Bibliometric analysis of literature on knowledge sharing

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This study aims to analyze globally published research papers on Knowledge Sharing (KS) using different bibliometric parameters based on data downloaded from Thomson Reuter's Web of Science (WoS). Results indicated that an increasing trend was found in annual production during 1990–2016. The two most productive journals are *Journal of Knowledge Management* and *Knowledge Management Research & Practice*. Out of the 101 countries that contributed to research papers on 'knowledge sharing', USA topped with 689 articles. The City University of Hong Kong of China and the National Central University of Taiwan were the most productive institutions.

Introduction

Knowledge is considered as a fundamental prerequisite for the growth and accomplishment of organizations[1,2]. According to Orlikowski, knowledge is an unending social achievement, constituted and reconstituted on a daily basis[3]. This constitution and reconstitution of knowledge is possible when it is shared. Sharing is a significant feature of the knowledge economy[2]. It is opined that the sharing of knowledge is to make it accessible for use within an organization and converting the same into a form that can be effectively comprehended and used[4]. According to Gupta & Govindarajan, it is a process of "identification, outflow, transmission, and inflow of knowledge"[5]. It has also been defined by Helmstadter, "as a voluntary behavior wherein an individual shares his or her acquired knowledge with others"[6]. It is both an individual experience and also what is imparted to others[2]. Thus we can say that KS is an activity which helps to produce higher intellectual level, as it is believed to be an incessant practice of creating, acquiring, and transferring knowledge accompanied by a feasible change of behavior to reproduce new

knowledge and insight, and to create a higher-level scholarly content[7].

The development of the scientific basis for KS should be based on a significant and accumulating literature and exchanging information and knowledge globally. Therefore, it is urgent to collect the number of publications dealing with aspects of KS. The principal aim of this study is to bibliometrically examine the literature published in this area from 1990 to 2016, in order to present insight into the different characteristics of the literature. Such information can have important implications for scientific research planning and policy management.

Review of literature

The three most commonly used metric terms are bibliometrics, scientometrics and informetrics. Among them, the earliest metric which is used to statistically and mathematically analyse books and other media of communication is called bibliometrics[8]. The second most widely used metric method for analysing the past, present, and future development of sciences is called scientometrics[9]. The

credit for its development goes to researchers like Robert King Merton, Derek J. de Solla Price and Eugene Garfield[10-14]. The most recent metric term among all the three metric terms is informetrics, it incorporates bibliometrics and scientometrics[15].

Bibliometric indicators undoubtedly have some merit in assessing the huge R&D complex of modern societies[16]. There are many reasons why researchers conduct descriptive metric studies of a particular academic research field. The most important reason is to understand the identity of a scientific discipline, on both prospective and retrospective lines. In a broader sense, it helps to discover the entire intellectual core of a scientific field instead of focusing on its specific work[17].

There are studies which ascertain the research output in terms of most prolific institutions, countries, authors, articles and journals[18-31]. Such type of bibliometric studies may possibly provide all investors (journal editors, journal publishers, conference organizers, government research policy agencies, pioneers and leading researchers, research centres, and graduate programs)[32] in policymaking and help them adjust their activities if necessary[33]. The credit of scientific quality helps prominent scholars to communicate their accomplishments both within and outside their domain of knowledge and inspires them to contribute further. It also assists junior researchers in finding academic guides[32].

Over the years, KS has become a subject of research in the field of knowledge management. The landscape of KS covers a number of issues and trends, including modes of KS, barriers to KS, advantages and disadvantages of KS, the impact of information technology on KS, models of KS, the implications of KS, etc. It will be useful to examine the bibliographical data on the KS to discover past and present trends in this field of research in order to understand its strong and weak research areas using various bibliometric indicators.

Objectives of the study

The broad objective of this study is to analyse the performance of global knowledge-sharing research reported in 1990-2016 and indexed in the WoS database. The specific objectives are:

- To analyse the growth, document and language distribution of publications;

- To identify the most prominent journals, articles and subject categories; and

- To identify the leading countries, institutions and authors.

Methodology

The data used for this study was based on the SCI-Expanded (Science Citation Index Expanded) and SSCI (Social Sciences Citation Index) of Web of Science (WoS) in the Thomson Reuters (as on August 31st, 2017). There were 3222 documents for the period 1990 to 2016 with the keyword ''Knowledge Sharing'' in titles, abstracts and keywords. Yearly citations for every document that were published in all those years were downloaded.

Different terms were used to determine the author collaboration and the same was determined by their addresses. The term used are "Single country article" (used for authors whose addresses were from the same country), "Internationally collaborative article" (allocated to those articles which were coauthored by researchers from more than one country), "single-institution article" (was used for articles in which all authors association was from the same institution) and "inter-institutionally collaborative article" (if authors were from different institutions)[21,25,20,26]. Articles originating from England, Northern Ireland, Wales and Scotland were put under the United Kingdom (UK)[21, 26].

TC2016 was used as an indicator to denote the total number of citations from the time when the paper was first published till 2016 [20, 22, 25-27], the feature of this indicator is that it is a constant parameter in comparison with the index of citations from the WoS which is being updated on regular basis[20, 22]. Another indicator C2016 which indicates the total number of citations for a paper in a single year was also used[26-27]. H-index[34] was used to access the impact of countries, institutions, and authors.

The visibility of an article was assessed using citation per publication (CPP)[18-19,26]. There is a significant statistical relation between the number of times an article is cited and the duration from the time when it was first published[18-19, 26]. The journal impact factors were obtained from JCR 2016.

Results and discussion
Document types

The 3222 publications on "Knowledge Sharing" were categorized under 13 document types published from 1990 to 2016 (Table 1). Among the total publications, 2762 (85.72%) were articles followed by proceeding papers 235 (7.29%) and reviews 112 (3.48%). 42 documents belonged to the category of editorial material which constitutes 1.30%. other document types i.e. Book reviews, meeting abstracts, letters, corrections, retracted publications and retraction showing meager significance, etc., constituted 2.11%. Further analysis was carried based on the 2762 papers published in the form of articles.

Distribution of publications by year

The year-wise distribution of publication output globally shows an increasing trend. It increased from 87 papers during 1990-1999 to 3135 papers during 2000-2016 (Table 2).

Figure 1 shows the number of articles and citations per article (CPP) from 1990 to 2016. During 1990 and 2016 the average CPP was 17.53. The lowest CPP was 0.50 for 2016, whereas the higher CPP was 222.5 for the year 1991 followed by 80.85 for the year 2002.

Language

Thirteen different languages were used in publishing the retrieved articles. The primary language which contributes more than 98% (2715) of the papers was English. Other languages like Portuguese, Spanish, German, French, Turkish, Slovak, Russian, Korean, Japanese, Italian, Dutch and Chinese were also used. Table 3 shows the list of languages and their contribution in terms of a number of articles and percentage.

Table 1—Document types

Document type	No. of documents	%
Article	2762	85.72
Proceedings paper	235	7.29
Review	112	3.48
Editorial material	42	1.3
Book review	26	0.81
Meeting abstract	24	0.74
Letter	6	0.19
Correction	5	0.16
Retracted publication	4	0.12
Retraction	3	0.09
Reprint	1	0.03
News item	1	0.03
Book Chapter	1	0.03
Total	3222	100

Table 2—Year-wise distribution of documents

Year	No. of publications	%	Year	No. of publications	%
2016	386	11.98	2002	64	1.99
2015	340	10.55	2001	44	1.37
2013	296	9.19	2000	34	1.06
2012	296	9.19	1999	24	0.75
2014	293	9.09	1998	18	0.56
2011	284	8.81	1997	15	0.47
2010	232	7.2	1995	9	0.28
2009	192	5.96	1996	7	0.22
2008	171	5.31	1994	6	0.19
2007	123	3.82	1993	2	0.06
2005	111	3.45	1992	2	0.06
2006	107	3.32	1991	2	0.06
2004	90	2.79	1990	2	0.06
2003	72	2.24			

Journal and Web of Science category

There are 252 WoS categories present in the WoS database. The Knowledge-sharing articles were available in 927 Journals which fall under 170 Web of Science categories (WoSC) in Science Citation Index Expanded (SCI-EXPANDED) and Social Sciences Citation Index (SSCI). Out of 927 journals, 538 contained one article; 159 contained two articles, and 70 contained three articles. KS covers 67.46% of the categories indicating that the subject is interdisciplinary in nature. The journals with the highest IF among the top ten most prolific journals is shown in Table 4 were *Expert Systems with Applications* (IF2016 = 3.928), followed by *International Journal of Information Management*

(IF2016 = 3.872), published 62 (2.24%) and 37 (1.33%) articles, respectively.

Applying Bradford's Law of Scattering for the 927 journals showed that the first zone consisted of the most prolific 1/3rd of the total articles with 36 journals (3.88 % of 927 journals). The second zone with 171 journals (18.44%) represents the subsequent most prolific 1/3rd of total articles and the last zone with 720 journals (77.66%) represents the least prolific 1/3rd of total articles. This shows that the number of journals in all the three zones more or less followed Bradford's law.

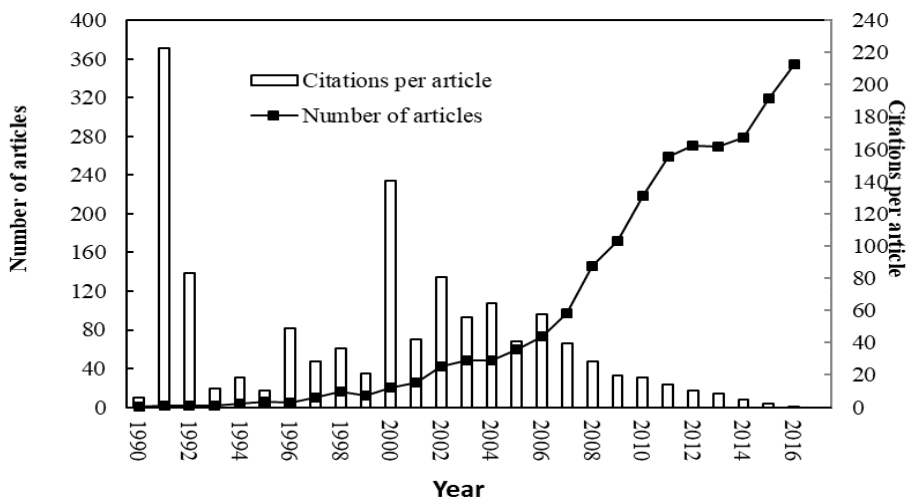Table 5 shows the ten Science Citation Index Expanded (SCI-Expanded) and Social Sciences

Fig. 1—Knowledge sharing related research articles and citations per article (1990-2016)

Table 3—Languages of retrieved articles on knowledge sharing (1990-2016)

Languages	No. of articles	%
English	2715	98.3
Portuguese	18	0.65
Spanish	12	0.43
German	4	0.15
French	4	0.15
Turkish	2	0.07
Slovak	1	0.04
Russian	1	0.04
Korean	1	0.04
Japanese	1	0.04
Italian	1	0.04
Dutch	1	0.04
Chinese	1	0.04
Total	2762	100

Table 4—The 10 most productive journals

Journal	TP (P)	IF2016	PF	Country	WoS Category
Journal of Knowledge Management	157(5.68)	2.053	Quarterly	England	Information science & library science; Management
Knowledge Management Research & Practice	71 (2.57)	1.013	Quarterly	England	Information science & library science; Management
Computers in Human Behavior	70 (2.53)	3.435	Bimonthly	England	Experimental psychology; Multidisciplinary psychology
Expert Systems with Applications	62 (2.24)	3.928	23 issues/yr	England	Artificial intelligence computer science: Electrical & electronic engineering; Operations research & management science
International Journal of Information Management	37 (1.33)	3.872	Bimonthly	England	Information science & library science
Information & Management	30 (1.08)	3.317	8 issues/yr	Netherlands	Information systems computer science: Information science & library science; Management
Social Behavior and Personality	27 (0.97)	0.548	10 issues/yr	New Zealand	Social Psychology
Journal of Information Science	25 (0.90)	0.468	Bimonthly	England	Information systems computer science; Information science & library science;
Decision Support Systems	25 (0.90)	3.222	Monthly	Netherlands	Artificial intelligence computer science; Information systems computer science; Operations research & management science
Computers & Education	25 (0.90)	3.819	Monthly	England	Interdisciplinary applications computer science; Education & educational research

TP Total Articles; *P* Percentage of total articles; *IF2016* Impact factor in 2016; *PF* Publication Frequency; *Yr* Year; *WoSC* web of science categories

Table 5—Ten SCI-Expanded and SSCI categories with the majority articles

SCI-Expanded Subject Category	TP (P)	SSCI Subject Category	TP (P)
Computer science information systems	352 (26.7)	Management	887 (40.5)
Operations research management science	208 (15.8)	Information science& library science	605 (27.7)
Information science & library science	179 (13.6)	Business	299 (13.7)
Computer science artificial intelligence	176 (13.4)	Computer science information systems	271 (12.4)
Computer science interdisciplinary applications	160 (12.1)	Education educational research	142 (6.5)
Management	155 (11.8)	Operations research management science	122 (5.6)
Engineering industrial	130 (9.9)	Engineering industrial	97 (4.4)
Engineering electrical electronic	109 (8.3)	Psychology multidisciplinary	91 (4.2)
Computer science software engineering	95 (7.2)	Computer science interdisciplinary applications	86 (4)
Engineering manufacturing	89 (6.8)	Psychology experimental	71 (3.2)

TP Total articles; *P* Percentage of total articles out of SCI-Expanded (1319) and SSCI (2188) Subject Categories respectively

Table 6—Top ten most prolific countries (1990-2016)

Country	TP	TP R (P)	SP R (P)	CP R (P)	FP R (P)	RP R (P)	S	h-index
USA	689	1(24.9)	1(19.1)	1(43)	1(18.4)	1(18.6)	56.3	72
Taiwan	324	2(11.7)	2(13.6)	9(6.9)	2(11.3)	2(11.2)	85.2	35
UK	319	3(11.5)	4(8)	3(18.9)	4(8.7)	4(8.9)	50.8	37
Peoples R China	312	4(11.3)	3(8.9)	2(22.4)	3(9.7)	3(9.6)	57.7	32
Australia	171	5(6.2)	5(4.3)	4(12)	5(4.5)	5(4.4)	50.9	22
Canada	143	6(5.2)	7(3.8)	8(7.1)	7(4)	7(3.9)	54.5	21
South Korea	133	7(4.8)	6(4.1)	6(9.3)	6(4.1)	6(4.1)	62.4	27
Netherlands	132	8(4.8)	8(3.3)	5(9.4)	8(3.5)	8(3.5)	50	25
Germany	100	9(3.6)	11(2.2)	10(5.9)	9(2.5)	9(2.6)	44	19
Spain	88	10(3.2)	9(2.8)	7(8)	11(2.3)	10(2.4)	63.6	18

TP Total articles; *R* Rank; *P* Percentage; *SP* Single country articles; *CP* Internationally collaborative articles; *FP* First author articles; *RP* Corresponding author articles; *S* Percentage of single country articles out of the total articles for each country

Citation Index (SSCI) subject categories with most articles. In SCI and SSCI subject category "Computer Science Information System" and "Management" had 352 (26.7%) and 887 (40.5%) articles respectively. Information Science & Library Science was ranked 2nd in SSCI Category and 3rd in SCI Category. In WoS, publications belonged to more than one subject category that is why the total number of publications displayed were greater than 2762.

Countries/territories and Institutions

It was found that 35 articles did not have author addresses. Out of the other 2727 articles that had author address, 2027 (74.33%) were single country articles published by 70 countries and remaining 700 (25.67%) were collaborative articles published by 97 countries. The top ten prolific countries are listed in

Table 6 based on five indicators: TP, SP, CP, FP, and RP[25]. The percentage of SP among the total articles for each country S and h-index are also presented.

USA tops with 24.9% articles during the period with highest h-index, followed by Taiwan with 11.7%. USA also had the most internationally collaborative articles accounting for 43% out of the total collaborative articles. 19.1% articles were the single country publications for the USA. Taiwan contributed 13.6% of the overall single country publication but the value of S which is 85.2% indicates that Taiwan had the most publications without collaboration followed by Spain and South Korea.

Table 7 shows the prolific 11 institutions ranked in terms of a number of articles contributed. Of the 2727

articles analyzed, 1209 (44.33%) were single institution articles and 1518 (55.67%) were inter-institutionally collaborative articles. Out of these top institutions, four were in Taiwan, three were in China, two in Singapore and one each in England and Canada. The topmost prolific institution was the City University of Hong Kong, China with 50 articles. It also contributed the majority of inter-institutionally and first-authored articles. The National Chiao Tung University and National Cheng Kung University published the single institution articles both of them belong to Taiwan.

Table 7— Top 11 most productive institutions

Institution	TP	TP R (P)	SP R (P)	CP R (P)	FP R (P)	RP R (P)	S	h-index
City University of Hong Kong, China	50	1(1.81)	18(0.41)	1(2.96)	1(1.47)	5(0.78)	10	18
National Central University, Taiwan	48	2(1.74)	3(1.16)	2(2.24)	2(1.21)	1(1.18)	29.17	20
National Cheng Kung University, Taiwan	34	3(1.23)	1(1.32)	4(1.19)	4(0.81)	3(0.89)	47.06	13
National Chiao Tung University, Taiwan	29	4(1.05)	1(1.32)	21(0.86)	3(0.84)	2(0.93)	55.17	13
Hong Kong Polytechnic University, China	27	5(0.98)	5(0.91)	8(1.05)	5(0.66)	6(0.7)	40.74	12
Nanyang Technol University, Singapore	25	6(0.91)	4(1.08)	25(0.79)	6(0.59)	4(0.81)	52	11
Loughborough University, England	24	7(0.87)	6(0.74)	10(0.99)	14(0.37)	7(0.67)	37.5	11
National Sun Yat Sen University, Taiwan	23	8(0.83)	228(0.08)	3(1.45)	58(0.22)	13(0.44)	4.35	13
National University of Singapore, Singapore	20	9(0.72)	50(0.25)	5(1.12)	29(0.29)	26(0.33)	15	12
Zhejiang University, China	19	10(0.69)	31(0.33)	10(0.99)	40(0.26)	13(0.44)	21.05	9
University of Toronto, Canada	19	10(0.69)	113(0.17)	5(1.12)	253(0.07)	116(0.15)	10.53	8

TP Total articles; *R* Rank; *P* Percentage; *SP* Single institution articles; *CP* Inter-institutionally collaborative articles; *FP* First author articles; *RP* Corresponding author articles; S Percentage of the single institution articles out of the total articles of each institution

Table 8—Fifteen most productive authors in Knowledge sharing research

Author	Country	TP	TP R (P)	FP (P)	RP R (P)	SP R (P)	h-index
Lin, Chieh-Peng	Taiwan	13	1 (0.47)	1 (0.34)	1 (0.45)	1 (1.52)	10
Zhang, Xi	Peoples R China	9	2 (0.33)	7 (0.21)	8 (0.22)	NA	7
Davison, Robert M.	Peoples R China, Hong Kong	7	3 (0.25)	81 (0.08)	39 (0.13)	NA	6
Wu, Wei-Li	Taiwan	7	3 (0.25)	2 (0.25)	4 (0.27)	28 (0.25)	3
Yang, Stephen J. H.	Taiwan	7	3 (0.25)	26 (0.13)	2 (0.36)	NA	6
Liu, Duen-Ren	Taiwan	7	3 (0.25)	2 (0.25)	2 (0.36)	NA	4
Mueller, Julia	Austria	7	3 (0.25)	26 (0.13)	39 (0.13)	10 (0.51)	6
Luu Trong Tuan	Vietnam	6	8 (0.22)	2 (0.25)	4 (0.27)	1 (1.52)	2
Lee, Matthew K. O.	Peoples R China, Hong Kong	6	8 (0.22)	259 (0.04)	285 (0.04)	NA	5
van den Hooff, Bart	Netherlands	6	8 (0.22)	26 (0.13)	39 (0.13)	NA	5
Tsai, Ming-Tien	Taiwan	6	8 (0.22)	7 (0.21)	NA	NA	3
Lin, Hsiu-Fen	Taiwan	6	8 (0.22)	2 (0.25)	4 (0.27)	4 (1.27)	5
Young, Mei-Lien	Taiwan	6	8 (0.22)	26 (0.13)	39 (0.13)	28 (0.25)	5
Michailova, Snejina	New Zealand	6	8 (0.22)	81 (0.08)	8 (0.22)	NA	6
Kuo, Tsung-Hsien	Taiwan	6	8 (0.22)	259 (0.04)	285 (0.04)	28 (0.25)	6

TP Total number of articles; *R* Rank; *FP* First author articles; *RP* corresponding authored articles; *SP* Single authored articles; *NA* Not available

Table 9—Top ten highly cited knowledge sharing articles

Article	Country	TC2016 (R)	C2016 (R)	C0 (R)
Dyer, J. H.. & Nobeoka, K. (2000). Creating and managing a high-performance knowledge-sharing network: the Toyota case. *Strategic Management Journal, 21*(3), 345-367.	USA.Japan	1167(1)	101(3)	8(3)
Wenger. EC & Snyder. WM. (2000). Communities of practice: The organizational frontier. *Harvard Business Review, 78*(1), 139	USA	792(2)	54(12)	4(19)
Chiu, C.. Hsu, M.. & Wang, E. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems, 42*(3), 1872-1888.	Taiwan	699(3)	145(1)	0(604)
Calantone, R., Cavusgil, S., & Zhao, Y. (2002). Learning orientation. firm innovation capability, and firm performance. *Industrial Marketing Management, 31*(6), 515-524.	USA	626(4)	90(4)	0(604)
Tsai, W. (2002). Social Structure of "Coopetition" Within a Multiunit Organization: Coordination, Competition, and Intraorganizational Knowledge Sharing. *Organization Science, 13*(2), 179-190.	USA	565(5)	72(7)	0(604)
Hansen. M. (2002). Knowledge Networks: Explaining Effective Knowledge Sharing in Multiunit Companies. *Organization Science, 13*(3), 232-248.	USA	508(6)	42(21)	0(604)
Bechky, B. (2003). Sharing Meaning Across Occupational Communities: The Transformation of Understanding on a Production Floor. *Organization Science, 14*(3), 312-330.	USA	501(7)	73(6)	1(202)
Cummings. J. (2004). Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization. *Management Science, 50*(3), 352-364.	USA	473(8)	61(9)	2(70)
Neches, R et.al. (1991). Enabling technology for knowledge sharing. *AI Magazine,* 12(3), 36-56.	USA	443(9)	18(75)	0(604)
Hsu, C.., & Lin, J. (2008). Acceptance of blog usage: The roles of technology acceptance, social influence, and knowledge sharing motivation. *Information & Management, 45*(1), 65-74.	Taiwan	412(10)	74(5)	3(32)

TC2016 Total number of citations till 2016; *R* Rank; *C2016* Number of citations in 2016; *C0* Number of citations in publication year of the articles

Table 10—Keywords in papers on knowledge sharing

Author Keywords	TP	R (P)	Author Keywords	TP	R (P)
Knowledge sharing	1006	1 (41.8)	Organizational culture	41	11 (1.7)
Knowledge management	377	2 (15.7)	Motivation	35	12 (1.5)
Innovation	84	3 (3.5)	Social networks	35	12 (1.5)
Trust	80	4 (3.3)	Knowledge-sharing	34	14 (1.4)
Ontology	76	5 (3.2)	Social media	34	14 (1.4)
Knowledge transfer	68	6 (2.8)	Semantic web	33	16 (1.4)
Social capital	64	7 (2.7)	Learning	31	17 (1.3)
Collaboration	64	7 (2.7)	Tacit knowledge	31	17 (1.3)
Knowledge	44	9 (1.8)	Knowledge creation	29	19 (1.2)
Communities of practice	44	9 (1.8)	Organizational learning	26	20 (1.1)

TP Total articles; *R* Rank; *P* Percentage of the total articles

Authorship

An analysis of author's publications showed that 2762 articles which were contributed by 6788 authors that included 2378 first authors, 2246 corresponding authors, and 395 single authors. Thirteen articles out of the total articles were without corresponding author information. Table 8 lists the top 15 productive authors. Chieh-Peng Lin from the National Chiao Tung University of Taiwan with 13 articles topped the list with the most first and corresponding authored articles. It was also found that Luu Trong Tuan from University Econ UEH of Vietnam published six single-authored articles. Xi Zhang contributed 9 collborative articles and was ranked 2nd. Out of the top 15 authors, 8 (53.33%) are from Taiwan.

Impact of the most frequently cited articles

The articles with the maximum TC2016 can be considered as the most impactful articles in KS. The ten most cited articles with TC2016>400 are shown in Table 9. Out of the ten highly cited articles, eight (80% of 10 articles) are from the USA, two are from Taiwan and the top one is a collaborative article by authors in USA and Japan. Out of these 10 articles, only one article which is ranked 9th was published in 1991. The rest were published in-between 2000 to 2008. The journal *Organization Science* published three articles (IF 2016= 2.691), *Strategic Management Journal* (IF 2016= 4.461), *Harvard Business Review (IF 2016= 3.227), Decision Support Systems* (IF 2016= 3.222), *Industrial Marketing Management* (IF 2016= 3.166), *Management Science* (IF 2016= 2.822), *AI Magazine* (IF 2016= 0.812) and

Information & Management (IF 2016= 3.317) had one each of the top ten highly cited articles.

Author keywords

Out of the total articles, 2407 had keywords and 355 did not have keywords. Among the 6620 keywords used, 5334 (80.56%) keywords were used only once and 658 (9.9%) keywords were used twice. "Knowledge sharing" (used 1,006 times) followed by "Knowledge management" (377 times), "Innovation" (84 times), "Trust" (80 times), and "Ontology" (76 times) (Table 10).

Conclusion

This study analysed KS research literature published internationally between 1990 and 2016. The study concluded that narrow international research was conducted in this area from 1990 to 1999, although it shows an increasing trend but went at a snail's pace in those ten years. At the beginning of the 21st century, research in this field shows an increasing trend, with an average annual increase of 14%. USA, Taiwan and UK emerged as leading countries in KS research. Institutional and author level contributions reveals that Asian institutions and authors are active in KS research, as most prolific institutions and authors are from Asia. Even though prolific intuitions and authors are from Asia but highly cited articles predominantly belongs to USA. Which connotes that the quality KS research is being produced by USA. It also illustrates that other countries must consider why they cannot produce such a research result. Furthermore, it can be concluded that KS literature focuses mainly on

computer science information systems, management, information science & library science and the business subject categories in WoS.

References

1. Hayek F A, The use of knowledge in society, *The American Economic Review*, 35 (4) (1945) 519-530. Available at: https://doi.org/10.1257/aer.98.5.i (Accessed on 20 July 2017).

2. Styhre A, The knowledge-intensive company and the economy of sharing: rethinking utility and knowledge management, *Knowledge and Process Management*, 9 (4) (2002) 228–236. Available at: https://doi.org/10.1002/kpm.155 (Accessed on 23 July 2017).

3. Orlikowski W J, Knowing in practice: enacting a collective capability in distributed organizing, *Organization Science*, 13 (3) (2002) 249–273. Available at: https://doi.org/10.1287/orsc.13.3.249.2776 (Accessed on 8 August 2017).

4. Isika N U, Ismail M A and Khan F A A, Knowledge sharing behaviour of postgraduate students in University of Malaya, *The Electronic Library*, 31 (6) (2013) 713–726. Available at: https://doi.org/10.1108/EL-02-2012-0021 (Accessed on 15 August 2017).

5. Gupta A K and Govindarajan V, Knowledge flows within multinational corporations, *Strategic Management Journal*, 496 (August 1999) (2000) 473–496. Available at: https://doi.org/10.1002/(SICI)1097-0266(200004)21:4<473::AID-SMJ84>3.0.CO;2-I (Accessed on 22 August 2017).

6. Helmstadter E, The economics of knowledge sharing: A new institutional approach, (Edward Elgar; Cheltenham), 2003 p. 11-38.

7. Schwartz D G and Te'eni D, Encyclopedia of Knowledge Management, 2nd edn (Information Science Reference; Hershey New York), 2011 (1), p. 804-821. Available at: https://doi.org/10.4018/978-1-59904-931-1 (Accessed on 5 September 2017).

8. Pritchard A, Statistical bibliography or bibliometrics. *Journal of Documentation*, 25(4) (1969) 348-349.

9. Serenko A, Hardie T, Bontis N, Booker L, and Sadeddin K, A scientometric analysis of knowledge management and intellectual capital academic literature (1994-2008), *Journal of Knowledge Management*, 14 (1) (2010) 3–23. Available at: https://doi.org/10.1108/13673271011015534 (Accessed on 21 October 2018).

10. Price J D S, *Little Science , Big Science* (1963). Available at: https://doi.org/10.1007/BF02018109 (Accessed on 20 October 2018).

11. Garfield E, Citation Analysis as a Tool in Journal Evaluation, *Science*, (178) (1972) 471–479. Available at: http://www.garfield.library.upenn.edu/essays/V1p527y1962-73.pdf (Accessed on 20 October 2018).

12. Merton R K, *The sociology of science: Theoretical and empirical investigations*, University of Chicago press (1973).

13. Merton R K, *Sociological ambivalence and other essays*, Simon and Schuster (1976).

14. Garfield E, *Citation Indexing: Its Theory and Application in Science, Technology, and Humanities*. New York: Wiley (1979). Available at http://www.garfield.library.upenn.edu/ci/title.pdf (Accessed on 21 October 2018).

15. Brookes B C, *Biblio-, Sciento-, Infor-metrics??? What are we talking about? In: L. EGGHE, R. ROUSSEAU (Eds),. Informetrics 89/90*. Amsterdam: Elsevier Science Publishers (1990). Available at: https://uhdspace.uhasselt.be/dspace/bitstream/1942/857/1/Brookes31.PDF (Accessed on 20 October 2018).

16. Skoie H, Bibliometrics-some warnings from the North, *Scientometrics*, 45 (3) (1999) 433–437. Available at: https://doi.org/https://doi.org/10.1007/BF02457603 (Accessed on 21 October 2018).

17. Sidorova A, Evangelopoulos N, Valacich J S, and Ramakrishnan T, Uncovering the intellectual core of the information systems discipline, *MIS Quarterly*, 32 (3) (2008) 467–482. Available at: https://doi.org/10.2307/25148852 (Accessed on 21 October 2018).

18. Qiu H and Chen Y F, Bibliometric analysis of biological invasions research during the period of 1991 to 2007. *Scientometrics*, 81 (3) (2009) 601–610. Available at: https://doi.org/10.1007/s11192-008-2207-4 (Accessed on 8 September).

19. Hsieh W H, Chiu W T, Lee Y S and Ho Y S, Bibliometric analysis of patent ductus arteriosus treatments, *Scientometrics*, 60 (2) (2004) 105–115. Available at: https://doi.org/10.1023/b:scie.0000027793.12866.58 (Accessed on 1 september 2017).

20. Fu H Z, Wang M H and Ho Y S, The most frequently cited adsorption research articles in the Science Citation Index (Expanded), *Journal of Colloid and Interface Science*, 379 (1) (2012) 148–156. Available at: https://doi.org/10.1016/j.jcis.2012.04.051 (Accessed on 18 september 2017).

21. Chiu W T and Ho Y S, Bibliometric analysis of homeopathy research during the period of 1991 to 2003, *Scientometrics*, 63 (1) (2005) 3–23. Available at: https://doi.org/10.1007/s11192-005-0201-7 (Accessed on 10 septermber 2017).

22. Ho Y S and Hartley J, Highly cited publications in World War II: a bibliometric analysis, *Scientometrics*, 110 (2) (2017) 1065–1075. Available at: https://doi.org/10.1007/s11192-016-2199-4 (Accessed on 3 October 2017).

23. Raza A, and Malik B A, A Bibliometric nalysis *of the Journal of Knowledge Management*, *Journal of Indian Library Association*, 54 (2) (2018) 91–99. Available at: https://www.ilaindia.net/jila/index.php/jila/article/view/195 (Accessed on 21 October 2018).

24. Ho Y-S, Siu E, and Chuang K-Y, A bibliometric analysis of dengue-related publications in the Science Citation Index Expanded, *Future Virology*, 11 (9) (2016) 631–648. Available at: https://doi.org/10.2217/fvl-2016-0057 (Accessed on 21 October 2018).

25. Chuang K Y, Wang M H and Ho Y S, High-impact papers presented in the subject category of water resources in the essential science indicators database of the institute for scientific information, *Scientometrics*, 87 (3) (2011) 551–562.Available at: https://doi.org/10.1007/s11192-011-0365-2 (Accessed on 4 september 2017).

26. Sui X, Chen Y, Lu Z and Chen Y, A bibliometric analysis of research papers related to the Mekong River, *Scientometrics*,

105 (1) (2015) 419–434. Available at: https://doi.org/10.1007/s11192-015-1683-6 (Accessed on 14 september 2017).

27. Ho Y S, Top-cited Articles in chemical engineering in Science Citation Index Expanded: A bibliometric analysis, *Chinese Journal of Chemical Engineering*, 20 (3) (2012) 478–488. Available at: https://doi.org/10.1016/S1004-9541 (11)60209-7 (Accessed on 2 October 2017).

28. Dhawan S M, Gupta B M and Gupta R, Research in electronic publishing field: A scientometric assessment of publications output during 2005-14, *Annals of Library and Information Studies*, 63 (1) (2016) 59–67. Available at: http://op.niscair.res.in/index.php/ALIS/article/view/10327 (Accessed on 29 October 2018).

29. Dhawan S M, Gupta B M and Gupta R, Mobile computing: A scientometric assessment of global publications output, *Annals of Library and Information Studies*, 64 (3) (2017) 172–180. Available at: http://op.niscair.res.in/index.php/ALIS/article/view/17031/1377 (Accessed on 29 October 2018).

30. Dwivedi S, Global allergy research during 1994-2013: A scientometric study, *Annals of Library and Information Studies*, 63 (1) (2016) 16–23.

31. Rahul L R and Nishy P, Mycobacterial tuberculosis and leprosy in India: A scientometric study, *Annals of Library and Information Studies*, 63 (2) (2016) 140–153. Available at: http://op.niscair.res.in/index.php/ALIS/article/view/12589 (Accessed on 29 October 2018).

32. Serenko A, Meta-analysis of scientometric research of knowledge management: Discovering the identity of the discipline, *Journal of Knowledge Management*, 17 (5) (2013) 773–812. Available at: https://doi.org/10.1108/JKM-05-2013-0166 (Accessed on 21 October 2018).

33. Straub D, The value of scientometric studies: an introduction to a debate on IS as a reference discipline, *Journal of the Association for Information Systems*, 7 (5) (2006) 241–246. Available at: https://pdfs.semanticscholar.org/77be/681884e1a42f481d7c634c171de2f1d90f20.pdf (Accessed on 21 October 2018).

34. Hirsch J E, An index to quantify an individual's scientific research output, (1) (2005) 1–5. Available at: https://doi.org/10.1073/pnas.0507655102 (Accessed on 6 October 2017).