotheses empirically and subsequently remove falsified hypotheses. The percentage of articles in which hypothesis testing is done is shown in Table 4. IMD accounts for highest hypothesis testing (11.76 percent). The 5.26 percentage of articles uses hypothesis testing in KMS. DSS and ESA are both close to 4 percent in hypothesis testing. The total percent of hypothesis testing in reviewing articles are only 6.10. One of the reasons could be that, all journals are more inclined toward desk qualitative methods.

5.3. Research methods

The research methods chosen for this study are namely survey, interviews, math modeling, case studies, conceptual

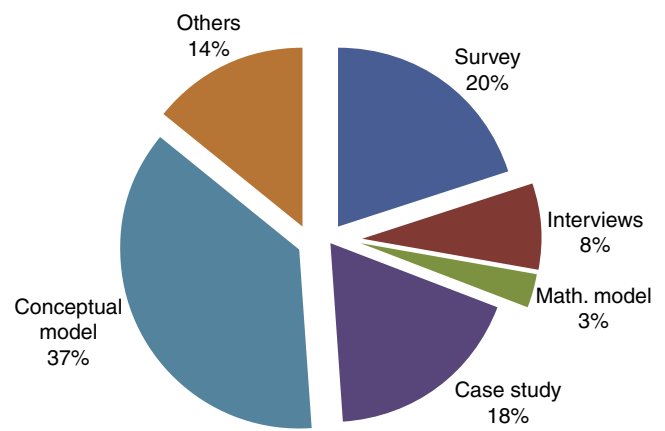


Figure 3 Research method wise distribution of reviewed articles.

model and others (literature review, insights from the organizations etc.). Table 5 shows information about the research methods found after surveying the articles.

The conceptual model (37 percent) is a common method used in KM research (see Fig. 3). It is highest in all journals. The survey is holding second position in ESA, IMD and JKM. The case study and conceptual model ranked first in KMS, whereas case study is second in KBS and VINE and third position in ESA, DSS, IMD and JKM. Other research methods also have significant percentages in DSS, KBS and VINE (see Fig. 4). It is observed that most of the articles (37 percent) have used conceptual model, therefore now a much

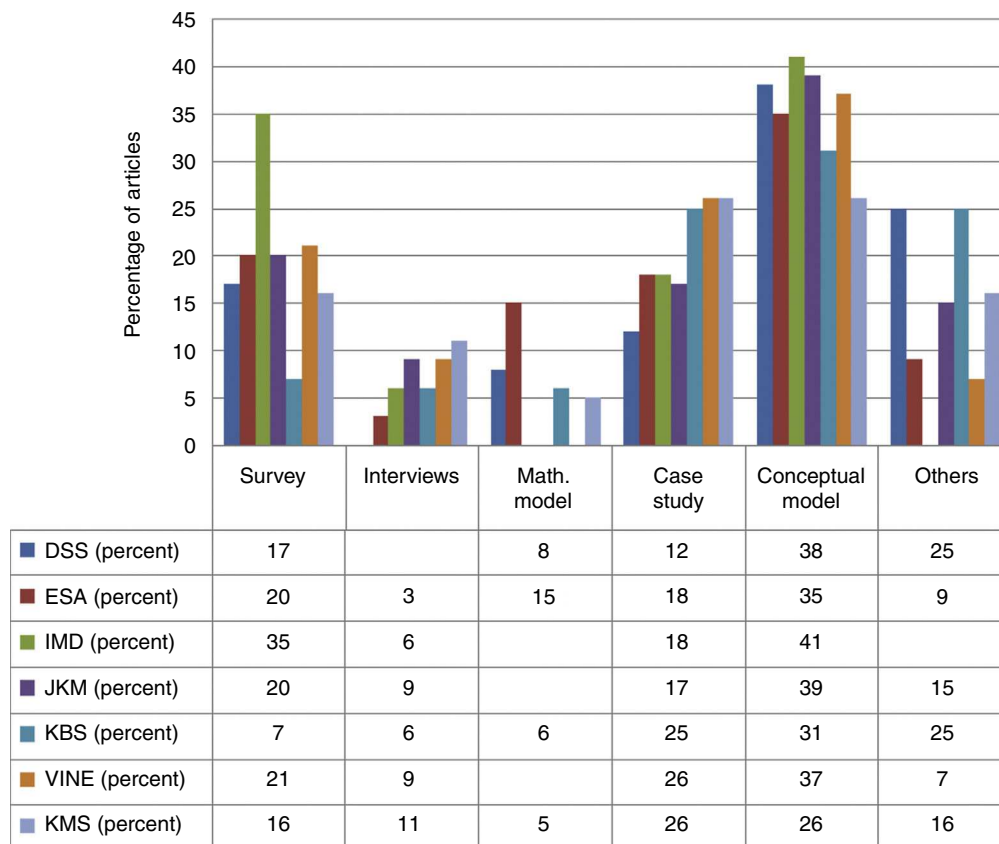
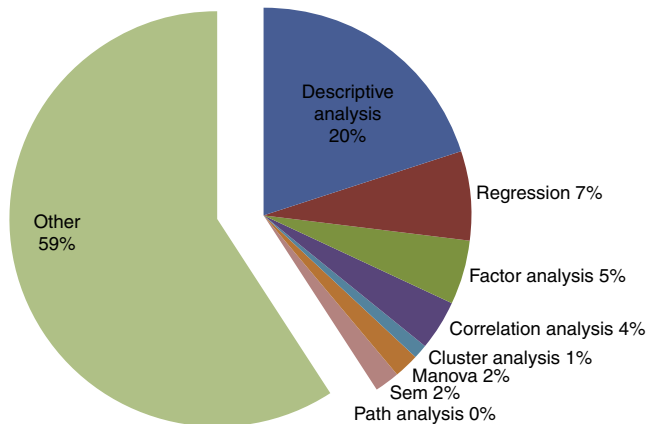


Figure 4 Research methods wise comparison of journals with respect to reviewed articles.

Table 7 Reviewed articles distributions according to the levels of analysis in reviewed articles.

Level of analysis	DSS (percent)	ESA (percent)	IMD (percent)	JKM (percent)	KBS (percent)	VINE (percent)	KMS (percent)	Total (percent)
Function	8 (33)	14 (41)	6 (35)	75 (39)	3 (19)	15 (35)	3 (17)	124 (36)
Firm	6 (25)	10 (29)	5 (29)	41 (21)	5 (31)	13 (30)	5 (26)	85 (25)
Dyad	3 (13)	3 (9)	3 (18)	7 (4)	1 (6)	1 (2)	1 (5)	19 (5)
Chain	2 (8)	2 (6)	1 (6)	21 (11)		2 (5)	5 (26)	33 (10)
Sector	3 (13)	4 (12)	2 (12)	25 (3)	2 (12)	5 (12)	1 (5)	42 (12)
Others	2 (8)	1 (3)		22 (12)	5 (32)	7 (16)	4 (21)	41 (12)
Total	24 (100)	34 (100)	17 (100)	191 (100)	16 (100)	43 (100)	19 (100)	344 (100)

**Figure 5** Distribution of data analysis techniques used in reviewed articles.

stronger movement is required toward direct observation via case, action and field studies.

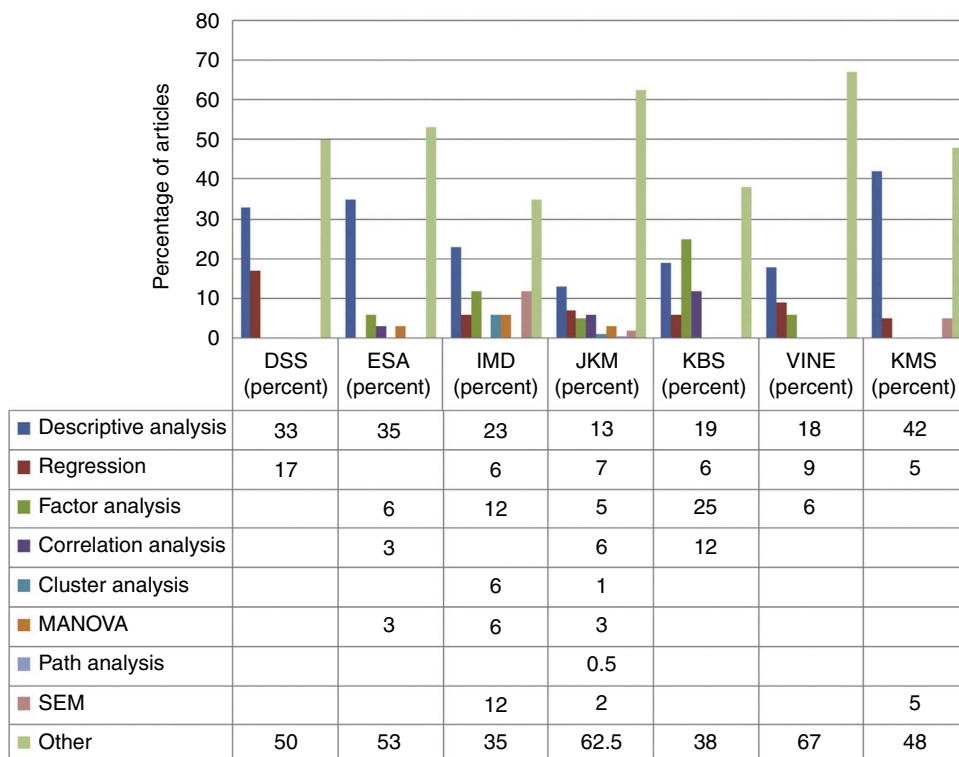
5.4. Data analysis techniques

Analysis of data is a process of inspecting, cleaning, transforming, and modeling data with the goal of highlighting useful information, suggesting conclusions, and supporting decision making.

Data analysis techniques help the researcher in the following way:

- To understand the effects of a number of variables on the final outcome.
- To minimize the confounding effects inherent in most questionnaire data.
- To assess the effects of alternative future scenario.

Major techniques used for data analysis are descriptive statistics, factor analysis, regression, path analysis, and

**Figure 6** Data analysis techniques wise comparison of journals with respect to reviewed articles.

structural equation modeling. Table 6 shows information about data analysis techniques used in the reviewed articles.

More than 50 percent of the articles used other techniques, i.e. other analysis technique (see Fig. 5). Other data analysis techniques have included MCDM analysis (Hung, Chou, & Tzeng, 2011), KM theory development (Wang & Wang, 2008), etc. This may be one of the reasons of low hypothesis testing in these journals. Descriptive analysis is second in all reviewed journals except KBS (see Fig. 6). The 90 percentage of the article in KMS uses descriptive and conceptual data analysis techniques. The factor analysis, holding good position in IMD and KBS as compared to other journals. This effect may be due to the percentage of hypothesis testing, which is slightly higher in these journals. Cluster analysis, MANOVA, path analysis and SEM are used in a very less number of articles (Only 5 percent).

5.5. Levels of analysis

The levels of analysis chosen for this study are function, firm, dyad, chain, and sector. The information about the level of analysis in these seven journals is shown in Table 7.

More than 60 percent articles operate at the levels of functions and single firm (209 out of 344). It is remarkable to note that very few articles have an inter-organizational level (dyad, chain) of analysis (see Fig. 7). The Chain and firm analysis used in KMS is significant. In KBS, function as a level of analysis is used in only 19 percent of the articles (see Fig. 8). This shows that KM is basically introduced to

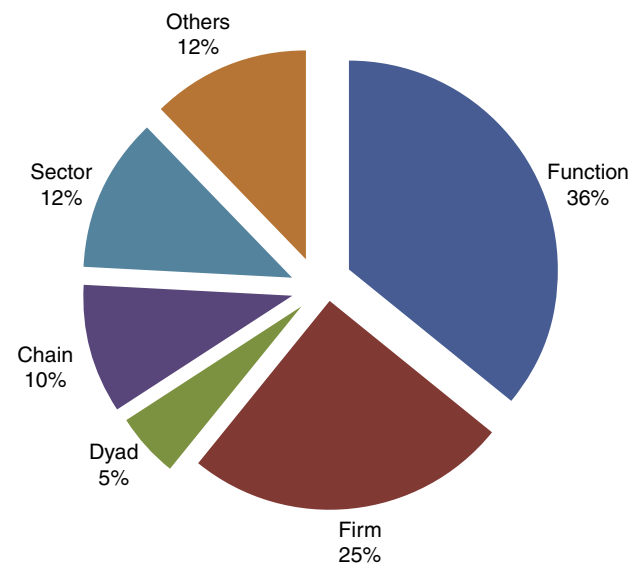


Figure 7 Distribution of level of analysis in reviewed articles.

help organizations in creating, sharing, and using knowledge effectively within individuals as well as organizations.

6. Conclusions

This paper attempts to provide an overview of the body of the 344 articles having KM in their title, which is published

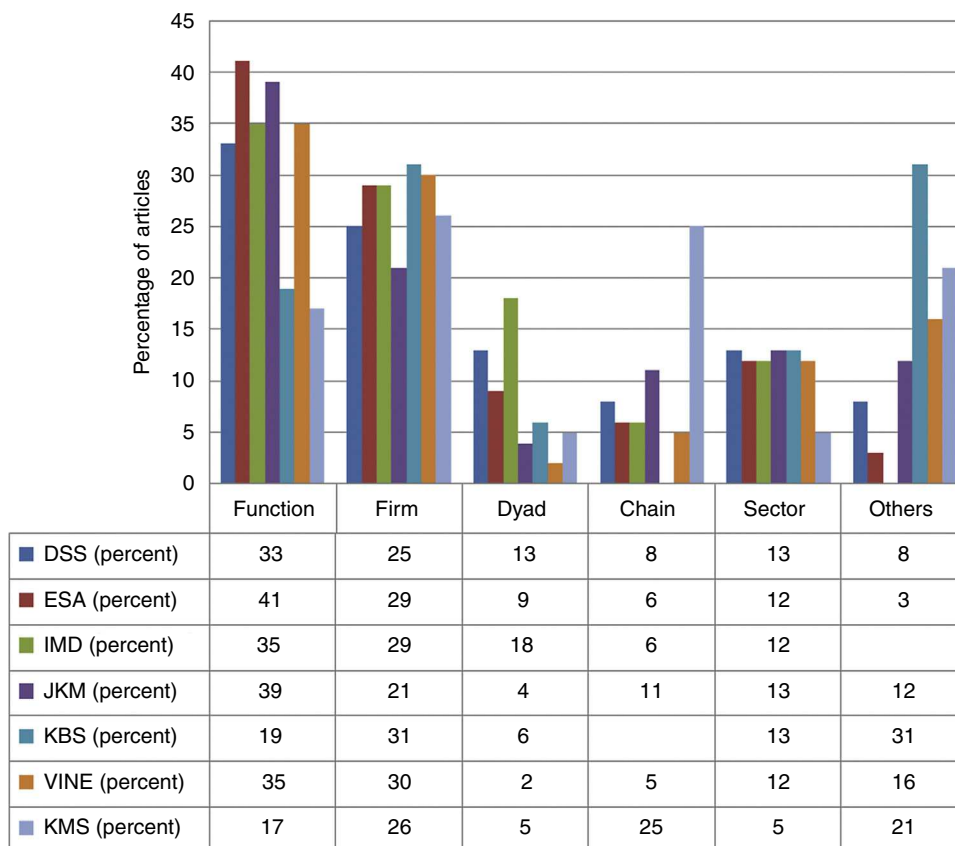


Figure 8 Levels of analysis wise comparison of journals with respect to reviewed articles.

in the above-mentioned seven journals. As stated, this survey has attempted to provide an introductory picture of the body of articles published in seven journals. These journals are DSS, ESA, IMD, JKM, KBS, VINE and KMS. In general, the articles reviewed were based on empirical research. Most of the researchers have developed a conceptual model in their articles. Very few articles (3 percent) used mathematical models in the area of KM. Now it is required that research has to expand its limited set of exhausted theories and consider new research methods. Subsequent subsections present the gaps identified in the research, significant findings of the paper, limitations of the study and future directions of the research.

6.1. Gaps identified

Mathematical models are used in very limited articles (2 percent); in most of the article's researchers have done only theoretical study (about 55 percent). Because organizations are hesitating to explore their quantitative data, hence it is really difficult to work on mathematical model in KM research.

The hypothesis testing is highest in IMD while DSS, VINE and KMS have about 5 percent of hypothesis testing. In the reviewed journals hypothesis testing is being done for about 6.10 percent, which is very less.

KM adoption at inter organizational level is time consuming and costly. Limited organizations have adopted KM at interorganizational level. The data collection for the same is difficult. Hence the research at an inter organizational level is very less. About 60 percent operate on the level of function and single firm.

6.2. Significant findings

The qualitative research methods such as a case study, action based research, conceptual models, archival studies, and developing propositions for future research are used in 73 percent of articles. Conceptual model scores highest among all the research method used in the discipline. KM is a relatively new field and researchers still believe on conceptual models rather than mathematically proving the theories.

The survey research stands second among all the research method used in the KM discipline. The most common method used in KM research is survey research because, it is well known and comparatively easier method than mathematical modeling. Survey research methodology is often used to capture data from business organizations. However, it seems that, effective contribution to theory development in the KM field requires careful implementation of survey methodology. Poorly designed and executed survey research is of little or no value.

More than 50 percent of the articles used the conceptual analysis as a data analysis technique. Descriptive analysis holds a good position among all the data analysis techniques.

6.3. Limitation of the study

The literature review for the broad category of KM is a difficult task due to the huge number of articles on KM and it is really difficult for studying, classifying, and comparing

these articles. Therefore first limitation of this paper is to restrict a review to only those articles having KM in their title. A second limitation is only seven journals which are having better number of articles on KM as well as SJR value more than 100 and having H index have been selected for study. It restricts the generalize conclusion.

6.4. Direction of future KM research

This paper has shown the current status of KM research from the standpoint of research design, number of hypothesis testing, research methods, data analysis techniques and level of analysis. This paper covers a broader scope than past research articles on KM. The following points offer some direction for future research:

- In earlier studies most common method used was conceptual method and survey. Researcher mostly concentrated on theoretical work. But with the passage of time, now there is need much stronger movement is required toward direct observation via case, activity and field study in KM research.
- The researcher should also focus on hypothesis testing and mathematical modeling in KM research. Most of the articles have done a conceptual study and interested to find out "what" aspect of the KM research instead of "Why" aspects of KM research. To get the answer of these, hypothesis testing and mathematical modeling is required.
- KM is basically introduced to help organizations to create, share, and use knowledge effectively within individuals and organizations. But this inter organizational level research is currently less in discipline as compared to function or organization level research. To get more momentum to KM research, more research is essential at KM in inter organizational level.

It is hoped that this paper has thrown light on certain dark areas of research methods in KM research and will accelerate the speed up use of greater research methodologies in future research.

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