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Knowledge management: A global examination based on bibliometric analysis

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ABSTRACT

Knowledge management (KM) is a field of research that has gained wide acceptance in the scientific community and management literature. This article presents a bibliometric overview of the academic research on KM in the business and management areas. Various bibliometric methods are used to perform this overview, including performance analysis and science mapping of the KM field. The performance analysis uses a series of bibliometric indicators, such as the h-index, productivity and citations. In addition, the VOSviewer software is used to map the bibliographic material. Science mapping uses co-citations and the concurrency of keywords. References were obtained from the Web of Science database. We identified and classified the most relevant research in the field according to journals, articles, authors, institutions and countries. The results show that research in this field has increased significantly in the last ten years and that the USA is the most influential country in all aspects in this field. It is important to consider, however, that science continues to advance in this and in all fields and that data rapidly change over time. Therefore, this paper fulfills an informational role that shows that most of the fundamental research of KM is in business and management areas.

1. Introduction

Based on the assertion of the important role of knowledge in the development of business economics and productivity (Drucker, 1968; Polanyi, 1967), multiple studies and practices have been developed around knowledge. Among the topics developed is that of KM, which has become a topic of general interest and attraction in the field of business management. Indeed, KM is a relatively young discipline that is considered to be an effective source for determining the strategic direction of and developing competitive advantages within a company. From this perspective, KM has attracted significant attention from academics and practitioners who seek to make use of its fundamental concepts (Serenko et al., 2011). That is how professionals highlight the importance of KM in the organizational success (Staples et al., 2001) and researchers see the great potential offered by this discipline to unify various fields of research (Holsapple and Wu, 2008).

Although the recent theory of KM only began to develop in the early 1960s, it has deep historical roots (Lambe, 2011). In the literature, it is well recognized that the development of the KM field is divided into three stages or generations (Tzortzaki and Mihiotis, 2014). Serenko (2013) notes that each generation is based on previous ideas, and therefore, the development of the KM field has been cumulative. The same author states that a fourth generation remains to be developed and should address the complexities of the knowledge domain, thus leading to new KM metaphors, paradigms and tools (for more information about the development of the KM field generations, see Serenko (2013)).

Despite the progress observed during the field's developmental years, several authors note that the field remains in an embryonic stage, lacking both a common consensus on future lines of research and conceptual robustness (Serenko and Dumay, 2015a; Tzortzaki and Mihiotis, 2014). However, the literature has been emphasizing the significant benefits derived from appropriate knowledge management (Hassan et al., 2016). As a consequence, KM has developed with the characteristics of a well-defined scientific field, exhibiting a rich academic structure to encourage research in the field. For example, KM has its own journal classification system and many exclusive journals (Serenko and Bontis, 2009), among which we can find several

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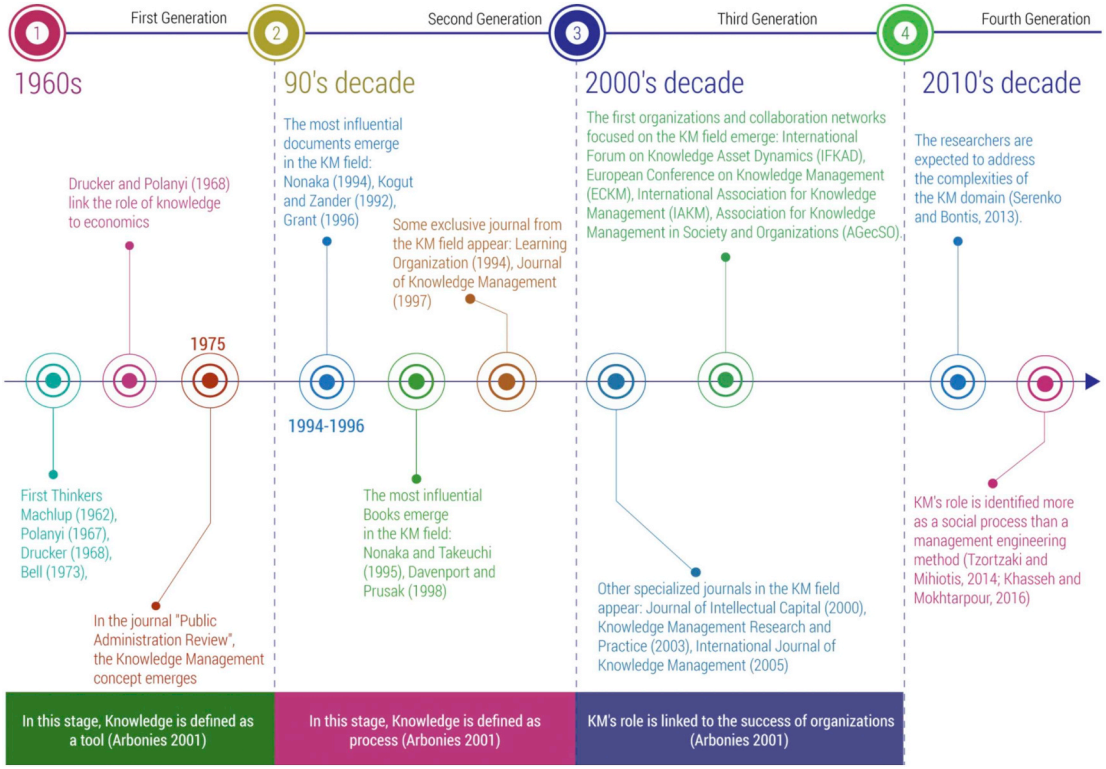

Fig. 1. Important steps on the development of knowledge management.

theoretical developments (Serenko et al., 2007) and scientometric studies (Gu, 2004a; Harman and Koohang, 2005; Nonaka and Peltokorpi, 2006; Serenko et al., 2010; Serenko and Bontis, 2004). In addition, the KM field has a wide network of collaborators and researchers grouped in different international organizations. For example, the Association of Knowledge Management in Society and Organization (AGecSO) is an association of Francophone researchers that is in full development and is currently located in France and Quebec. AGecSO, through the GecSO International Conference, annually convenes an important number of researchers who study this interesting field. Likewise, the International Association for Knowledge Management (IAKM) acts as a meeting point and reference point that collects an abundant list of international conferences on KM, including but not limited to, the International Forum on Knowledge Asset Dynamics (IFKAD), European Conference on Knowledge Management (ECKM), and Annual Conference on Knowledge Management (ACKM). All of this structure has resulted in the accelerated growth of the body of literature related to the KM field (Lambe, 2011). Fig. 1 summarizes some important milestones that have occurred in the different stages of the development of the KM field.

From an academic point of view, it is important that the material published in a specific research field, such as KM, be classified so that one can follow all of the field's advances and trends (Merigó et al., 2016). One way to perform such a classification is through bibliometrics, which guides academics toward a discipline's most influential studies (Godin, 2006). In recent years, computer science and the Internet have facilitated the development of bibliometric analysis, which has become an increasingly popular technique among researchers (Ding et al., 2014). Bibliometrics has enabled the study of a wide range of journals and scientific fields. In the case of journals, many of them have published a bibliometric analysis of the publications of the journal, through the special issue of their anniversary. For example, García-Merino et al. (2006) develop a bibliometric analysis of the Technovation to celebrate the 25th anniversary of the journal. Merigó et al. (2018) develops a bibliometric study of the 50th anniversary of Information Science. Recently, Gaviria-Marin et al. (2018) analyze all publications of the Journal of Knowledge Management with bibliometric techniques. In addition, the different scientific fields of Business and Management have published bibliometric studies, for example, the field of innovation (Merigó et al., 2016), entrepreneurship (Sorheim and Landstrom, 2001) and management (Podsakoff et al., 2008), among several others. Even these bibliometric techniques have also been applied to specific areas within a given field of research, including service innovation (Sakata et al., 2013), technological entrepreneurship (Ratinho et al., 2015) and international entrepreneurship (Baier-Fuentes et al., 2018) among others. In the KM field, many authors have performed studies of this type. For example, Gu (2004b) conducted a study that characterized dynamic publications on global knowledge management (KM) using data collected from the WoS. In the same year, Gu (2004a) presented and analyzed the similarities and differences in the performance of information management (IM) and knowledge management (KM) studies indexed in several bibliographic databases. Moreover, Harman and Koohang (2005) analyzed citations to collect data on the annual frequency and topical emphasis of books and doctoral dissertations on KM published during the period from 1983 to 2005. Nonaka and Peltokorpi (2006) reviewed and positioned the top 20 KM articles most frequently cited in management journals. Qiu and Lv (2014) generated a global bibliometric study of the field of knowledge management. Finally, Serenko, together with other researchers, conducted several similar studies (Serenko et al., 2009; Serenko and Dumay, 2015a, 2015b). Note that these studies have focused on analyzing either a limited number of articles in the field or exclusive journals in the KM field, overlooking published literature in journals

focused on organizational issues. Therefore, the specificity of these studies has left an important gap in the field by excluding several studies that emphasize that KM is an important strategy that influences organizational competitiveness (Hassan et al., 2016). Recently, Akhavan et al. (2016) performed a bibliometric study that attempted to extend the range of the analytical dimensions. However, this study and most of the previous bibliometric studies almost completely avoid the complementarity of different modern bibliometric tools, such as performance analysis and science mapping (Cobo et al., 2011a).

Therefore, based on the background presented, the main aim of this study is to complement previous work and provide a broad quantitative and qualitative view of KM research with a focus on the organization by using the main bibliometric procedures, namely, performance analysis and science mapping (Cobo et al., 2011a). To meet this aim, a wide set of references related to the KM field is obtained from the Web of Science (WoS) and the bibliometric procedures are applied to different units of analysis, such as authors, journals, universities and countries. In particular, in the performance analysis we use different basic bibliometric indicators, such as the number of publications and the number of citations received. In addition, we use the h-index as a measure that combines the number of publications and citations. The above analyses are complemented by the development of a science mapping analysis that is constructed using different techniques, such as bibliographic coupling, co-citation analysis (Small, 1973) and co-occurrence of keywords analysis (Callon et al., 1983), among others. Co-occurrence of keywords allows us to quantify and visualize the thematic evolution of the KM research field. To perform this analysis, we use a longitudinal frame according to the different stages of development of the KM field. In developing these bibliometric procedures, we offer a fairly complete overview of research that focuses on knowledge management of organizations.

This work is organized as follows. Section 2 describes the methodology. Section 3 presents the results, which are organized as follows: Section 3.1 examines the bibliometric performance analyses of journals, articles, authors, institutions and countries. Section 3.2 presents the science mapping analysis of KM field. Finally, Section 4 discusses this work's main conclusions.

2. Methodology

Although a large number of databases group global research, the present study considers bibliographic records obtained from the *Web of Science* (WoS), which belongs to *Clarivate Analytics*. More specifically, this study uses the WoS Core Collection. The WoS is a digital bibliometric platform that is internationally recognized among researchers for having high quality standards (Merigó et al., 2015b) and has become one of the main tools for both searching and evaluating different types of publications and journals (Thelwall, 2008). Bibliometric researchers consider the WoS to be a relevant database because it provides a set of metadata that is essential for this type of analysis, including abstracts, references, number of citations, lists of authors, institutions, countries and the journal impact factor (Carvalho et al., 2013). This metadata set also includes a wide range of documents from various research fields. According to Merigó and Yang (2016), the WoS contains > 15,000 journals and 50,000,000 classified documents in 251 categories and 150 thematic research areas.

To perform a search within the WoS database, key words are selected to filter the information. The criteria for these key words are based on existing studies that identify KM as a dynamic set of activities that improve a company's knowledge flows. Several researchers have tried to classify KM's main activities (Park and Kim, 2006). One of the most cited works is that of Nonaka and Takeuchi (1995). However, models have emerged (Hedlund, 1994; Kogut and Zander, 1992; Nonaka and Takeuchi, 1995) that classify the importance of activities in knowledge management processes (Davenport and Prusak, 1998; Mertins et al., 2001; Mishra and Uday Bhaskar, 2011). According to Bhatt (2001), knowledge management must be an integral process, which interacts between information technologies (IT), people and techniques in order to take advantage of knowledge (Bhatt, 2001). In this sense, IT plays a fundamental role in the appearance of KM (Maier, 2004) since they influence the flow of knowledge in a company (Ernst and Kim, 2002) and are considered to be a tool that favors the activities of these processes. Some knowledge management processes have been identified in the literature. For example, authors such as Wiig (1997, 1993) and Alavi and Leidner (2001) state that the knowledge management processes of an organization are backed by the creation, transfer and use of knowledge. Tiwana and Amrit (2000) suggest acquisition, sharing and utilization. Other researchers highlight the application, integration and spillover of knowledge as important activities in knowledge management (Alavi and Leidner, 2001; Choi et al., 2010; Kayworth and Leidner, 2003; Park and Kim, 2006; Sarin and McDermott, 2003; Wang et al., 2017). Therefore, when searching for bibliographic records in the WoS, the previously mentioned concepts in the KM literature are used as keywords. In this way, the Boolean operator (OR), command of the quotation marks and asterisk are used to search the following keywords in a single search: knowledge management ("*knowledge manage**"), organizational knowledge ("*organization* knowledge**"), knowledge acquisition ("*knowledge acquisiti**"), knowledge creation ("*knowledge creati**"), knowledge integration ("*knowledge integrati**"), knowledge transfer ("*knowledge transfer**"), knowledge sharing ("*knowledge shar**"), knowledge diffusion ("*knowledge diffus**"), knowledge spillover ("*knowledge spill**"), knowledge use ("*knowledge use**") and knowledge application ("*knowledge applicat**").

The search was conducted between June and September 2016, and only documents published between 1961 and 2015 were taken into account. This approach guaranteed the inclusion of publications in all of the field's stages of development (Tzortzaki and Mihiotis, 2014). Based on these criteria, 42,795 bibliographical references were obtained. It is important to note that the most productive areas in this field are computer science (with 16,120 documents, representing 37.66% of the overall results) and business economics (with 13,166 documents, representing 30.76% of the overall results). There are several disciplines that publish in the KM field. It should also be noted that the results obtained correspond to all publications that used any or some of the keywords that we used in the search process. It is important to note that research focused on KM appeared in many scientific areas, but in this study, given that we focused on KM at the organizational level, we selected research from the areas of business economics. By using this limit, we intend to perform an approximation of the concepts associated with knowledge management processes. In addition, to evaluate only research studies, the results were filtered to only take articles, reviews, notes and letters into account (Merigó et al., 2016), thus obtaining a sample of 6155 studies. In any case, to show the updated global volume of studies focused on KM available in the WOS by research areas, Table 1 is presented. It should be noted that the results may vary over time (Cobo et al., 2011a).

The records corresponding to these results were analyzed using bibliometric analysis. According to Noyons et al. (1999), bibliometrics combines two main procedures: performance analysis and science mapping. Bibliometric performance analysis uses a wide range of techniques, including word frequency analysis, citation analysis, and counting publications by country, universities, research group or authors (Thelwall, 2008). However, these techniques are now complemented by other measures and indicators, such as the g-index (Egghe, 2006) and hg-index (Alonso et al., 2009) or h-index (Hirsch, 2005). The last – the h-index - is a recent, very popular indicator among

Table 1
KM references in different areas.
Source: Based on WoS 2017. Note that the acronyms of all the indicators are defined in Appendix 1.

Phase 1			Phase 2	
Preliminary results = 44,193			Results considering only papers, reviews, notes and letters = 23,494	
R	Areas	TP	Areas	TP
1	Computer science	16,753	Business Economics	7502
2	Business economics	13,537	Computer Science	6472
3	Engineering	9424	Engineering	3751
4	Information science library science	4426	Information Science Library Science	2609
5	Operations research management science	3644	Operations Research Management Science	1643
6	Education educational research	3497	Education Educational Research	1531
7	Psychology	2100	Psychology	1419
8	Social sciences other topics	1307	Environmental Sciences Ecology	1072
9	Environmental sciences ecology	1289	Public Administration	845
10	Public administration	1242	Health Care Sciences Services	675
11	Telecommunications	1068	Social Sciences Other Topics	614
12	Health care sciences services	870	Geography	565
13	Automation control systems	858	Public Environmental Occupational Health	435
14	Medical informatics	748	Medical Informatics	427
15	Geography	610	Science Technology Other Topics	339
16	Mathematics	525	Nursing	280
17	Public environmental occupational health	497	Mathematics	245
18	Materials science	494	Automation Control Systems	219
19	Science technology other topics	466	General Internal Medicine	219
20	Robotics	346	Agriculture	213

researchers that combines the number of publications and number of citations into a single indicator.[1] This indicator can be applied to several units of analysis (for example, authors, articles, journals, countries, universities, etc.), and its interpretation is simple. In this manner, for an analysis unit that has an h-index equal to N, N documents were cited at least N times (Hirsch, 2005). For example, if a university has an h-index of 80, then the university has 80 documents that received at least 80 citations. It should also be noted that the value of this indicator can change over time. The popularity of this indicator is related to the advantages that several authors have indicated in the literature. For example, Costas and Bordons (2007) noted that the objectivity of the indicator can play an important role in evaluating the performance of a scientific actor. Vanclay (2007) noted that the h-index is a robust indicator that is insensitive to a set of poorly cited papers, and therefore, it represents the performance of a scientific field well. Likewise, Thelwall (2008) noted that the h-index is an easily calculable and intuitively understandable indicator. As the advantages of the h-index have been illustrated, some limitations have been mentioned that must be taken into account. Some authors have noted that the h-index is incapable of comparing researchers from different disciplines. Others, such as Kelly and Jennions (2006), noted that this indicator is not adequate to compare researchers at different stages of their careers. Finally, Egghe (2006) noted that this type of composite indicator does not benefit researchers who have extremely cited documents and moderate productivity since they would have a similar or equal h-index as researchers with moderate or highly cited papers.

These limitations, however, can be overcome by evaluating the field of research using more than one indicator (Martin, 1996). Therefore, to provide a broader performance analysis, this section of bibliometrics includes both traditional and complementary bibliometric indicators. More specifically, this study classifies records according to the h-index, the number of citations and their productivity, as determined by the number of publications. Other indicators are also considered, including but not limited to, the citation ratio of articles (citations/articles) and number of articles above a citation threshold (Merigó et al., 2015b). Performance analysis also presents other indicators that usually arise from combining the previously mentioned indicators, such as the number of articles in which papers produced by the author are cited (ACKM) or the average citations per article of the author in the KM research (PCKM), among others. Other indicators that are included are include the dimensions of temporality (Q1, Q2, …Qn) that allow the publication behaviors of the different scientific authors to be observed over time. Finally, this analysis is applied to units of analysis that correspond to journals, articles, authors, institutions and countries, thus providing a better representation of the KM literature.

Science Mapping is another main procedure of bibliometrics and is a spatial representation of how different scientific actors are related to one another (Small, 1999). In this sense, the objective of this methodology is to show the structural and dynamic aspects of scientific research (Börner et al., 2003; Cobo et al., 2012). The development of computer technologies and software has allowed this methodology to be perfected and positioned as an interesting methodological option to evaluate the structures and networks of science. Among some of the most popular academic software tools are IN-SPIRE (Wise, 1999), CiteSpace II (Chen, 2006), VantagePoint (Porter and Cunningham, 2005), VOSviewer (van Eck and Waltman, 2010) and SciMAT (Cobo et al., 2012), among others. These software programs have different characteristics and operate based on different algorithms. However, these programs use the same techniques to build the network structure of different analysis units. Among the most used techniques are co-citation analysis (Small, 1973) and the co-occurrence of key words in documents (Callon et al., 1983). Note that co-citation analysis studies the structure of a field using pairs of documents that are commonly cited together. This technique is used in units of analysis, such as authors, references and journals. Likewise, the co-occurrence of keywords (Callon et al., 1983) uses the most important words or keywords of documents to study the conceptual structure of a research field. It should be noted that, in this present study, we used the VOS viewer software to perform co-citation analysis of the different units of analysis. Likewise, the co-occurrence of keywords is also analyzed by taking into account a longitudinal framework to observe the trends of

[1] The original definition of the h-index, as proposed by Hirsch (2005), was: "A scientist has index h if h of his or her N_p papers have at least h citations each and the other ($N_p - h$) papers have $\leq h$ citations each."

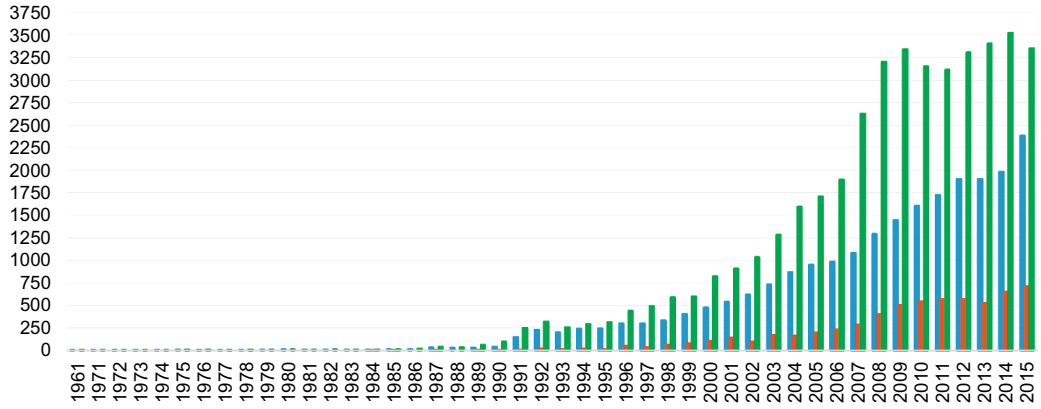

Fig. 2. Number of publications on knowledge management. (For interpretation of the references to color in this figure, the reader is referred to the web version of this article.)

the KM field over time. Finally, it should be noted that the graphs are represented by a network of elements in which the size of the circle varies according to the importance of the element, while the network connections represent the closeness of the link between elements. The locations of the circles and colors are used to cluster the items.

3. Results

3.1. Performance bibliometric analysis

In this section, we present a performance analysis based on the bibliometric indicators described above, such as the number of documents published, number of citations received, h-index of the different actors analyzed and various ratios obtained from these indicators. Note that the acronyms of all of the indicators are defined in Appendix 1.

3.1.1. Publications and citations in KM research

First, we show the general aspects of the KM research field. Fig. 2 shows the evolution of publications related to the KM field over time. In this figure, the green bars indicate the overall number of publications per year in the WoS, 42,795 overall. The blue bars show the evolution of academic documents (articles, reviews, letters and notes) in the WoS, 23,128 overall. Finally, the red bars represent the evolution of KM records from the *business and management* areas, 6155 overall. These results represent our work's primary objective, which is to include publications not only from KM-exclusive journals but also from the KM literature published in journals that focus on all types of business organization. According to Fig. 2, we clearly observe that the KM literature has been growing significantly in the areas of *business* and *management*. There are several reasons for this growth. First, an increasing number of researchers worldwide have been highlighting the importance of KM in organizations (Garavelli et al., 2004). Second, an increasing number of journals have emerged at the intersection of the fields of KM and organizational problems, including but not limited to, the *JKM*, *KMRP*, *JIKM* and *KPM* (note that the acronyms are defined in Table 4).

Another way of analyzing the evolution of KM publications is according to the productivity ratio, which is specific to the various research areas. As discussed, our study analyzes academic publications framed in the areas of business and management. The ratio of publications in these areas has increased significantly, demonstrating the transversality and importance that KM offers to other scientific disciplines.

According to Table 2, during the first 24 years studied (1961–1985), for every 37 articles published in the KM field, 1 was published in the business and management areas. That is, 2.7% of publications in KM are related to organizational and business issues. However, this gap has been narrowing significantly. Note, for example, that over the last decade (2006–2015), for every three publications, one was published in the business and management areas. That is, 33.3% of the publications in KM are on topics related to organizations and companies. In addition, it is important to highlight the significant progress of the number of papers published in the areas of business and management. For example, there were 13 times as many publications in 1996–2005 compared to the previous decade (1986–1995). This increase can be attributed to the appearance of papers that are considered to be foundational in the KM field and that are now the field's most-cited works (Tzortzaki and Mihiotis, 2014).

In this sense, one way of highlighting the importance and influence of a field of research is through the number of citations of published works within its area. To evaluate the citation rate of the KM field, Table 3 presents the general citation structure of all academic research obtained from the Core Collection of WoS. These investigations are classified based on several thresholds related to the number of citations and according to the generations or stages of development that the KM field has experienced. In addition, the percentage of papers in each section is included. Accordingly, Table 3 shows that only 3 articles have received > 3000 citations, 5.09% of articles have received equal to or > 100 citations, and 75.5% of articles have received fewer than 25 citations.

Table 2
Evolution of research in the area of business and management.
Source: Own elaboration based on WoS 2015.

	Year	TPKM	TPKM-BM	Ratio	%km
Period 1	1961–1985	73	2	37	2,7%
Decade 1	1986–1995	1192	86	14	7,14%
Decade 2	1996–2005	5508	1092	5	20%
Decade 3	2006–2015	16,355	4975	3	33,3%
		23,128	6155		100%

3.1.2. The most productive and influential journals in KM research

Articles on KM issues are published in a wide range of journals. This field has progressed remarkably and therefore has a wide structure of academic resources, including a series of dedicated journals. In addition, the theoretical frameworks of the field of KM research are increasingly used to explain certain business phenomena, such as innovation and performance (Lai et al., 2014; López-Nicolás and Meroño-Cerdán, 2011). Therefore, a wide variety of journals from the business and management areas publish KM-based articles to explain their phenomena of study. To classify journals and their publications in KM

Table 3
General citation structure by generation of knowledge management research in WoS.
Source: Own elaboration based on WoS 2015.

Number of citations	TP - first generation (1962–1990)	TP - second generation (1991–2000)	TP - third generation (2001–2016)	TP	% of papers
≥3000 citations	–	4	–	4	0,06%
≥1000 citations	–	13	9	22	0,36%
≥500 citations	–	19	24	43	0,70%
≥250 citations	–	28	94	122	1,98%
≥100 citations	–	64	305	369	6,00%
≥50 citations	1	51	528	580	9,42%
≥25 citations	1	50	835	886	14,39%
≤25 citations	8	159	3788	3955	64,26%
0 citations	–	20	154	174	2,83%
Total of papers	10	408	5737	6155	100%

field, Table 4 presents the field's 50 most productive and influential journals. It should be noted that the journals are ordered according to their productivity. In the event of a tie, the h-index of KM documents in journals was taken into account.

According to Table 4, the productivity index (TPKM) and percentage of KM publications in journals (%APKM) indicate that the JKM is the most productive journal in the field, with 404 articles. In accordance according to the percentage of KM publications, two journals—the JKM and KMRP—stand out, with 92.45% and 79.08%, respectively. It is important to note that both of these journals are dedicated exclusively to KM. Other important journals in the field are the IJTM and RPC. In addition, the most influential journals in this field are OSC and SMJ, both with a volume of > 20,000 citations each. This large number of citations is explained because these journals include several of the most cited articles. Note, for example, that SMJ and OSC have 12 and 8 articles, respectively, with > 500 citations. Another journal that stands out in this sense is RPC. Despite having a low percentage of publications in KM (7.75%), this journal has an h-index of 49 and several publications with a high number of citations.

Another important aspect to analyze is the total number of citations in *Knowledge Management* (TCKM). Two journals stand out because they are above the threshold of 20,000 citations. OSC has the largest number of citations, with 21,748 citations, followed by SMJ, with 20,930 citations. A second group of journals has citations above the threshold of 5000 citations. Those journals include *RPC*, *JIBS*, *JMS*, *MSC* and *MQY*. All of the journals mentioned above have a fairly strong orientation toward the specific topics of organizations and companies. It is also interesting to note that these journals are dedicated exclusively to the KM field, and although they have a high level of productivity, they are not sufficiently influential in the field, which may be a consequence of the breadth of the concepts in the areas of business and management, along with researchers' tendencies to publish in journals with higher quality indices (Norris and Oppenheim, 2007).

It is also interesting to analyze the evolution of publications that appeared in journals over time. The following analysis considers this evolution by taking into account a classification of journals based on both productivity and thematic orientation. We grouped the first three journals according to their productivity (MPRJ). These journals have published 14.05% of all KM articles. A second group of journals includes those ranked in the top 10 journals in business and management (TMGJ). These journals have published 12.32% of all KM articles. A third group of journals includes journals grouped according to their orientation toward innovation (INNJ). These journals have published 13.8% of all KM articles. Subsequently, the journals were grouped with an orientation toward information systems (ISYS). This group of journals has published 4.03% of all KM articles. A fourth set of journals includes journals grouped according to their orientation toward human resources (HRJ), which have published 2.6% of all KM articles. Finally, one group was classified as other journals within the business and management (OPJ) sections. The journals in this group have published 20.1% of all KM articles. It is important to note that based on this classification, 4142 KM publications were analyzed, which corresponds to 67.3% of all KM publications. These classifications are presented in Table 5.

It should be noted that the number of publications was grouped by journal and period of time and that, at the end of the table, the acronyms of the columns are defined. Also, the journals within each group are ordered by the h-index, which represents both their productivity and influence in the field.

From a more specific perspective and related to each group of journals, in the group of the most productive journals, JKM and KMRP stand out as being exclusively dedicated to the field. Although JKM has been publishing since 1997, its publications began to appear only in the penultimate five-year period (Q4). It is possible that several of this journal's references may have been overlooked. This phenomenon can be explained by what bibliometrics defines as “missed citations”, which often occur in social sciences (Harzing and Alakangas, 2016). Another factor that could also explain this phenomenon is the year that these journals were indexed in the WoS. Nevertheless, it is important to note that within this group of journals, IJTM has been publishing incrementally since Q1.

In relation to the older journals in this field, we note that RDM, TFSC, ITEM, IMG and EJOR are among the leading journals that initiate KM research. However, although these journals' production in the field is incremental over time, none of them occupy the top positions of productivity and influence.

Interestingly, several of the major business and management journals (TMGJ) began to publish in the 1990s. The oldest journals in this group are OSC, SMJ and MSC. These journals are also the most productive in the group and have increasingly accepted and published works focused on KM.

Among innovation journals, RPC and TCH stand out for both their high productivity in KM and because they have been publishing since 1991 (Q1). However, other journals, such as RDM, TFSC and ITEM, which have published KM articles since the earliest days of the field, have not been as prominent. Among the information system journals (ISYS), IMG stands out for its high productivity and influence. IMG and ISR stand out because of the length of time that they have published KM articles.

More recently, journals oriented toward human resources

Table 4
The most productive journals in KM research.
Source: Elaborated from the WoS 2015.

R	Journal	TPKM	HKM	TAP	TCKM	ACKM	PCKM	%APKM	≥500	≥200	≥100	≥50	< 50	T50	IF	5Y-IF
1	JKM	404	24	437	3052	1892	4,68	92,45	–	–	–	6	398	–	1,689	2,426
2	IJTM	247	21	1970	1938	1797	7,28	12,54	–	–	2	2	243	–	0,867	0,861
3	KMRP	242	15	306	932	778	3,21	79,08	–	–	–	–	242	–	0,595	0,994
4	RPC	225	49	2904	8737	6986	31,05	7,75	1	7	15	24	178	1	3,47	5,118
5	TCH	141	32	1900	3252	2834	20,1	7,42	–	–	5	14	122	–	2,243	3,833
6	OSC	128	57	1486	21,748	15,423	120,49	8,61	8	11	21	19	69	10	3,36	6,137
7	SMJ	110	54	2323	20,930	13,580	123,45	4,74	12	14	14	17	53	12	3,38	5,972
8	IMG	107	28	2071	3053	2581	24,12	5,17	–	1	5	12	89	–	2,163	3,175
9	JIBS	105	42	2040	5123	3690	35,14	5,15	–	5	9	23	68	1	3,62	5,659
10	JBR	99	23	4341	1655	1612	16,28	2,28	–	–	4	9	86	–	2,129	2,67
11	JMS	90	44	3096	5297	4571	50,79	2,91	–	3	13	25	49	–	4,131	6,497
12	IMM	89	21	2840	1652	1626	18,27	3,13	–	1	2	3	83	1	1,93	3,132
13	IBR	89	19	710	1038	934	10,49	12,54	–	–	1	3	85	–	1,669	2,307
14	TFSC	87	18	3858	1041	1054	12,11	2,26	–	1	–	2	84	–	2,678	3,005
15	MSC	83	46	6370	8653	7065	85,12	1,3	3	11	15	10	44	3	2,741	3,728
16	IJHRM	83	19	2130	1339	1130	13,61	3,9	–	1	1	4	77	–	1,262	1,619
17	AJBM	82	6	1968	181	149	1,82	4,17	–	–	–	–	0	–	1,105	1,105
18	MDC	81	14	1183	581	466	5,75	6,85	–	–	–	–	81	–	1,134	1,868
19	SBE	74	19	1430	1293	1164	15,73	5,17	–	–	2	6	66	–	1,795	2,318
20	MLG	73	22	1142	1162	1030	14,11	6,39	–	–	–	4	69	–	1,393	2,167
21	ITEM	70	18	2002	982	940	13,43	3,5	–	–	–	3	67	–	1,454	1,699
22	MISQ	68	40	1276	8246	6261	92,07	5,33	4	5	10	14	35	4	5,384	9,51
23	JTT	68	16	392	627	567	8,34	17,35	–	–	–	1	67	–	2,213	2,474
24	JPIM	66	25	1864	1638	1493	22,62	3,54	–	–	3	8	55	–	2,086	3,178
25	RDM	66	20	1947	1138	1075	16,29	3,39	–	–	–	7	59	–	1,19	2,47
26	JMIS	64	27	734	3675	2937	45,89	8,72	1	4	5	6	48	1	3,025	3,775
27	JWB	63	19	744	1016	973	15,44	8,47	–	–	–	6	57	–	2,811	3,729
28	TASM	62	14	1043	817	825	13,31	5,94	–	–	2	2	58	–	0,845	1,086
29	IJPM	58	14	737	459	407	7,02	7,87	–	–	–	–	58	–	2,885	3,411
30	SRBS	56	12	1139	470	388	6,93	4,92	–	–	–	2	54	–	0,991	0,905
31	TQMBE	55	10	1116	356	307	5,58	4,93	–	–	–	–	55	–	0,896	1,49
32	OST	54	26	2487	2756	2578	47,74	2,17	1	1	5	7	40	1	2,798	3,899
33	SIJ	51	9	1783	291	274	5,37	2,86	–	–	–	1	50	–	0,776	1,071
34	IIN	46	10	270	224	238	5,17	17,04	–	–	–	–	46	–	0,87	1,677
35	LRP	45	23	4138	2296	2067	45,93	1,09	1	1	3	8	32	1	2,936	6,619
36	JETM	45	20	467	1362	1265	28,11	9,64	–	1	2	5	37	–	1,474	2,19
37	EJOR	45	15	15,843	653	676	15,02	0,28	–	–	1	1	43	–	2,679	3,109
38	IJOPM	45	13	1591	463	460	10,22	2,83	–	–	–	1	44	–	2,252	2,935
39	BJM	44	18	697	872	870	19,77	6,31	–	–	1	3	40	–	2,188	3,096
40	AMJ	43	31	3269	4806	4280	99,53	1,32	1	11	2	9	20	1	6,233	10,588
41	ISR	41	21	766	1795	1640	40	5,35	–	2	4	6	29	–	3,047	4,014
42	JSIS	41	20	463	1501	1364	33,27	8,86	–	1	2	3	35	–	2,595	3,486
43	JOM	40	25	715	1727	1416	35,4	5,59	–	1	3	14	22	–	4	8,229
44	ICC	40	16	697	834	881	22,03	5,74	–	–	2	1	37	–	1,327	2,17
45	HRS	39	21	3365	1242	1180	30,26	1,16	–	–	2	7	30	–	2,619	3,544
46	JORS	39	11	8230	119	399	10,23	0,47	–	–	–	1	38	–	1,225	1,386
47	HRM	38	16	1395	602	571	15,03	2,72	–	–	–	3	35	–	1,798	2,526
48	EMJ	38	8	367	203	230	6,05	10,35	–	–	–	1	37	–	1,437	1,702
49	JM	37	17	1592	1381	1443	39	2,32	–	1	2	7	27	–	6,051	10,48
50	JIT	36	15	674	818	807	22,42	5,34	–	–	1	6	29	–	4,775	6,189

JKM, Journal of Knowledge Management; IJTM, International Journal of Technology Management; KMRP, Knowledge Management Research Practice; RPC, Research Policy; TCH, Technovation; OSC, Organization science; SMJ, Strategic Management Journal; IMG, Information Management; JIBS, Journal of International Business Studies; JBR, Journal of Business Research; JMS, Journal of Management Studies; IMM, Industrial Marketing Management; IBR, International Business Review; TFSC, Technological Forecasting and Social Change; MSC, Management Science; IJHRM, International Journal of Human Resource Management; AJBM, African Journal of Business Management; MDC, Management Decision; SBE, Small Business Economics; MLG, Management Learning; ITEM, IEEE Transactions on Engineering Management; MISQ, Miss Quarterly; JTT, Journal of Technology Transfer; JPIM, Journal of Product Innovation Management; RDM, R D Management; JMIS, Journal of Management Information Systems; JWB, Journal of World Business; TASM, Technology Analysis Strategic Management; IJPM, International Journal of Project Management; SRBS, Systems Research and Behavioral Science; TQMBE, Total Quality Management Business Excellence; OST, Organization Studies; SIJ, Service Industries Journal; IIN, Industry and Innovation; LRP, Long Range Planning; JETM, Journal of Engineering and Technology Management; EJOR, European Journal of Operational Research; IJOPM, International Journal of Operations Production Management; BJM, British Journal of Management; AMJ, Academy of Management Journal; ISR, Information Systems Research; JSIS, Journal of Strategic Information Systems; JOM, Journal of Operations Management; ICC, Industrial and Corporate Change; HRS, Human Relations; JORS, Journal of The Operational Research Society; HRM, Human Resource Management; EMJ, European Management Journal; JM, Journal of Management; JIT, Journal of Information Technology.

Table 5
Temporal evolution by quinquenniums and journals in the KM field.
Source: Elaborated based on WoS 2015. The abbreviated name of the journal is in Table 4.

R	Journal	HKM	TPKM	TCKM	Q5	Q4	Q3	Q2	Q1	OY	JGT
1	JKM	24	404	3052	284	120	-	-	-	-	
2	IJTM	21	247	1938	39	103	54	50	1	-	MPRJ
3	KMRP	15	242	932	152	90	-	-	-	-	
1	OSC	57	128	21748	51	37	28	8	4	-	
2	SMJ	54	110	20930	42	29	20	14	5	-	
3	MSC	46	83	8653	13	28	31	8	3	-	
4	JMS	44	90	5297	23	42	17	7	1	-	
5	JIBS	42	105	5123	46	41	12	6	-	-	TMGJ
6	MISQ	40	68	8246	22	15	20	6	5	-	
7	AMJ	31	43	4806	15	15	13	-	-	-	
8	OST	26	54	2756	15	21	13	2	3	-	
9	JM	17	37	1381	24	8	4	1	-	-	
10	ICC	16	40	834	16	17	7	-	-	-	
1	RPC	49	225	8737	93	82	37	11	2	-	
2	TCH	32	141	3252	42	52	35	11	1	-	
3	JOM	25	40	1727	18	20	2	-	-	-	
4	JPIM	25	66	1638	37	15	9	5	-	-	
5	RDM	20	66	1138	26	20	10	7	2	1	INNJ
6	TFSC	18	87	1041	44	27	8	6	1	1	
7	ITEM	18	70	982	26	22	14	5	1	2	
8	TASM	14	62	817	31	12	5	14	-	-	
9	IJOPM	13	45	463	22	10	10	3	-	-	
10	IIN	10	46	224	33	13	-	-	-	-	
1	IMG	28	107	3053	37	40	18	6	5	1	
2	JMIS	27	64	3675	18	20	22	4	-	-	ISYS
3	ISR	21	41	1795	16	15	6	3	-	1	
4	JIT	15	36	818	9	15	9	3	-	-	
1	HRS	21	39	1242	10	15	12	2	-	-	
2	IJHRM	19	83	1339	38	29	13	3	-	-	HRJ
3	HRM	16	38	602	18	18	2	-	-	-	
1	LRP	23	45	2296	14	7	11	12	1	-	
2	JBR	23	99	1655	65	25	9	-	-	-	
3	MLG	22	73	1162	23	27	19	4	-	-	
4	IMM	21	89	1652	46	30	12	1	-	-	
5	JSIS	20	41	1501	16	13	5	7	-	-	
6	JETM	20	45	1362	14	13	13	5	-	-	
7	SBE	19	74	1293	50	13	9	2	-	-	
8	IBR	19	89	1038	58	27	4	-	-	-	
9	JWB	19	63	1016	34	18	10	1	-	-	
10	BJM	18	44	872	17	17	10	-	-	-	
11	JTT	16	68	627	43	25	-	-	-	-	OPJ
12	EJOR	15	45	653	9	17	8	7	3	1	
13	MDC	14	81	581	54	27	-	-	-	-	
14	IJPM	14	58	459	47	11	-	-	-	-	
15	SRBS	12	56	470	16	31	8	1	-	-	
16	JORS	11	39	119	3	13	15	2	6	-	
17	TQMBE	10	55	356	26	20	9	-	-	-	
18	SIJ	9	51	291	31	18	2	-	-	-	
19	EMJ	8	38	203	34	4	-	-	-	-	
20	AJBM	6	82	181	56	26	-	-	-	-	

Table 6
Bibliometric indicators by groups of journals.
Source: Elaborated based on WoS 2015.

R	JGT	TPKM	HKM	TC
1	MPRJ	893	34	6045
2	INNJ	225	71	20,372
3	TMGJ	128	140	81,636
4	ISYS	107	54	9546
5	OPJ	45	63	17,611
6	HRJ	39	35	3222

management (HRJ) have increasingly occupied the KM framework. Finally, among the group of other business and management (OPJ) journals, two journals stand out. JBR has had high productivity, especially in the most recent period (Q5), and it stands out for its h-index within this group. In relation to the rest of the journals, EJOR's increasing publication of KM articles and its regularity over time are remarkable. Note that most of these journals have significantly increased the number of KM articles published in the last period (Q5).

Another interesting analysis is related to the number of citations received by each group of journals and their respective h-indexes. The data, ordered according to their productivity, are presented in Table 6.

Note that the group of the most productive journals (MPRJ) has an

Table 7
The 50 most influential articles in knowledge management research.
Source: Elaborated based on WoS 2015.

R	Title	Authors	J	YP	TC	TCKM	C/Y
1	A dynamic theory of organizational knowledge creation	Nonaka, I	OSC	1994	3722	3649	173,76
2	Knowledge of the firm, combinative capabilities, and the replication of technology	Kogut, B; Zander, U	OSC	1992	3519	3440	149,57
3	Toward a knowledge-based theory of the firm	Grant, RM	SMJ	1996	3437	3363	177,00
4	The relational view: cooperative strategy and sources of interorganizational competitive advantage	Dyer, JH; Singh, H	AMR	1998	2854	2782	163,65
5	Exploring internal stickiness: impediments to the transfer of best practice within the firm	Szulanski, G	SMJ	1996	2247	2190	115,26
6	Organizational learning: the contributing processes and the literatures	Huber, GP	OSC	1991	2116	2087	86,96
7	Review: knowledge management and knowledge management systems: conceptual foundations and research issues	Alavi, M; Leidner, DE	MISQ	2001	1904	1868	133,43
8	Prospering in dynamically-competitive environments: organizational capability as knowledge integration	Grant, RM	OSC	1996	1543	1511	79,53
9	The knowledge-creating company	Nonaka, I	HBR	1991	1212	1189	49,54
10	Making knowledge the basis of a dynamic theory of the firm	Spender, JC	SMJ	1996	1134	1120	58,95
11	The concept of “ba”: building a foundation for knowledge creation	Nonaka, I; Konno, N	CMR	1998	1072	1057	62,18
12	Knowledge flows within multinational corporations	Gupta, AK; Govindarajan, V	SMJ	2000	1014	987	65,80
13	Creating and managing a high-performance knowledge-sharing network: the Toyota case	Dyer, JH; Nobeoka, K	SMJ	2000	984	964	64,27
14	Strategic alliances and interfirm knowledge transfer	Mowery, DC; Oxley, JE; Silverman, BS	SMJ	1996	974	949	49,95
15	Relationships between providers and users of market-research - the dynamics of trust within and between organizations	Moorman, C; Zaltman, G; Deshpande, R	JMR	1992	961	934	40,61
16	Knowledge transfer in intraorganizational networks: effects of network position and absorptive capacity on business unit innovation and performance	Tsai, WP	AMJ	2001	940	918	65,57
17	What's your strategy for managing knowledge?	Hansen, MT; Nohria, N; Tierney, T	HBR	1999	939	932	58,25
18	Why should I share? Examining social capital and knowledge contribution in electronic networks of practice	Wasko, MM; Faraj, S	MISQ	2005	921	894	89,40
19	Network structure and knowledge transfer: the effects of cohesion and range	Reagans, R; Mcevily, B	ASQ	2003	828	792	66,00
20	Behavioral intention formation in knowledge sharing: examining the roles of extrinsic motivators, social-psychological forces, and organizational climate	Bock, GW; Zmud, RW; Kim, YG; Lee, JN	MQY	2005	802	774	77,40
21	Social capital, networks, and knowledge transfer	Inkpen, AC; Tsang, EWK	AMR	2005	760	736	73,60
22	Knowledge transfer: a basis for competitive advantage in firms	Argote, L; Ingram, P	OBH	2000	742	716	47,73
23	A pragmatic view of knowledge and boundaries: boundary objects in new product development	Carlile, PR	OSC	2002	740	726	55,85
24	Knowing in practice: enacting a collective capability in distributed organizing	Orlikowski, WJ	OSC	2002	739	718	55,23
25	Technology brokering and innovation in a product development firm	Hargadon, A; Sutton, RI	ASQ	1997	729	708	39,33
26	Seci, ba and leadership: a unified model of dynamic knowledge creation	Nonaka I; Toyama, R; Konno, N	LRP	2000	705	699	46,60
27	Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms	Yli-Renko, H; Autio, E; Sapienza, HJ	SMJ	2001	703	688	49,14
28	Successful knowledge management projects	Davenport, TH; De Long, DW; Beers, MC	SMR	1998	693	693	40,76
29	Modularity, flexibility, and knowledge management in product and organization design	Sanchez, R; Mahoney, JT	SMJ	1996	683	668	35,16
30	Toward a new economics of science	Dasgupta, P; David, PA	RPY	1994	669	647	30,81
31	Knowledge management: an organizational capabilities perspective	Gold, AH; Malhotra, A; Segars, AH	JMI	2001	661	634	45,29
32	Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing	Cook, SDN; Brown, JS	OSC	1999	660	665	41,56
33	The strength of weak ties you can trust: the mediating role of trust in effective knowledge transfer	Levin, DZ; Cross, R	MSC	2004	657	649	59,00
34	Beyond local search: boundary-spanning, exploration, and impact in the optical disk industry	Rosenkopf, L; Nerkar, A	SMJ	2001	643	620	44,29
35	Ambiguity and the process of knowledge transfer in strategic alliances	Simonin, BL	SMJ	1999	616	601	37,56
36	Knowledge, knowledge work and organizations: an overview and interpretation	Blackler, F	OSC	1995	607	602	30,10
37	Communities of practice: the organizational frontier	Wenger, EC; Snyder, WM	HBR	2000	605	598	39,87
38	Contributing knowledge to electronic knowledge repositories: an empirical investigation	Kankanhalli, A; Tan, BCY; Wei, KK	MISQ	2005	590	569	56,90
39	Managing knowledge in organizations: an integrative framework and review of emerging themes	Argote, L; Mcevily, B; Reagans, R	MSC	2003	548	531	44,25
40	Knowledge networks as channels and conduits: the effects of spillovers in the boston biotechnology community	Owen-Smith, J; Powell, WW	OSC	2004	546	533	48,45
41	Absorptive capacity, learning, and performance in international joint ventures	Lane, PJ; Salk, JE; Lyles, MA	SMJ	2001	544	527	37,64
42	A model of knowledge management and the n-form corporation	Hedlund, G	SMJ	1994	516	512	24,38
43	Developing a knowledge strategy	Zack, MH	CMR	1999	491	467	29,19
44	In search of complementarity in innovation strategy: internal r&d and external knowledge acquisition	Cassiman, B; Veugelers, R	MSC	2006	490	490	54,44
45	Motivation, knowledge transfer, and organizational forms	Osterloh, M; Frey, BS	OSC	2000	473	439	29,27
46	Social structure of “coopetition” within a multiunit organization: coordination, competition, and intraorganizational knowledge sharing	Tsai, WP	OSC	2002	464	463	35,62
47	The reification of absorptive capacity: a critical review and rejuvenation of the construct	Lane, PJ; Koka, BR; Pathak, S	AMR	2006	463	423	47,00
48	The process of knowledge transfer: a diachronic analysis of stickiness	Szulanski, G	OBH	2000	461	445	29,67
49	The internationalization and performance of smes	Lu, JW; Beamish, PW	SMJ	2001	454	443	31,64
50	Learning orientation, firm innovation capability, and firm performance	Calantone, RJ; Cavusgil, ST; Zhao, YS	IMM	2002	452	460	35,38

J, abbreviated journal names are found in Table 4, except for AMR, Academy Of Management Review; ASQ, Administrative Science Quarterly; CMR, California Management Review; HBR, Harvard Business Review; JMR, Journal of Marketing Research; OBH, Organizational Behavior And Humans; and SMR, Sloan Management Review.

Table 8
The most productive and influential authors in KM research.
Source: Elaborated based on WoS 2015.

R	Name	C	HKM	TCKM	TPKM	PCKM	ACKM	TP	TC	H	T50
1	Audretsch DB	USA	16	1133	25	45,32	933	210	8737	47	–
2	Von Krogh G	SWZ	15	1205	26	46,35	1127	66	2515	24	–
3	Nonaka I	JPN	14	7518	16	469,88	6342	103	8939	25	4
4	Argote L	USA	13	2523	17	148,41	2173	57	4924	28	2
5	Newell S	UK	12	585	17	34,41	560	45	514	15	–
6	Foss NJ	DEN	11	789	16	49,31	785	92	2250	27	–
7	Scarbrough H	UK	11	759	12	63,25	723	53	1233	18	–
8	Swan J	UK	11	628	11	57,09	592	42	1132	18	–
9	Lyles MA	USA	10	1844	13	141,85	1523	53	3809	24	1
10	Lichtenthaler U	GER	10	517	14	36,93	468	51	1085	19	–
11	Sabherwal R	USA	10	492	10	49,20	454	69	2105	24	–
12	Michailova S	NZL	10	476	13	36,62	452	28	627	15	–
13	Szulanski G	SIN	9	3417	9	379,67	2971	21	3816	14	2
14	Acs ZJ	USA	9	464	13	35,69	440	106	4833	36	–
15	Bontis N	CAN	9	353	12	29,42	301	43	1278	17	–
16	Wright M	UK	9	330	14	23,57	341	151	3240	39	–
17	Beamish PW	CAN	8	845	10	84,50	855	90	4991	35	–
18	Volberda HW	NED	8	830	9	92,22	858	76	3740	29	–
19	Bjorkman I	FIN	8	810	12	67,50	807	43	1250	18	–
20	Hitt MA	USA	8	677	9	75,22	757	174	13,707	63	–
21	Majchrzak A	USA	8	642	11	58,36	635	69	1975	21	–
22	Pedersen T	ITA	8	538	12	44,83	536	56	1930	23	–
23	Agarwal R	USA	8	535	10	53,50	559	63	2032	21	–
24	Tiwana A	USA	8	485	10	48,50	483	54	1452	24	–
25	Akgun AE	TUR	8	348	10	34,80	318	46	848		–
26	Minbaeva DB	DEN	8	243	9	27,00	250	20	576	11	–
27	Carayannis EG	USA	8	216	9	24,00	202	71	773	18	–
28	Singh J	SIN	7	535	7	76,43	562	13	727	10	–
29	Husted K	NZL	7	367	9	40,78	391	10	407	8	–
30	Pan Sl	SIN	7	304	9	33,78	300	8	44	4	–
31	Kodama M	JPN	7	191	13	14,69	147	44	322	11	–
32	Lin CP	TPE	7	183	9	20,33	201	67	585	16	–
33	Revilla E	SPA	7	182	10	18,20	209	17	201	8	–
34	Sinkovics RR	UK	7	167	10	16,70	174	50	707	17	–
35	Serenko A	CAN	7	165	11	15,00	108	43	722	16	–
36	Corso M	ITA	7	163	10	16,30	152	37	305	10	–
37	McAdam R	UK	7	157	10	15,70	162	56	546	15	–
38	Liu YI	CHI	7	149	9	16,56	191	44	697	18	–
39	Giroud A	UK	6	121	9	13,44	115	24	188	11	–
40	Park BI	KOR	6	93	11	8,45	89	19	90	6	–
41	Fang SC	TPE	6	86	9	9,56	109	33	127	7	–
42	Ooi KB	MAS	6	69	9	7,67	73	68	795	21	–
43	Liu XH	UK	5	235	10	23,50	239	30	449	12	–
44	Shaw D	UK	5	95	10	9,50	90	18	322	9	–
45	Navas-Lopez JE	SPA	5	82	10	8,20	82	24	133	7	–
46	Hurmelinna-Laukkanen P	FIN	5	65	13	5,00	76	22	237	9	–
47	Cegarra-Navarro JG	SPA	5	60	12	5,00	61	78	325	9	–
48	Lin HF	TPE	4	211	9	23,44	213	80	1427	23	–
49	Molina-Morales FX	SPA	4	83	9	9,22	107,00	35	305	12	–
50	Palacios-Marques D	SPA	4	31	10	3,10	36	30	89	8	–

h-index and a total number of citations that are quite low compared to the group of journals designated as those in the Top of business and management (TMGJ) or even compared to groups of innovation journals (INNJ). This result can be explained from the debate that persists on the indicators that evaluate a journal's quality (Raj and Zainab, 2012). Authors have a tendency to publish and cite articles from major journals, a phenomenon known as the *Impact Factor* (Norris and Oppenheim, 2007). Second, given the cross-cutting nature of the KM field, KM scholars are intertwined with researchers from other fields, such as innovation, business and management, thus allowing a wider community. Finally, because knowledge management is a practice that influences companies' competitiveness, it makes sense that the top business and management journals are the most influential and the most cited.

3.1.3. *The 50 most influential articles in the field of knowledge management*

For decades, many influential articles have been published in various journals. One method to identify them is to classify publications based on the number of citations received (Merigó et al., 2015b). The number of citations reflects the influence, popularity and attention received by the scientific community. In this section, we analyze the most-cited articles in the journals of the business and management areas of the WoS. This information is shown in Table 7.

According to Table 7, the three most cited and influential articles exceed the threshold of 3000 citations (Grant, 1996; Kogut and Zander, 1993; Nonaka, 1994). Of these, Nonaka's (1994) publication is the most cited and influential. Nonaka dominates this list, with 4 papers. It is important to note that some of Nonaka's works are considered to be foundations of this field of research. The next author with more

Table 9
Most productive authors in the most productive journals grouped by topic.
Source: Elaborated based on WoS 2015.

R	JKM		KMRP		IJTM		TMGJ		INNJ		ISYS		HRJ		OPJ	
	Author	P	Author	P	Author	P	Author	P	Author	P	Author	P	Author	P	Author	P
1	Serenko A	9	Gorry GA	3	Corso M	5	Lyles MA	10	D'este P	7	Lee JN	5	Bjorkman I	3	Audretsch DB	13
2	Bontis N	7	Handzic M	3	Yang J	5	Pedersen T	9	Carayannis EG	7	Whinston AB	4	Bonache J	3	Von Krogh G	13
3	Chua Ayk	4	Hossain L	3	De Pablos PO	4	Volberda HW	9	Santoro MD	6	Grover V	4	Brewster C	3	Acs ZJ	10
4	Del Giudice M	4	Huang JJ	3	Bontis N	3	Foss NJ	8	Roper S	6	Gosain S	4	Harzing AW	3	Newell S	8
5	Magnier-Watanabe R	4	Osei-Bryson KM	3	Phaal R	3	Argote L	7	Lichtenthaler U	6	Durcikova A	4	Makela K	3	Giroud A	6
6	Andreeva T	3	Salmador MP	3	Wink R	3	Bjorkman I	7	Kodama M	6	Choi B	4	Paauwe J	3	Li Y	6
7	Chawla D	3	Bolisani E	2	Wu SH	3	Haas MR	7	Geuna A	6	Yen DC	3	Boussebaa M	2	Shaw D	6
8	Corner Jl	3	Carlucci D	2	Bowonder B	2	Majchrzak A	7	Audretsch DB	6	Reich BH	3	Brown M	2	Swart J	6
9	Cruz-Gonzalez J	3	Chan YE	2	Bueno E	2	Szulanski G	7	Akgun AE	6	Mehta N	3	Buch R	2	Andersson U	5
10	Dumay J	3	Chong SC	2	Chen YH	2	Van Den Bosch FAJ	7	Von Krogh G	5	Malhotra A	3	Cabrera A	2	Cavusgil ST	5
11	Durst S	3	Edvarsson IR	2	Chiesa V	2	Almeida P	6	Sofka W	5	Majchrzak A	3	Cerdin JL	2	Cegarra-Navarro JG	5
12	Ganesh LS	3	Kianto A	2	Ding HB	2	Beamish PW	6	Sabherwal R	5	Lin CH	3	Currie G	2	Easterby-Smith M	5
13	Joshi H	3	Kong E	2	Howells J	2	Liu Y	6	Keskin H	5	Jarvenpaa SL	3	Dysvik A	2	Kodama M	5
14	Kumar JA	3	Lagumdzija A	2	Hsu BF	2	Martin X	6	Garcia-Morales VJ	5	Huysman M	3	Edwards T	2	Lee GG	5
15	Levy M	3	Laihonen H	2	Hyland P	2	Rosenkopf L	6	Duysters G	5	Gray PH	3	Ferner A	2	Lin CH	5
16	Lin HF	3	Lettieri E	2	Liyanage S	2	Schroeder RG	6	Tiwana A	4	Fadel KJ	3	Foss NJ	2	Nakamori Y	5
17	Lopez-Saez P	3	Liebowitz J	2	Lytras MD	2	Singh J	6	Tijssen RJW	4	Dennis AR	3	Hocking JB	2	Ooi KB	5
18	Massingham P	3	Liebowitz JAY	2	Malik K	2	Agarwal R	5	Salter A	4	Benbasat I	3	Kuvaas B	2	Park BI	5
19	Navas-Lopez JE	3	Lin Hf	2	Martini A	2	Fey CF	5	Love JH	4	Lee H	2	Le Pargneux M	2	Buckley PJ	4
20	Rowley J	3	Lonnqvist A	2	Miyake T	2	Hansen MT	5	Lawson B	4	Sabherwal, R	2	Lengnick-Hall ML	2	Carlsson B	4
21	Senoo D	3	Magnier-Watanabe R	2	Nonaka I	2	Hitt MA	5	Hewitt-Dundas N	4	Tiwana A	2	Minbaeva DB	2	Johnston WJ	4
22	Sun PYT	3	Mothe C	2	Peltokorpi V	2	Kane GC	5	Hemmert M	4	Mclean ER	2	Morris SS	2	Li L	4
23	Venkitachalam K	3	Mura M	2	Probert DR	2	Lavie D	5	Grimpe C	4	Miranda SM	2	Pedersen T	2	Nonaka I	4
24	Delbridge R	2	Radaelli G	2	Rui MJ	2	Makino S	5	Gopalakrishnan S	4	Staples DS	2	Scarbrough H	2	Pan SL	4
25	Edvardsson IR	2	Reichgelt, H	2	Salmador MP	2	Nonaka I	5	Garavelli AC	4	Arnott D	2	Sturdy A	2	Pemsel S	4
26	Heisig P	2	Rosendaal B	2	Soosay C	2	Zhou KZ	5	Chai KH	4	Pervan G	2	Swan J	2	Roldan JL	4
27	Kianto A	2	Scarso E	2	Tovstiga G	2	Alavi, M	4	Autio E	4	Alavi M	2	Tarique I	2	Scarbrough H	4
28	Stone DN	2	Wijnhoven F	2	Verganti R	2	Grant RM	4	Dahl MS	3	Leidner DE	2	Tregaskis O	2	Swan J	4
29	Zhang W	2	Zhu ZC	2	Wang JJ	2	Nerkar, A	4	Verona G	3	Joshi KD	2	Vance CM	2	Tsai MT	4
30	64 Authors	2	15 Authors	2	16 Authors	2	18 Authors	4	47 Authors	3	40 Authors	2	3 Authors	2	12 Authors	4

Table 10
Temporal evolution by quinquennium and authors in the KM field.
Source: Elaborated based on WoS 2015.

R	Authors	C	HKM	TCKM	TPKM	Q5	Q4	Q3	Q2	Q1
1	Audretsch DB	USA	16	1133	25	10	10	4	1	–
2	Von Krogh G	SWZ	15	1205	26	12	10	3	1	–
3	Nonaka I	JPN	14	7518	16	2	5	3	3	3
4	Argote L	USA	13	2523	17	5	4	3	3	2
5	Newell S	UK	12	585	17	4	4	7	1	1
6	Foss NJ	DEN	11	789	16	10	5	0	1	–
7	Scarbrough H	UK	11	759	12	1	2	7	2	–
8	Swan J	UK	11	628	11	–	2	7	2	–
9	Lyles MA	USA	10	1844	13	2	5	3	2	1
10	Lichtenthaler U	GER	10	517	14	3	11	–	–	–
11	Sabherwal R	USA	10	492	10	2	4	4	–	–
12	Michailova S	NZL	10	476	13	6	3	4	–	–
13	Szulanski G	SIN	9	3417	9	1	3	3	2	–
14	Acs ZJ	USA	9	464	13	8	3	2	–	–
15	Bontis N	CAN	9	353	12	5	5	–	2	–
16	Wright M	UK	9	330	14	8	5	1	–	–
17	Beamish PW	CAN	8	845	10	3	3	3	1	–
18	Volberda HW	NED	8	830	9	3	4	1	1	–
19	Bjorkman I	FIN	8	797	12	5	3	3	1	–
20	Agarwal R	USA	8	722	10	3	5	1	1	–
21	Hitt MA	USA	8	677	9	2	5	1	1	–
22	Majchrzak A	ITA	8	642	11	5	3	3	–	–
23	Pedersen T	USA	8	538	12	10	1	1	–	–
24	Tiwana A	USA	8	485	10	1	6	3	–	–
25	Akgun AE	TUR	8	348	10	2	5	1	2	–
26	Minbaeva DB	DEN	8	243	9	6	2	1	–	–
27	Carayannis EG	USA	8	216	9	2	2	–	5	–
28	Singh J	SIN	7	532	7	2	3	2	–	–
29	Husted K	NZL	7	367	9	2	3	4	–	–
30	Pan Sl	SIN	7	304	9	2	4	2	1	–
31	Kodama M	JPN	7	191	13	3	7	3	–	–
32	Lin CP	TPE	7	183	9	5	4	–	–	–
33	Revilla E	SPA	7	182	10	3	5	2	–	–
34	Sinkovics RR	UK	7	167	10	6	4	–	–	–
35	Serenko A	CAN	7	165	11	7	4	–	–	–
36	Corso M	ITA	7	163	10	–	3	7	–	–
37	McAdam R	UK	7	157	10	1	5	3	1	–
38	Liu YI	CHI	7	149	9	7	2	0	–	–
39	Giroud A	UK	6	121	9	4	5	0	–	–
40	Park BI	KOR	6	93	11	9	2	0	–	–
41	Fang SC	TPE	6	86	9	5	4	0	–	–
42	Ooi KB	MAS	6	69	9	6	3	0	–	–
43	Liu XH	UK	5	235	10	6	4	0	–	–
44	Shaw D	UK	5	95	10	3	4	3	–	–
45	Navas-Lopez JE	SPA	5	82	10	1	5	3	1	–
46	Hurmelinna-Laukkanen P	FIN	5	65	13	10	3	–	–	–
47	Cegarra-Navarro JG	SPA	5	60	12	8	4	–	–	–
48	Lin HF	TPE	4	211	9	7	2	–	–	–
49	Palacios-Marques D	SPA	4	31	10	9	1	–	–	–
50	Molina-Morales FX	SPA	4	4	9	7	1	1	–	–

citations in this list is Grant, who has two articles. It should also be noted that this list only includes academic publications (i.e., articles, notes, reviews and letters) and excludes some works that may be highly cited in the field of research, such as the work of Davenport and Prusak (1998).

3.1.4. An overview of the most productive and influential authors in KM

Since its inception, the KM field has been characterized by continuous growth and the participation of a large number of researchers. According to Serenko and Bontis (2013), KM is a very attractive domain in which the contributions of both academics and professionals are welcome. One important issue when obtaining an overview of KM research is that of determining the most productive and influential authors in the field. Table 8 is presents the results of this analysis. Note that the number of articles is an indicator that should be analyzed with caution because several limitations must be considered, including the length of each paper, quality of the journal and number of authors per work (Merigó et al., 2015a). In addition, it is necessary to consider that some known authors may not appear because of the nature of this classification, which can occur as a result of the year of indexing the journals in the WoS. Therefore, although it is true that we present some key researchers in the KM field, note that the authors may vary according to the predetermined parameters of the search. The classification presented in Table 8 is ordered according to HKM. In the event of a tie, each author's citations are considered (TCKM). Recall that the h-index is a composite indicator that combines both productivity and influence.

The author with the best combination of productivity and influence in the KM literature is Audretsch, with an h-index of 16. Audretsch is a well-known author on issues related to entrepreneurship and has used theoretical frameworks from KM to explain how entrepreneurial opportunities are generated (see, e.g., Audretsch and Keilbach, 2007). The second author on this list is Von Krogh, who has an h-index of 15. It is important to note that Von Krogh is the most productive author in the KM field. Nonaka is in third place, with an h-index of 14. However, if all of the indicators presented in Table 8 are considered, Nonaka can be considered one of the most relevant authors within this field. Note that although he is not the most productive author, he has many more citations (7518) than the other authors on the list. Moreover, Nonaka's articles have a much higher average number of citations that those of other authors (PCKM = 469.88 citations per article). Furthermore, Nonaka has four articles within the 50 most cited. Therefore, his relevance and influence in the field is clear. Another author who stands out in this sense is Szulanski who, with only 9 articles in the field, has 3417 citations, with 379.67 citations per article on average.

To obtain a more complete picture of the most productive authors in the groups of journals analyzed above, Table 9 is presented. To perform this analysis, the same groups of journals are used as were used for the analysis presented in Table 5.

According to Table 9, Nonaka is the author with the most complete profile among these groups of journals. He has two articles in IJTM, 5 articles in the group of the top business and management journals (TMGJ), and 4 articles in other business and management journals (OPJ). Other authors who appear in more than one group are Von Krogh and Audretsch, who have published articles in both innovation (INNJ) and other business and management (OPJ) journals. Likewise, Alavi has published articles in both the ISYS journals and main business and management journals (TMGJ). Authors such as Lin HF, Kianto, Bontis, Magnier-Watanabe and Salmador MP have published in the most productive and exclusive journals of the KM field. Finally, we emphasize that there is no concentration of authors in any group of journals, which can initially be explained by the relative youth of the KM field. Additionally, it is a good sign that the KM field does not have a "super star" effect, which occurs when journal editors prefer a small group of highly productive researchers when deciding which articles to publish (Serenko et al., 2011).

Another important issue is analyzing an authors' productivity over time. This analysis is presented in Table 10, which shows the number of publications per author and per quinquennium. This list of authors is sorted in a decreasing manner according to their influence within the field. In the event of a tie, the total number of citations by each author is considered.

Lin CP is the most veteran author in the field. He is followed by Nonaka, Argote, Newell and Lyles, all of whom have been published for > 25 years. All of these authors can be considered to be pioneers in the KM literature. In Q4, 17 new authors appear, among which Carayannis stands out with 5 articles. The following five-year periods

Table 11
The 50 most productive and influential institutions in KM research.
Source: Elaborated based on WoS 2015.

R	Institutions	C	HKM	TCKM	TPKM	PCKM	ACKM	T50	≥500	≥200	≥100	≥50	< 50
1	U North Carolina	USA	31	2957	76	38,91	2891	1	1	2	2	11	60
2	U Maryland College Park	USA	28	5117	40	127,93	4603	2	2	5	8	4	21
3	INSEAD Business School	FRA	27	4740	51	92,94	4316	1	1	3	7	10	30
4	Copenhagen Business School	DEN	27	2489	97	25,66	2327	–	–	1	6	9	81
5	Harvard U	USA	26	4997	44	113,57	4813	3	3	2	7	5	27
6	U Minnesota TC	USA	26	3191	57	55,98	3077	1	1	3	4	9	40
7	Erasmus U Rotterdam	NED	25	2194	70	31,34	2214	–	1	1	3	9	56
8	U Warwick	UK	25	1476	66	22,36	1404	–	–	–	2	8	56
9	Carnegie Mellon U	USA	23	3741	46	81,33	3222	3	3	1	5	14	23
10	Indiana U	USA	23	2574	36	71,50	2429	1	1	4	2	6	23
11	U Pennsylvania	USA	22	5624	40	140,60	5214	4	2	4	2	12	20
12	U Texas Austin	USA	22	4768	39	122,26	4491	2	2	1	7	5	24
13	Arizona State U	USA	22	3144	33	95,27	3074	2	1	3	7	7	15
14	New York U	USA	22	2720	34	80,00	2702	–	–	7	3	3	21
15	U Southern California	USA	22	1992	35	56,91	1882	–	–	3	3	7	22
16	U Cambridge	UK	21	2033	44	46,20	2065	1	1	1	3	4	35
17	U Manchester	UK	21	1240	73	16,99	1233	–	–	–	–	8	65
18	National U Singapore	SIN	20	2930	52	56,35	2672	2	2	1	2	6	41
19	Michigan State U	USA	20	2115	37	57,16	2099	1	–	4	2	7	24
20	Bocconi U	ITA	20	1451	59	24,59	1473	–	–	–	4	5	50
21	U Nottingham	UK	20	1403	51	27,51	1397	–	–	1	1	6	43
22	U Western Ontario	CAN	19	1657	40	41,43	1588	–	–	1	5	2	32
23	City U Hong Kong	CHI	18	2679	61	43,92	2297	2	2	2	1	4	52
24	Tilburg U	NED	18	1139	39	29,21	1145	–	–	1	2	1	35
25	Cranfield U	UK	18	1113	40	27,83	1110	–	–	1	2	2	35
26	Swiss Fed. Inst. of Tech Zurich	SWZ	18	1051	49	21,45	970	–	–	1	2	–	46
27	Rutgers State U	USA	17	1696	48	35,33	1686	1	1	–	2	7	38
28	Temple U	USA	17	1495	37	40,41	1438	–	–	3	–	5	29
29	Imperial College London	UK	17	1060	32	33,13	1163	–	–	–	2	8	22
30	Xi an Jiaotong U	CHI	17	770	45	17,11	741	–	–	–	2	1	42
31	Stockholm Sch. of Econ.	SWE	16	5123	35	146,37	4722	2	2	2	1	2	28
32	Georgia State U	USA	16	1236	38	32,53	1212	–	–	–	5	–	33
33	Eindhoven U Tech	NED	16	1113	32	34,78	1177	–	–	–	5	4	23
34	National Cheng Kung U	TPE	16	691	50	13,82	720	–	–	–	–	3	47
35	U Toronto	CAN	15	1472	38	38,74	1493	1	1	–	–	1	36
36	U Melbourne	AUS	15	715	36	19,86	696	–	–	–	1	2	33
37	KU Leuven	BEL	14	1106	34	32,53	1124	1	1	1	–	1	31
38	Aalto U	FIN	14	1091	38	28,71	1114	1	1	–	–	2	35
39	George Washington U	USA	14	847	34	24,91	853	–	–	1	2	2	29
40	Loughborough U	UK	14	616	31	19,87	725	–	–	1	2	–	28
41	Lancaster U	UK	13	1373	33	41,61	1387	1	1	–	3	1	28
42	Polytechnic U Milan	ITA	13	444	32	13,88	484	–	–	–	–	2	30
43	U Leeds	UK	12	434	39	11,13	449	–	–	–	1	2	36
44	BI Norwegian Bus. Sch.	NOR	11	472	33	14,30	559	–	–	–	2	2	29
45	Polytechnic U of Valencia	SPA	11	446	46	9,70	464	–	–	–	1	2	43
46	Cardiff U	UK	11	375	34	11,03	415	–	–	–	–	2	32
47	U Groningen	NED	11	302	34	8,88	320	–	–	–	–	–	34
48	Lappeenranta U Tech	FIN	10	303	34	8,91	305	–	–	–	–	1	33
49	Hong Kong Polytech. U	CHI	9	223	34	6,56	255	–	–	–	–	–	34
50	U Valencia	SPA	9	184	38	4,84	212	–	–	–	–	–	38

(Q3, Q2 and Q1) are characterized by an increase in the number of publications and the emergence of new authors.

3.1.5. *The most productive and influential institutions*

The KM field has become a rather attractive and productive discipline of study. For several years, authors have sought to establish KM's unique identity as an academic field that is recognized by diverse actors, including university institutions (Serenko et al., 2010). These institutions are primarily responsible for promoting the development of various fields of research. It is interesting, in this sense, to conduct an analysis of KM research performed in different universities. Table 11 presents this analysis. Note that the data are sorted according to the HKM. Like the tables mentioned above, in the event of a tie in the HKM, the total number of citations (TCKM) are considered.

According to Table 11, no single university leads this field of research. The University of North Carolina has the best combination of productivity and influence, with an HKM of 31. In second place is the University of Maryland-College Park, with an HKM of 28. Third and fourth places are occupied by INSEAD Business School and Copenhagen Business School, both of which have an HKM of 27. In this case, the tiebreaker was based on the TCIE. The remainder of the institutions are sorted in succession. In terms of productivity, note that Copenhagen Business School is the most productive, with 97 publications. The University of North Carolina is in second place, with 76 articles. Third and fourth place are occupied by the University of Manchester and Erasmus University Rotterdam, with 73 and 70 articles, respectively. The rest of the schools are sequentially ordered in decreasing order. As for the total number of citations, three universities stand out because

Table 12
The 30 most productive institutions in the 50 most productive journals grouped by theme.
Source: Elaborated based on WoS 2015.

R	JKM		KMRP		IJTM		TMGJ		INNJ		ISYS		HRJ		OPJ	
	Institutions	P	Institutions	P	Institutions	P	Institutions	P	Institutions	P	Institutions	P	Institutions	P	Institutions	P
1	Lakehead U	10	U Sydney	4	PolyTechnic U Milan	7	INSEAD Bus. Sch.	38	Bocconi U	17	City U Hong Kong	14	U Warwick	7	Copenhagen Bus. Sch.	24
2	Nanyang Tech. U	7	UE Sao Paulo	4	U Oviedo	6	U Maryland College Park	27	U Sussex	16	U Texas Austin	9	U Melbourne	7	National Cheng Kung U	22
3	McMaster U	7	Tampere U Tech.	4	U Queensland	5	U Pennsylvania	26	Eindhoven U Tech.	16	U Southern California	8	Copenhagen Bus. Sch.	6	U Manchester	21
4	Tampere U Tech.	6	Queens U Canada	4	U Manchester	5	U Minnesota TC	24	U Manchester	15	U Pittsburgh	8	U Bath	4	XI AN Jiaotong U	19
5	U Waikato	5	Vrije U Amsterdam	3	Georgia Inst. Tech.	5	Erasmus U Rotterdam	24	National U Singapore	14	U North Carolina	8	Tilburg U	4	U Warwick	17
6	U Padua	5	Virginia Commonwealth U	3	U Pisa	4	Copenhagen Bus. Sch.	23	Copenhagen Bus. Sch.	14	U Arizona	7	Rutgers State U	4	Swiss Federal IT Zurich	17
7	U Newcastle	5	U Southern Queensland	3	U Cambridge	4	New York U	22	U North Carolina	12	Simon Fraser U	6	Cranfield U	4	U North Carolina	16
8	U Castilla-La Mancha	5	U Padua	3	National Yunlin U Sci. Tech.	4	U Illinois	19	KU Leuven	12	National Sun Yat Sen U	6	U Reading	3	U Valencia	15
9	Seconda U Degli Studi Di Napoli	5	U Murcia	3	Lappeenranta U Tech.	4	U Southern California	18	CNRS-France	12	London Sch. Econ. Political Sci.	6	U Manchester	3	U Sevilla	15
10	Macquarie U	5	Rice U	3	Autonomous U Madrid	4	U North Carolina	18	U Toronto	11	Georgia State U	6	U Carlos III Madrid	3	U Leeds	15
11	Indian Inst. Tech. IIT	5	Lappeenranta U Tech.	3	Western Sydney U	3	Indiana U	18	U Nottingham	11	U Western Ontario	5	Pace U	3	U Nottingham	14
12	Complutense U Madrid	5	Autonomous U Madrid	3	U Tokyo	3	Harvard U	17	U Groningen	11	U Texas Dallas	5	Norwegian Sch. Of Econ. NHH	3	Erasmus U Rotterdam	14
13	U Wollongong	4	U Twente	2	U Southern Mississippi	3	Carnegie Mellon U	17	George Washington U	11	U Oklahoma Norman	5	Lancaster U	3	U Tech. Sydney	12
14	U Tsukuba	4	U Tsukuba	2	U Reading	3	U Western Ontario	15	Cranfield U	11	U Minnesota TC	5	Kings College London	3	George Mason U	12
15	U Valladolid	4	U Strathclyde	2	U Padua	3	Ohio State U	15	U Warwick	10	U Kentucky	5	INSEAD Bus. Sch.	3	Uppsala U	11
16	Loughborough U	4	U Southampton	2	Swiss Federal IT Zurich	3	Massachusetts IT MIT	15	Swiss Federal IT Zurich	10	Queens U Canada	5	ESSEC Bus. Sch.	3	National U Singapore	11
17	George Washington U	4	U South Australia	2	Rutgers State U	3	U Texas Austin	14	Rensselaer PolyTechnic Inst.	10	National Cheng Kung U	5	Erasmus U Rotterdam	3	Cardiff U	11
18	CNRS-France	4	U Sherbrooke	2	National Sun Yat Sen U	3	U Warwick	13	Maastricht U	10	McGill U	5	De Montfort U	3	Aston U	11
19	Cardiff U	4	U Savoie	2	National Cheng Kung U	3	U Michigan	13	Imperial College London	10	Carnegie Mellon U	5	Cardiff U	3	U Politecnica Valencia	10
20	Bangkok U	4	U Salento	2	McMaster U	3	Tilburg U	13	CSIC	10	Boston U	5	BI Norwegian Bus. Sch.	3	PolyTechnic U Milan	10
21	Vrije U Amsterdam	4	U Portsmouth	2	Hsing Kuo U Manag.	3	Bocconi U	13	U Utrecht	9	Utah State U	4	Virginia PolyTechnic Inst. State U	2	U Granada	9
22	Victoria U Wellington	3	U Ottawa	2	George Washington U	3	Rutgers State U	12	U Cambridge	9	U Washington	4	U Texas Arlington	2	U Cambridge	9
23	U Ulster	3	U Montreal	2	Delft U Tech.	3	U Washington	11	U Politecnica Valencia	9	U Missouri St. Louis	4	U Santiago Compostela	2	U Bath	9
24	U Sydney	3	U Melbourne	2	Copenhagen Bus. Sch.	3	Stockholm Sch. Of Econ.	11	PolyTechnic U Milan	9	U British Columbia	4	U Oxford	2	Old Dominion U	9
25	U Salento	3	U Jean Moulin Lyon III	2	Complutense U Madrid	3	National U Singapore	11	Whu Otto Beisheim Sch. Manag.	8	Emory U	4	U Nottingham	2	National Taiwan U Sci. Tech.	9
26	U Reading	3	U Hull	2	Asia U Taiwan	3	London Bus. Sch.	11	U Tokyo	8	Clemson U	4	U New South Wales	2	Lancaster U	9
27	U North Texas Denton	3	U Cambridge	2	Aalto U	3	Emory U	11	U Strasbourg	8	Yonsei U	3	U Michigan	2	Georgia State U	9
28	U Melbourne	3	U Bologna	2	Zhejiang U	2	Brigham Young U	11	Seoul National U	8	Vrije U Amsterdam	3	U Cambridge	2	Whu Otto Beisheim Sch Manag.	8
29	U Limerick	3	U Basque Country	2	U Twente	2	Arizona State U	11	Korea U	8	U Warwick	3	U Birmingham	2	U Strathclyde	8
30	U Basilicata	3	U Basilicata	2	U Texas Austin	2	U Washington	10	Erasmus U Rotterdam	8	U South Florida	3	U Bedfordshire	2	Temple U	8

Table 13
Temporal evolution by quinquenniums and institutions in the KM field.
Source: Elaborated based on WoS 2015.

R	Institutions	C	HKM	TCKM	TPKM	Q5	Q4	Q3	Q2	Q1
1	U North Carolina	USA	31	2957	76	32	27	13	3	1
2	U Maryland College Park	USA	28	5117	40	10	18	7	5	–
3	INSEAD Bus. Sch.	FRA	27	4740	51	21	18	12	–	–
4	Copenhagen Bus. Sch.	DEN	27	2489	97	42	39	12	4	–
5	Harvard U	USA	26	4997	44	21	10	12	–	1
6	U Minnesota TC	USA	26	3191	57	23	23	8	2	1
7	Erasmus U Rotterdam	NED	25	2194	70	36	25	7	1	1
8	U Warwick	UK	25	1476	66	27	21	13	4	1
9	Carnegie Mellon U	USA	23	3741	46	38	8	–	–	–
10	Indiana U	USA	23	2574	36	19	11	4	1	1
11	U Pennsylvania	USA	22	5624	40	17	12	7	4	–
12	U Texas Austin	USA	22	4768	39	8	10	12	6	3
13	Arizona State U	USA	22	3144	33	11	12	8	2	–
14	New York U	USA	22	2720	34	20	13	1	–	–
15	U Southern California	USA	22	1992	35	8	10	12	3	2
16	U Cambridge	UK	21	2033	44	13	13	7	8	3
17	U Manchester	UK	21	1240	73	37	25	8	3	–
18	National U Singapore	SIN	20	2930	52	22	17	10	3	–
19	Michigan State U	USA	20	2115	37	16	15	5	1	–
20	Bocconi U	ITA	20	1451	59	30	21	8	–	–
21	U Nottingham	UK	20	1403	51	16	19	11	5	–
22	U Western Ontario	CAN	19	1657	40	8	19	8	4	1
23	City U Hong Kong	CHI	18	2679	61	33	15	11	2	–
24	Tilburg U	NED	18	1139	39	17	20	2	–	–
25	Cranfield U	UK	18	1113	40	14	16	6	3	1
26	Swiss Federal IT Zurich	SWZ	18	1051	49	29	19	1	–	–
27	Rutgers State U	USA	17	1696	48	24	15	6	3	–
28	Temple U	USA	17	1495	37	16	15	5	1	–
29	Imperial College London	UK	17	1060	32	16	9	5	2	–
30	Xi an Jiaotong U	CHI	17	770	45	22	23	–	–	–
31	Stockholm Sch. Econ.	SWE	16	5123	35	16	11	5	1	2
32	Georgia State U	USA	16	1236	38	22	9	5	2	–
33	Eindhoven U Tech	NED	16	1113	32	11	11	8	2	–
34	National Cheng Kung U	TPE	16	691	50	24	22	4	–	–
35	U Toronto	CAN	15	1472	38	18	18	1	1	–
36	U Melbourne	AUS	15	715	36	13	16	6	1	–
37	KU Leuven	BEL	14	1106	34	16	13	4	1	–
38	Aalto U	FIN	14	1091	38	30	8	–	–	–
39	George Washington U	USA	14	847	34	20	10	3	1	–
40	Loughborough U	UK	14	616	31	14	13	3	–	1
41	Lancaster U	UK	13	1373	33	17	12	1	2	1
42	Polytechnic U Milan	ITA	13	444	32	14	14	2	2	–
43	U Leeds	UK	12	434	39	28	6	3	1	1
44	BI Norwegian Bus. Sch.	NOR	11	472	33	23	5	3	1	1
45	Polytechnic U of Valencia	SPA	11	446	46	17	17	6	4	2
46	Cardiff U	UK	11	375	34	11	10	9	1	3
47	U Groningen	NED	11	302	34	17	6	4	6	1
48	Lappeenranta U Tech	FIN	10	303	34	25	7	2	–	–
49	Hong Kong Polytechnic U	CHI	9	223	34	24	7	2	1	–
50	U Valencia	SPA	9	184	38	12	18	7	1	–

they have > 5000 citations: the University of Pennsylvania, Stockholm School of Economics and the University of Maryland-College Park. Each of these institutions' publications have an average of > 120 citations. Harvard University, the University of Texas Austin and INSEAD Business School have > 4000 citations, and the average number of citations per article is > 110 citations, except for INSEAD Business School, which has an average number of 92.94 citations per publication. Another aspect that is interesting to highlight is that of universities with articles that are among the 50 most influential articles. Here, we note that the University of Pennsylvania has 4 articles within this group of publications, followed by Harvard University and Carnegie Mellon University, each of which have 3 articles in the Top 50 group. This table also shows that many institutions have one of the 50 most influential articles. In this sense, the USA is the country with the most articles (21) included in the 50 most influential articles. Finally, it is interesting to note that > 50% of the most influential universities come from only two countries: the USA (16 institutions) and the UK (10 institutions). Most of the rest of these institutions are in located Europe (16 institutions) and, to a lesser extent, Asia (5 institutions) and Oceania (one institution).

Another aspect that is interesting to analyze is the participation of the most relevant universities in the main groups of journals presented in Table 4. Therefore, the 30 major institutions in KM research are presented in Table 12.

According to Table 12, several institutions stand out because they publish in the main groups of journals. For example, the University of Warwick has published in all of the major journal groups. Copenhagen Business School, which is the most productive institution, has published in one of the most productive journals (IJTM), but concentrates its production of KM papers in almost all of the groups of journals, such as the top business and management journals (TMGJ), innovation journals (INNJ), human resource journals (HRJ) and other business journals (OPJ). The University of North Carolina and Erasmus University of Rotterdam are other institutions that, like Copenhagen Business School, have published in the main groups of journals. We also note the greater international dispersion in journals with greater productivity. It appears that, in this group, American universities are less influential.

Finally, to obtain a more complete view of the productivity of the main institutions, productivity over time is examined. This analysis was performed on the data presented in Table 13. As in the previous tables, the institutions are arranged according to their HKM, and the tie-breaking parameter is TCKM.

Several universities have been publishing increasingly more often since the field began. Most of them are located in the United States. However, it is also important to note that of the 25 papers published in the 1990s, 68% are from European universities. This suggests that although European universities have developed KM intensely from the outset, their North American peers have played a more active role in the development of the field over the years.

3.1.6. Country analysis

Based on the premise that research fosters economic development and growth, countries are increasingly investing in these activities (Becker, 2015). To obtain a complete image of the KM field, this section analyzes the geographical origin of KM publications. It is important to note that particularities can be observed in a country since some researchers often travel internationally, especially between the United States and the United Kingdom (Merigó et al., 2015a). Therefore, an author may have publications in two or more countries. In this sense, analysis by country refers to the country in which the author was working at the time of publication. Table 14 presents a ranking of the 50 main countries in KM research. This table also includes indicators that show both the productivity and number of citations per million inhabitants. Note that the ranking of countries is ordered by HKM. In the event of a tie, the total number of citations (TCKM) is taken into account.

The United States is the leading country in KM research by far. Note that the country's h-index is quite superior to that of other countries (HKM = 161). Likewise, the US productivity and citation levels are well above those of the UK, with > 2000 papers and more than five times the number of citations (TCKM = 113,564). Moreover, the United States is the country with the most papers among the 50 most influential countries and has a large number of highly cited papers. The size of the country, language facilities, number of researchers and

Table 14
The 50 most productive and influential countries in KM research.
Source: Elaborated based on WoS 2015 and datos.bancomundial.org /Jun/2016.

R	Country	HKM	TCKM	TPKM	PCKM	ACKM	T50	≥500	≥200	≥100	≥50	< 50	TPKM/PMH	TCKM/PMH
1	USA	161	113,564	2060	55,13	4167	39	36	84	115	217	1608	6,41	353,12
2	UK	75	21,794	928	23,48	17,289	4	4	12	32	69	811	14,26	334,79
3	Canada	51	8531	344	24,8	7747	2	1	3	13	24	303	9,60	238,13
4	Netherlands	45	6338	311	20,38	5904	–	–	2	8	24	277	18,36	374,22
5	Germany	42	4963	301	16,49	4565	–	–	1	8	17	275	3,70	60,96
6	China	38	6430	421	15,27	5634	2	2	2	8	17	392	0,30	4,65
7	Spain	38	5168	434	11,91	4589	1	–	3	8	12	411	9,33	111,08
8	Italy	38	4198	282	14,89	3693	–	–	1	4	10	267	4,64	69,05
9	France	37	6540	232	28,19	5962	2	2	3	6	12	209	3,47	97,89
10	Singapore	36	5786	115	50,31	5041	4	3	2	5	14	91	20,78	1.045,35
11	Australia	35	4490	330	13,61	4361	1	1	2	3	8	316	13,88	188,8
12	Taiwan	34	4417	371	11,91	3850	–	–	1	5	13	352	15,79	188
13	Denmark	33	3667	159	23,06	3296	–	–	2	7	12	138	28,09	648
14	Sweden	32	7607	197	38,61	6791	3	2	3	3	8	181	20,10	776
15	Finland	31	3309	170	19,58	2999	1	2	1	2	9	155	30,83	604
16	South Korea	30	4326	184	23,51	3990	1	1	4	6	6	167	3,64	85
17	Switzerland	30	3022	135	22,39	2853	1	0	2	4	8	121	16,39	367
18	Japan	27	9043	120	75,36	7771	4	4	3	4	5	104	0,95	71
19	Belgium	25	2107	77	27,36	2048	1	–	2	2	5	68	6,82	187
20	Norway	24	1555	100	15,71	1513	–	–	–	3	8	88	19,02	299
21	Israel	22	1284	51	25,18	1273	–	–	–	4	5	42	6,09	153
22	Austria	21	1443	78	18,5	1445	–	–	1	2	4	71	9,12	169
23	New Zealand	17	723	63	11,48	717	–	–	–	–	3	60	13,55	155
24	Ireland	17	524	55	9,70	653	–	–	–	–	1	53	11,64	110
25	Portugal	15	415	43	9,65	437	–	–	–	–	1	42	4,16	40
26	Malaysia	13	567	75	7,56	556	–	–	1	–	1	73	2,47	19
27	India	13	404	55	7,35	393	–	–	–	–	1	54	0,04	0
28	Turkey	13	389	40	9,73	402	–	–	–	–	2	38	0,51	5
29	Greece	11	887	39	22,74	897	–	–	1	2	1	35	3,60	82
30	Brazil	11	387	69	5,61	387	–	–	–	–	1	68	0,33	2
31	Slovenia	10	252	28	9	273	–	–	–	–	–	28	13,57	122
32	Mexico	10	241	22	10,95	272	–	–	–	–	1	21	0,17	2
33	Russia	8	487	15	32,47	506	–	–	1	–	1	13	0,10	3
34	Vietnam	8	180	17	10,59	172	–	–	–	–	–	17	0,19	2
35	South Africa	8	159	36	4,42	168	–	–	–	–	–	36	0,66	3
36	Thailand	7	101	26	3,88	114	–	–	–	–	–	26	0,38	1
37	U Arab Emirates	7	96	24	4	113	–	–	–	–	–	24	2,62	10
38	Saudi Arabia	7	85	20	4,25	107	–	–	–	–	–	20	0,63	3
39	Iceland	6	108	8	13,5	121	–	–	–	–	1	7	24,18	326
40	Iran	6	104	34	3,06	105	–	–	–	–	–	34	0,43	1
41	Chile	6	83	16	5,19	88	–	–	–	–	–	16	0,89	5
42	Argentina	5	91	7	13	80	–	–	–	–	–	7	0,16	2
43	Egypt	5	70	7	10	76	–	–	–	–	–	7	0,08	1
44	Poland	5	56	15	3,73	61	–	–	–	–	–	15	0,39	1
45	Czech Republic	4	91	8	11,38	80	–	–	–	–	–	8	0,76	9
46	Serbia	4	47	10	4,7	52	–	–	–	–	–	10	1,41	7
47	Cyprus	4	43	11	3,91	49	–	–	–	–	–	11	9,44	37
48	Estonia	4	19	8	2,38	26	–	–	–	–	–	8	6,10	14
49	Colombia	3	47	12	3,92	55	–	–	–	–	–	12	0,25	1
50	Pakistan	3	11	7	1,57	15	–	–	–	–	–	7	0,04	0

investment in R & D are some of the reasons that can explain this ranking. The UK is in second place, with a HKM of 75 and 928 papers overall. Note that the UK data are lower than the US data, but are much higher than the third and fourth positions, occupied by *Canada* and the *Netherlands*, respectively.

Consider that most of the countries that appear in this ranking are European (23 countries). They represent 46% of the list. Likewise, we observe that 30% of the list is Asian, with China being the most influential and productive country in the region (HKM = 38). Note that the participation of both Latin American and African countries is quite scarce in this field, both in quantity and influence. Finally, it is interesting to note that the Nordic countries, including Finland, Denmark, Sweden and Iceland, are the most productive countries per million people. Singapore is equally remarkable because it has a relatively large number of citations per million people.

Another aspect that is interesting to analyze is the number of articles published by each country in the different groups of journals. This analysis was performed on the data presented in Table 15.

As in the previous table, the results indicate that the USA and UK are the most productive countries in all journals and groups of journals. However, there are some peculiarities. For example, it is observed that the USA has a large difference from the UK and Canada in the top business and administration journals (TMGJ) and information systems journals (ISYS), respectively. Note that this difference is not noticeable in other groups of journals. It is also interesting to note that the most productive journals—JKM, KMRP and IJTM—have the widest range of countries, in which some Latin American and South African countries appear.

Finally, to provide a more global picture in terms of productivity per country, Table 16 presents the ranking of countries and their evolution

Table 15
Most productive countries in the 50 most productive journals grouped by theme.
Source: Elaborated based on WoS 2015.

R	JKM		KMRP		IJTM		TMGJ		INNJ		ISYS		HRJ		OPJ	
	Country	P	Country	P	Country	P	Country	P	Country	P	Country	P	Country	P	Country	P
1	USA	53	USA	43	USA	59	USA	525	USA	227	USA	149	UK	42	USA	263
2	UK	43	UK	30	UK	38	UK	96	UK	148	Canada	27	USA	39	UK	252
3	Australia	37	Australia	22	Taiwan	30	Netherlands	53	Germany	83	Taiwan	23	Australia	16	Taiwan	124
4	Spain	30	France	21	Spain	26	Canada	49	Netherlands	80	China	24	China	14	Spain	114
5	Italy	29	Spain	20	Italy	20	France	44	Italy	74	UK	21	Spain	13	China	103
6	China	26	Italy	20	Canada	12	Singapore	35	Taiwan	57	South Korea	18	Taiwan	12	Australia	73
7	Canada	26	Canada	16	Australia	12	China	38	Spain	57	Australia	10	Netherlands	9	Germany	71
8	France	21	Taiwan	14	Netherlands	11	Germany	32	France	48	Netherlands	7	France	9	Canada	58
9	India	18	China	9	China	10	Denmark	25	Canada	38	Germany	7	Germany	7	Netherlands	51
10	Malaysia	14	Netherlands	9	Japan	10	Australia	24	China	37	Singapore	6	Denmark	7	Italy	47
11	Germany	14	Germany	9	Sweden	9	Italy	23	South Korea	34	Switzerland	4	Norway	6	Sweden	44
12	Taiwan	13	Finland	9	Finland	9	Sweden	22	Japan	31	Spain	4	Finland	6	Denmark	39
13	Finland	13	Japan	7	Switzerland	7	Spain	20	Denmark	30	Sweden	3	Canada	6	France	36
14	Singapore	12	Sweden	5	South Korea	7	Switzerland	19	Sweden	29	U Arab Emirates	2	South Korea	5	Switzerland	33
15	South Korea	11	Malaysia	5	Austria	7	Finland	16	Switzerland	27	Israel	2	Ireland	5	South Korea	33
16	New Zealand	11	Brazil	5	Greece	6	South Korea	15	Finland	27	Turkey	1	Italy	4	Finland	31
17	Sweden	10	New Zealand	4	Germany	5	Norway	14	Australia	25	Thailand	1	Singapore	3	Malaysia	27
18	Brazil	10	Greece	4	France	4	Japan	14	Belgium	19	Norway	1	Belgium	3	Japan	22
19	Thailand	7	Russia	3	Denmark	4	Belgium	14	Singapore	17	Nigeria	1	Turkey	2	Norway	20
20	Switzerland	7	Bosnia Herceg	3	Belgium	4	Israel	8	Norway	15	New Zealand	1	Switzerland	2	Iran	18
21	Japan	7	South Korea	2	Ireland	3	Taiwan	5	Portugal	13	Malaysia	1	New Zealand	2	Austria	16
22	Netherlands	6	South Africa	2	India	3	UK	5	Turkey	11	Lebanon	1	Japan	2	Ireland	14
23	Iran	6	Saudi Arabia	2	Singapore	2	Austria	5	Austria	11	Japan	1	Austria	2	New Zealand	13
24	Austria	6	Mexico	2	Ukraine	1	Russia	4	Brazil	8	Italy	1	U Arab Emirates	1	Belgium	13
25	Portugal	5	Jordan	2	Thailand	1	Portugal	4	Ireland	7	Ireland	1	South Africa	1	Singapore	12
26	Norway	5	Jamaica	2	Slovenia	1	New Zealand	4	India	6	India	1	Slovenia	1	South Africa	10
27	Israel	5	Ireland	2	Saudi Arabia	1	India	3	Greece	6	Finland	1	Poland	1	Portugal	10
28	Denmark	5	Iran	2	Portugal	1	Greece	3	Thailand	5			Malta	1	Saudi Arabia	9
29	South Africa	4	Iceland	2	Mexico	1	Turkey	2	South Africa	5			Israel	1	India	9
30	Mexico	4	Denmark	2	Malaysia	1	Ireland	2	Israel	5			India	1	Vietnam	8

Table 16
Temporal evolution by quinquenniums and country in the KM field.
Source: Elaborated based on WoS 2015.

R	Country	HKM	TCKM	TPKM	Q5	Q4	Q3	Q2	Q1	OY
1	USA	161	113,564	2060	814	665	344	179	51	7
2	UK	75	21,794	928	415	308	137	54	13	1
3	Canada	51	8531	344	173	109	46	15	1	–
4	Netherlands	45	6338	311	144	119	32	14	2	–
5	Germany	42	4963	301	182	91	23	4	1	–
6	China	38	6430	421	278	111	23	8	1	–
7	Spain	38	5168	434	290	118	23	3	–	–
8	Italy	38	4198	282	172	75	29	6	–	–
9	France	37	6540	232	136	57	27	11	–	1
10	Singapore	36	5786	115	46	44	21	4	–	–
11	Australia	35	4490	330	193	93	32	10	2	–
12	Taiwan	34	4417	371	216	140	15	–	–	–
13	Denmark	33	3667	159	97	39	21	1	1	–
14	Sweden	32	7607	197	102	66	22	3	4	–
15	Finland	31	3309	170	97	53	16	4	–	–
16	South Korea	30	4326	184	113	47	21	3	–	–
17	Switzerland	30	3022	135	81	40	10	3	1	–
18	Japan	27	9043	120	51	44	12	9	3	1
19	Belgium	25	2107	77	49	17	7	4	–	–
20	Norway	24	1555	100	67	23	6	2	1	1
21	Israel	22	1284	51	19	23	6	3	–	–
22	Austria	21	1443	78	40	31	4	3	–	–
23	New Zealand	17	723	63	27	27	8	1	–	–
24	Ireland	17	524	55	30	16	8	1	–	–
25	Portugal	15	415	43	23	15	3	2	–	–
26	Malaysia	13	567	75	60	15	–	–	–	–
27	India	13	404	55	30	17	3	5	–	–
28	Turkey	13	389	40	26	12	1	–	1	–
29	Greece	11	887	39	15	17	6	1	–	–
30	Brazil	11	387	69	48	15	5	1	–	–
31	Slovenia	10	252	28	14	14	–	–	–	–
32	Mexico	10	241	22	8	14	–	–	–	–
33	Russia	8	487	15	13	2	–	–	–	–
34	Vietnam	8	180	17	9	7	1	–	–	–
35	South Africa	8	159	36	22	12	1	1	–	–
36	Thailand	7	101	26	20	4	2	–	–	–
37	U Arab Emirates	7	96	24	17	5	2	–	–	–
38	Saudi Arabia	7	85	20	17	3	–	–	–	–
39	Iceland	6	108	8	3	5	–	–	–	–
40	Iran	6	104	34	25	9	–	–	–	–
41	Chile	6	83	16	8	6	1	1	–	–
42	Argentina	5	91	7	7	–	–	–	–	–
43	Egypt	5	70	7	3	2	2	–	–	–
44	Poland	5	56	15	12	2	1	–	–	–
45	Czech Republic	4	91	8	5	2	1	–	–	–
46	Serbia	4	47	10	7	3	–	–	–	–
47	Cyprus	4	43	11	9	1	–	1	–	–
48	Estonia	4	19	8	6	2	–	–	–	–
49	Colombia	3	47	12	10	2	–	–	–	–
50	Pakistan	3	11	7	2	5	–	–	–	–

over time in terms of their academic production. The ranking is ordered based on the same criteria used previously.

Note that most countries exhibit increasing productivity over time, but only 5 countries have originated scientific research in KM. Among them is the USA, which is in first place, with 7 studies. In the same period, the UK, France, Japan and Norway began to publish in KM literature, with the publication of one article each. Among these countries, we should highlight the growing publication trend in both the USA and UK. France, Japan and Norway, although they have performed research in the field, did not have strong productivity like the previously mentioned countries. It should also be noted that the Q2 period represents a significant leap in productivity in several countries, since almost all of the 50 most productive and influential countries in KM research appeared in this period. Overall, it is noteworthy that in the last five years, many countries around the world have expanded their participation in the field. However, there are also some countries that have decreased their productivity in the last five years (Q1): Israel, Greece, Mexico, Iceland and Pakistan. Finally, the low productivity of regions of emerging countries, such as Africa and Latin America, should be highlighted. Although some of these countries have begun KM research, such as South Africa, Brazil, Mexico and Chile. That notwithstanding, and given the relevance of knowledge management to companies' competitiveness, we expect more research from these emerging countries.

3.2. Science mapping of the KM research

The previous section presents a fairly comprehensive performance

Table 17
Most cited documents among papers published on KM field.
Source: Elaborated based on WoS 2015.

R	Cited reference	Citations	Total link strength	Type
1	Cohen, WM, and Levinthal, DA., (1990). Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly*, 35, pp. 128–152	1445	1443.00	A
2	Nonaka, I. and Takeuchi H., (1995). The knowledge-creating company: how Japanese companies create the dynamics of innovation. Oxford University Press.	1289	1275.00	B
3	Kogut, B. and Zander, U., (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3), pp. 383–397	979	979.00	A
4	Grant, RM., (1996). Toward a knowledge-based theory of the firm. *Strategic Manage Journal*, 17(S2), pp. 109–122.	977	977.00	A
5	Nonaka, I., (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1), pp. 14–37.	974	974.00	A
6	Szulanski, G., (1996). Exploring internal stickiness: impediments to the transfer of best practice within the firm. *Strategic Management Journal*, 17(S2), pp. 27–43.	809	809.00	A
7	Barney, J., (1991). Firm resource and Sustained Competitive Advantage. *Journal of Management*, 17(1), pp. 99–120.	707	706.00	A
8	Nelson, RR, and Winter, SG. (1982). An evolutionary theory of economic change. Harvard University Press.	672	672.00	B
9	Nahapiet, J. and Ghoshal, S. (1998). Social Capital, Intellectual Capital, and the Organizational Advantage. *Academy Management Review*, 23(2), pp. 242–266.	653	652.00	A
10	Davenport, TH., (1998). Working Knowledge: How Organizations Manage what They Know. Harvard Business Press, pp. 199.	652	342.00	B
11	Polanyi, M., (1966). The Tacit Dimension. Garden City, N.Y., Doubleday.	561	559.00	B
12	March, JG., (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1), pp. 71–87.	554	554.00	A
13	Teece, DJ., (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), pp. 509–533.	554	554.00	A
14	Fornell, C., and Larcker, DF., (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), pp. 39–50.	505	505.00	A
15	Hansen, MT., (1999). The search-transfer problem: the role of weak ties in sharing knowledge across organization subunits. *Administrative Science Quarterly*, 44(1), pp. 82–111.	499	499.00	A
16	Alavi, M., and Leidner, DE., (2001). Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS Quarterly*, 25(1), pp. 107–136.	471	464.00	A
17	Zahra, SA., and George, G., (2002). Absorptive capacity: a review, reconceptualization, and extension. *Academy of Management Review*, 27(2), pp. 185–203.	461	461.00	A
18	Podsakoff, PP., MacKenzie, SB., Lee, JY., and Podsakoff, NP. (2003), Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), pp. 879–903.	442	442.00	A
19	Huber, GP., (1991). Organizational learning: the contributing processes and the literatures. *Organization Science*, 2(1), pp. 88–115.	438	438.00	A
20	Grant, RM., (1996). Prospering in dynamically-competitive environments: organizational capability as knowledge integration. *Organization Science*, 7(4), pp. 375–387.	436	436.00	A
21	Lane, PJ., and Lubatkin, M., (1998). Relative absorptive capacity and interorganizational learning. *Strategic Management Journal*, 19(5), pp. 461–477.	420	420.00	A
22	Gupta,AK., (2000). Knowledge flows within multinational corporations. *Strategic Management Journal*, 21(4), pp. 473–496.	409	409.00	A
23	Eisenhardt, KM., (1989). Building theories from case study research. *Academy of Management Review*, 14(4), pp. 532–550.	408	404.00	A
24	Nunnally, JC., (1978). Psychometric theory. McGraw-Hill, pp. 701.	406	403.00	B
25	Dyer, JH., and Singh, H., (1998). The relational view: cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review*, 23(4), pp. 660–679.	402	402.00	A
26	Spender, JC., (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal*, 17(S2), pp. 45–62.	382	382.00	A
27	Brown, JS., and Duguid, P., (1991). Organizational learning and communities-of-practice: toward a unified view of working, learning, and innovation. *Organization Science*, 2(1), pp. 40–57.	380	378.00	A
28	Powell, WW., Koput, KW., and Smith-Doerr, L., (1996). Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology, *Administrative Science Quarterly*, 41(1), pp. 116–145.	377	377.00	A
29	Tsai, W., (2001). Knowledge transfer in intraorganizational networks: effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal*, 44(5), pp. 996–1004.	369	369.00	A
30	Zander, U., and Kogut, B., (1995). Knowledge and the speed of the transfer and imitation of organizational capabilities: an empirical test. *Organization Science*, 6(1), pp. 76–92.	361	361.00	A
31	Tsai, WP., and Ghoshal, S., (1998). Social capital and value creation: the role of intrafirm networks. *Academy of Management Journal*, 41(4), pp. 464–476.	356	356.00	A
32	Granovetter, MS., (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), pp. 1360–1380.	340	339.00	A
33	Podsakoff, PM., and Organ, DW., (1986). Self-reports in organizational research: problems and prospects. *Journal of Management*, 12(4), pp. 531–544.	332	332.00	A
34	Mowery, DC., Oxley, JE., and Silverman, BS. (1996). Strategic alliances and interfirm knowledge transfer. *Strategic Management Journal*, 17(S2), pp. 77–91.	328	328.00	A
35	Burt, Ronald S., (1992). Structural Holes: The Social Structure of Competition. Harvard University Press, pp. 324.	327	326.00	B
36	Wernerfelt, B., (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), pp. 171–180.	317	317.00	A
37	Hansen, MT., Nohria, N., and Tierney, TJ., (1999). What's your strategy for managing knowledge? *Harvard Business Review*, 77(2), pp. 106–116.	303	303.00	B
38	Hamel, G., (1991), Competition for competence and interpartner learning within international strategic alliances. *Strategic Management Journal*, 12(S1), pp. 83–103.	303	303.00	A
39	Argyris, C., and Schon, DA., (1978). Organisational learning: a theory of action perspective. Addison Wesley Longman Publishing Co., pp. 356.	303	302.00	B
40	Uzzi, B., (1997). Social structure and competition in interfirm networks: the paradox of embeddedness. *Administrative Science Quarterly*, 42(1), pp. 35–67.	300	300.00	A
41	Porter, ME., (1990). Competitive advantage of nations: creating and sustaining superior performance. Free Press, pp. 855.	298	296.00	B
42	Eisenhardt, KM., and Martin, JA., (2000). Dynamic capabilities: what are they?. *Strategic Management Journal*, 21(10/11), pp. 1105–1121.	294	294.00	A
43	Jaffe, AB., Trajtenberg, M., and Henderson, R., (1993). Geographic localization of knowledge spillovers as evidenced by patent citations. *Quarterly Journal of Economics*, 108(3), pp. 577–598.	290	290.00	A

(*continued on next page*)

Table 17 (*continued*)

R	Cited reference	Citations	Total link strength	Type
44	Anderson, JC., and Gerbing, DW., (1988). Structural equation modeling in practice: a review of recommended two-step approach. *Psychological Bulletin*, 103(3), pp. 411–423.	289	289.00	A
45	Miles, MB., and Huberman, AM., (1994). Qualitative Data Analysis: An Expanded Sourcebook. SAGE, pp.338.	281	279.00	B
46	Argote, L, and Ingram, P., (2000). Knowledge transfer: a basis for competitive advantage in firms. *Organizational Behavior and Human Decision Processes*, 82(1), pp. 150–169.	281	278.00	A
47	Inkpen, AC., and Tsang, EWK., (2005). Social capital, networks, and knowledge transfer. *Academy of Management Review*, 30(1), pp. 146–165.	274	274.00	A
48	Baron, RM., and Kenny, DA., (1986). The moderator-mediator variable distinction in social psychological research. *Journal of Personality and Social Psychology*, 51(6), pp. 1173–1182.	269	268.00	A
49	Granovetter, M., (1985). Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology*, 91(3), pp. 481–510.	268	268.00	A
50	Reagans, R., and McEvily, B., (2003). Network structure and knowledge transfer: the effects of cohesion and range. *Administrative Science Quarterly*, 48(2), pp. 240–267.	268	268.00	A

Abbreviation: A: Article, B: Book.

analysis of KM research. To strengthen and complement this analysis, science mapping is presented, which aims to show the structural and dynamic aspects of a research field (Cancino et al., 2017; Merigó et al., 2017). This analysis allows us to identify the main documents and analyze the most representative structures and connections between the actors that perform in this field (Blanco-Mesa et al., 2017; Martínez-López et al., 2018). Note that this analysis is presented by using techniques such as co-citation and the co-occurrence of keywords (Valenzuela et al., 2017; Wang et al., 2018). In the latter technique, a temporal analysis is added to observe how the conceptual structure changes over time (Laengle et al., 2017), which allows us to observe the variation of the research interests in different years (Merigó et al., 2018; Tur-Porcar et al., 2018).

Mapping of the KM research begins by conducting a co-citation analysis. According to the taxonomy of the bibliometric techniques presented by Cobo et al. (2011b), co-citations can be analyzed according to the references of the authors and journals and the references of the publications. This technique maps the structure of a research field using pairs of documents that are commonly cited together. Taking this into account, the co-citation of references is presented first. The analysis is performed on the data presented in Table 17.

The most cited reference in KM research is that of Cohen and Levinthal (1990) and the book of Nonaka and Takeuchi (1995). Note that these data complement the results provided in Table 7. Additionally, Table 18 presents other books that were highly cited in KM research.

Another interesting unit to analyze co-citations is through journals. Co-citation of journals (McCain, 1991) seeks to identify journals that are frequently cited. Fig. 3 presents information supporting this analysis, which is performed using a threshold of eight hundred citations and one hundred most representative connections.

Observe that the most relevant journals in KM research have an orientation on the field of management. The centrality of the SMJ and OSC spheres indicates that they are the journals that lead KM research, and therefore, they possess a wide network of connections. Finally, keep in mind that this result is consistent with the results presented in Table 4.

Another unit that is analyzed using the co-citation technique is authors. Analysis of the co-citation of authors (White and Griffith, 1981) seeks to show the structure and connections of authors who are cited together more frequently. Fig. 4, which presents the results of this analysis, is developed with a threshold of four hundred citations and the one hundred most representative connections.

Fig. 4 corroborates the relevance of Nonaka in the KM research. The size of its sphere and its centrality in the figure stand out from the other authors. However, the figure shows other relevant authors who are strongly connected, such as Cohen, Grant, and Kogut, among others. Note that these results are consistent with the results presented in Table 18.

Another interesting issue is the co-occurrence of keywords. According to Callon et al. (1983), analysis of the co-occurrence of keywords uses keywords and seeks to study the conceptual structure of a field of research. Given the stages of development that the KM field has undergone (Serenko, 2013), it is interesting to conduct this analysis from a general point of view, taking into account a longitudinal framework and observing the main concepts studied in each KM stage.

Fig. 5 presents the general co-occurrences of keywords between 1961 and 2015, with a threshold of forty co-occurrences and the one hundred most representative connections.

There is a great diversity of concepts, among which knowledge management, knowledge transfer, knowledge sharing, innovation, and organizational learning are the words most frequently used in the field. To observe how the use of these keywords evolves over time, Figs. 6, 7 and 8 present the co-occurrences of keywords between 1985–1995, 1996–2005 and 2006–2015. It should be noted that the thresholds for these figures are one, six, and thirty-five co-occurrences, respectively.

Table 18
Most cited books among papers published on KM field.
Source: Elaborated based on WoS 2015.

R	Cited reference	Citations word	Total link strength
1	Lave J. Wenger E. (1991). Situated learning: legitimate Peripheral Participation. Cambridge University Press.	266	266.00
2	Leonard-Barton D. (1995). The wellsprings of knowledge. Harvard Business School Press.	265	265.00
3	Cyert RM. March JG. (1963). A behavioral theory of the firm. Prentice-Hall.	263	263.00
4	Penrose E. (1959). The theory of the growth of the firm. Oxford University Press.	259	259.00
5	Chesbrough H. (2003). Open Innovation: the new imperative for creating and profiting from Technology. Harvard Business School Press.	242	204.00
6	Polanyi M. (1962). Personal knowledge: towards a post-critical philosophy. University of Chicago Press.	238	237.00
7	Hofstede G. (1980). Culture's consequences: international differences in work-related values. Sage Publications.	234	232.00
8	Williamson OE. (1985). The economic institutions of capitalism. Collier Macmillan.	231	231.00
9	Wenger E. (1998). Communities practice. Cambridge University Press.	226	224.00
10	Argote L. (1999). Organizational learning creating, retaining and transferring knowledge. Kluwer Academic.	214	214.00
11	von Hippel E. (1988). The sources innovation. Oxford University Press.	192	192.00
12	Senge P. (1990). The fifth discipline: the art & practice of The learning organization. Doubleday/Currency.	188	184.00
13	March JG. Simon HA. (1958). Organizations. Wiley.	186	186.00
14	Schumpeter J. (1934). The theory of economic development: an inquiry into profits, capital, credit, interest, and the business cycle. Harvard University Press.	183	183.00
15	Allen TJ. (1977). Managing the flow of technology. MIT Press.	169	169.00
16	Thompson JD. (1967). Organizations in action; social science bases of administrative theory. McGraw-Hill.	167	166.00
17	Coleman J. (1990). Foundation social theory. Belknap Press of Harvard University Press.	156	156.00
18	Porter M. (1980). Competitive strategy: techniques for analyzing industries and competitors. Free Press.	144	142.00
19	Weick KE. (1995). Sensemaking in organizations. SAGE.	140	140.00
20	Pfeffer J. (1978). The external control of organizations. Stanford University Press.	139	138.00
21	Wasserman S. (1994). Social network analysis: methods and applications. Cambridge University Press.	138	138.00
22	Drucker PE. (1993). Post capitalist society. HarperBusiness.	136	134.00
23	Stewart TA. (1997). Intellectual capital: the new wealth of organizations. Doubleday.	126	126.00
24	von Krogh G. Ichijo K. Nonaka I. (2000). Enabling knowledge creation: how to unlock the mystery of tacit knowledge and release the power of innovation. Oxford University Press.	118	118.00
25	Lawrence PR. Lorsh JW. (1967). Organization and environment: managing differentiation and integration. Harvard University.	113	113.00
26	Galbraith J. (1973). Designing complex organizations. Addison-Wesley Pub. Co.	97	97.00
27	Berger P. (1966). The social construction of reality: a treatise in the sociology of knowledge. Doubleday	90	90.00
28	Edvinsson L. (1997). Intellectual capital: realizing your company's true value by finding Its hidden brainpower. HarperBusiness	90	89.00
29	Wenger. (2002). Cultivating communities of practice: a guide to managing knowledge. Harvard Business School Press.	89	89.00
30	Schumpeter JA, 1942, Capitalism, socialism and democracy	83	83.00

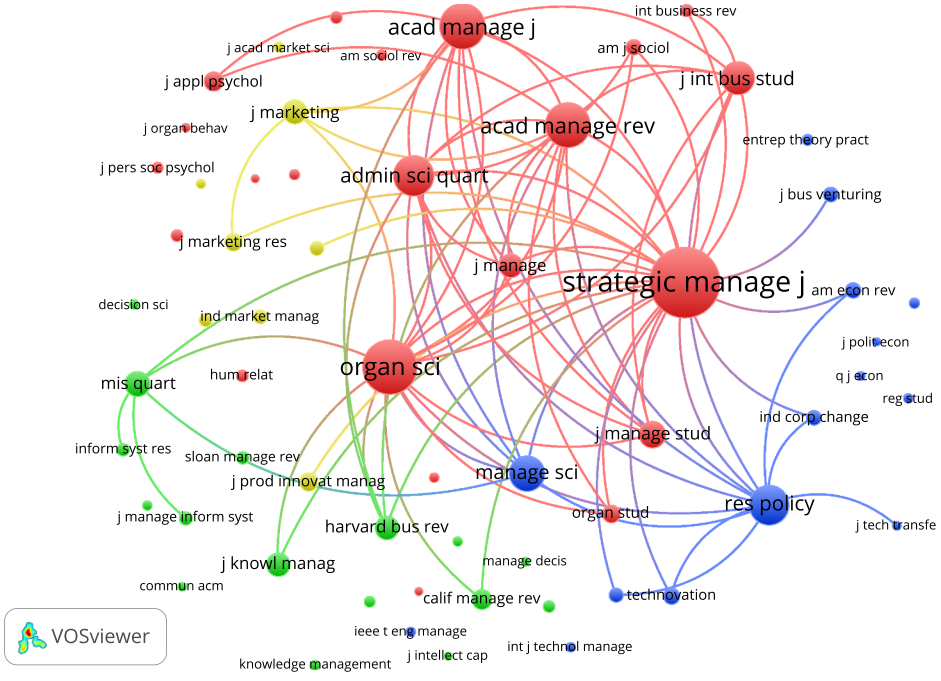

Fig. 3. Mapping of co-citation of journals.

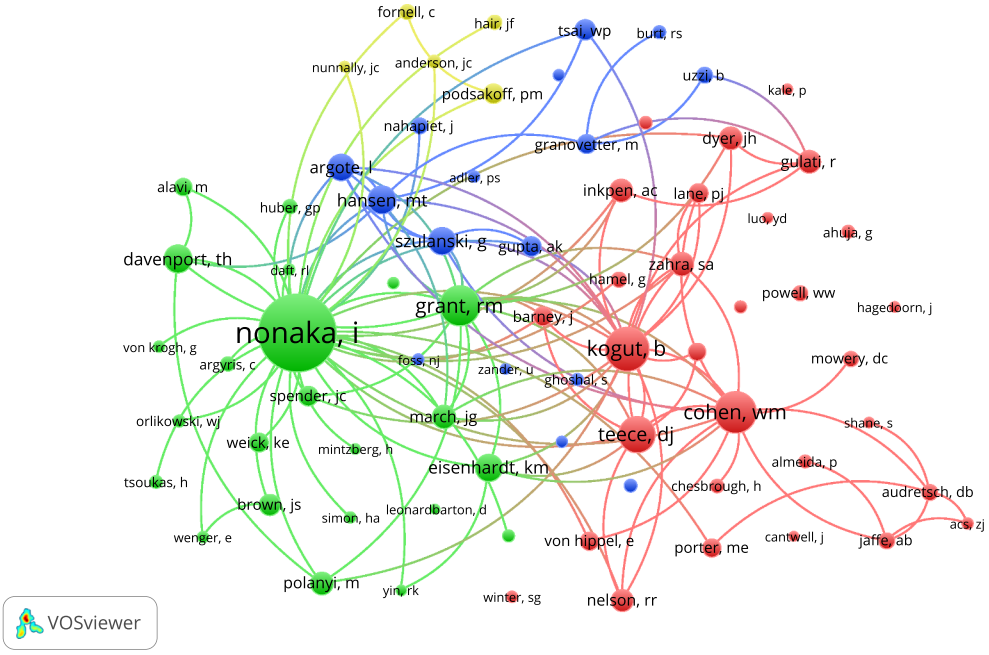

Fig. 4. Mapping of co-citation of authors.

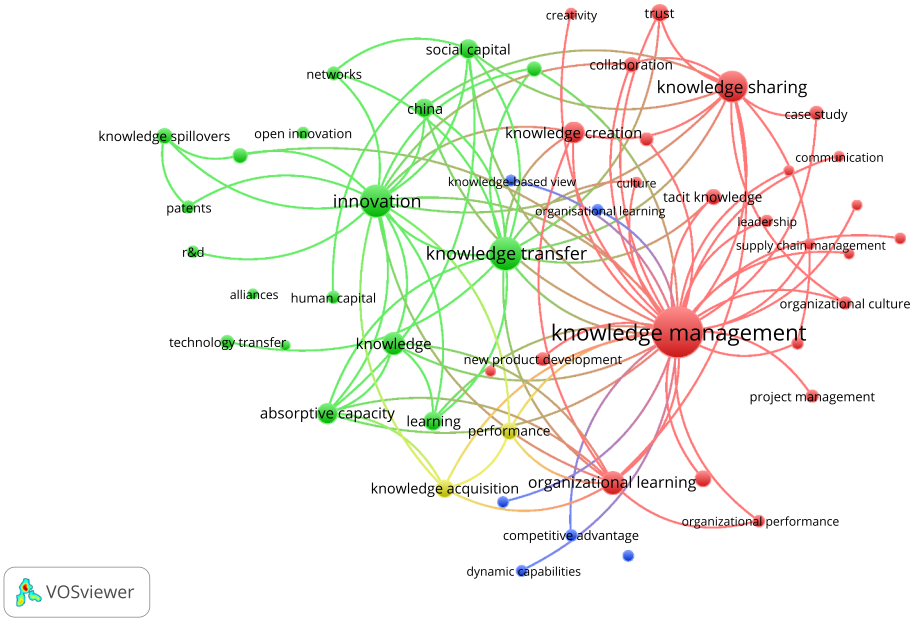

Fig. 5. Mapping of co-occurrences of keywords (1961–2015).

Note that in the first decade of analysis, keywords are clustered by different topics of interest, among which knowledge acquisition and expert systems stand out, which are connected to concepts in the area of information systems. In the following decades, it is observed that knowledge management is the keyword most frequently used and that it connects strongly with the rest of the keywords (see Figs. 7 and 8).

4. Conclusions

The objective of this work is to present an overview of KM research in the areas of business and management through an exhaustive bibliometric analysis. This analysis used the two main bibliometric methods, namely, performance analysis and science mapping. The first method uses several measures and bibliometric indicators, such as the

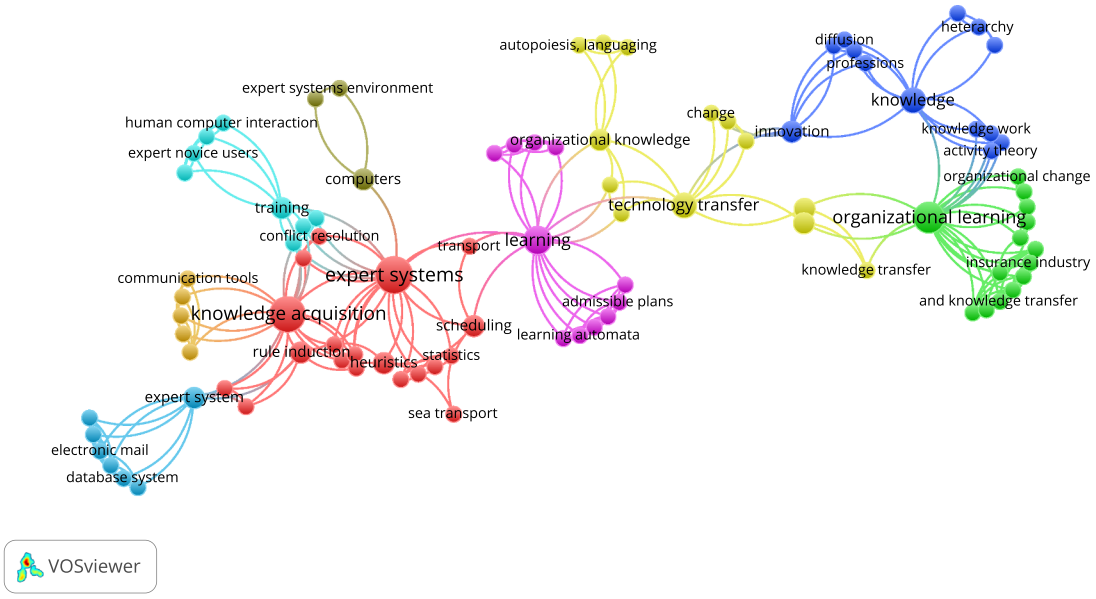

Fig. 6. Mapping of co-occurrences of keywords (1985–1995).

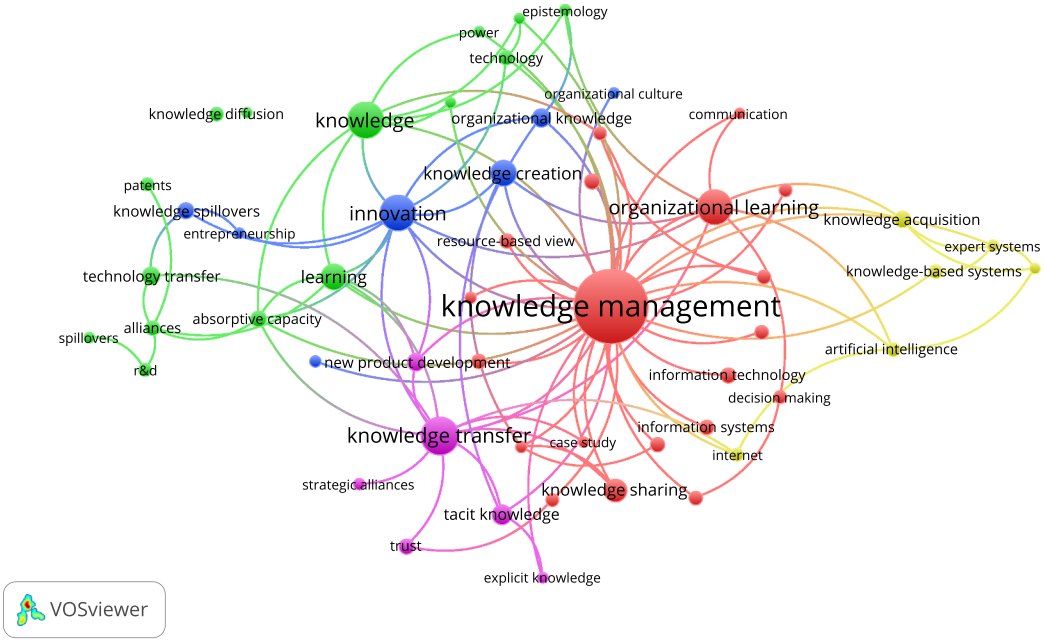

Fig. 7. Mapping of co-occurrences of keywords (1996–2005).

h-index, number of citations and productivity to evaluate the importance, impact and quality of publications in a particular field. Science mapping aims to complement performance analysis using co-citation techniques and co-occurrences of keywords from a temporal perspective. This analysis was conducted using the VOSviewer software. In addition, to gain a broader view of this field, these bibliometric methods were used, taking into account various dimensions of analysis, including journals, articles, authors, institutions and countries. The results were obtained through use of the WoS, which is a bibliographic database that is widely regarded as the most influential in the scientific community.

From an overall perspective, this study shows that KM research in business and management has experienced spectacular growth in recent years. The USA is the absolute leader in KM research and has the best

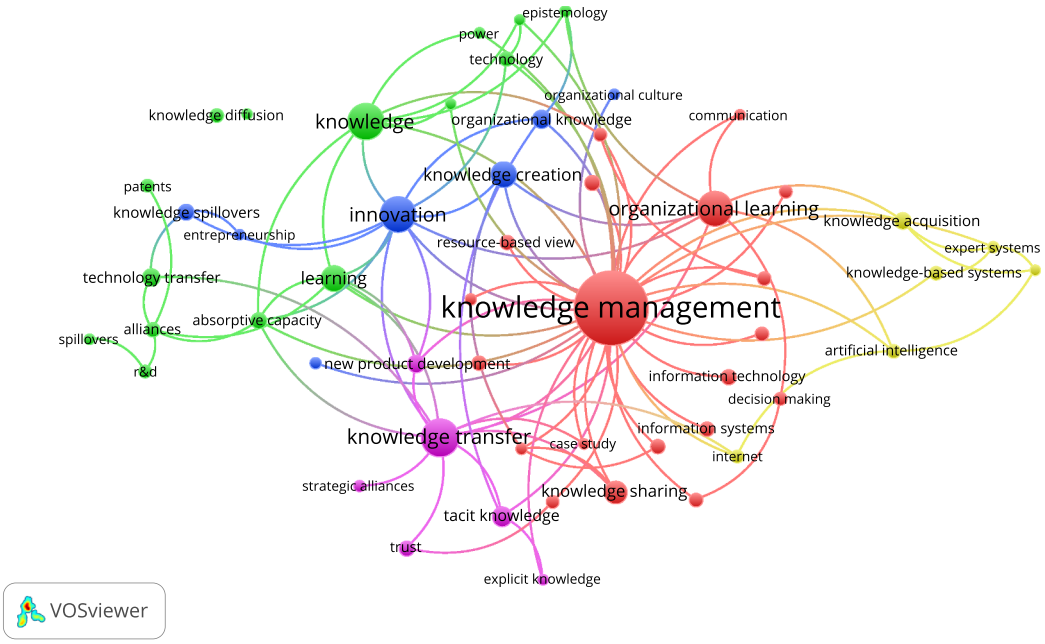

Fig. 8. Mapping of co-occurrences of keywords (2006–2015).

indicators of influence and productivity in all of the dimensions that we analyzed. This result was to be expected since the USA is usually the absolute dominator of investigations in other scientific areas. The UK has also shown considerable productivity and influence in KM. However, many other countries have increased their productivity and influence in KM due to the emergence of various research groups around the world. For example, although they have some longevity in the field, countries such as Spain, Canada and China have achieved remarkable growth in the last 10 years, and today, they are among the 10 most productive countries in KM research. Other cases, such as Japan, Singapore and Sweden, are also notable since with less productivity, they have managed to be quite influential.

With respect to institutions, the USA again has the largest number of universities, and its influence in the field is therefore quite dominant. The most prominent American universities in the field of KM include the University of North Carolina, the University of Maryland-College Park, Harvard University and the University of Minnesota Twin Cities, among others. The UK is again in second place. The University of Cambridge, the University of Manchester and the University of Warwick are the British universities with the best indicators of productivity and influence in the field. In general, the most influential universities are located in North America and Europe. Although there are several influential and renowned Asian researchers in this field, universities in this region have not been able to position themselves strongly in the field.

With regard to individual researchers, based on performance analysis, it appears that Nonaka is, by far, the most influential researcher in this field of research. This author is considered one of the fathers of knowledge management. Science mapping, specifically co-citation analysis of authors and documents, corroborates and gives strength to these results. We also found researchers who are quite productive and influential, including Audretsch and Von Krogh. In general, from both bibliometric methods, it is possible to observe that a large number of authors are related to this field of research. According to Holsapple and Wu (2008), KM offers a unifying basis for several disciplines. It is likely, in this sense, that the field's versatility has allowed many authors to apply KM theory to their research in business and management. For example, Audretsch has applied part of this theory in the entrepreneurship literature. Argote has published several articles focusing on isolation in different phases of the KM process. Finally, as expected, the vast majority of the main researchers are European and North American.

In relation to the journals, we found that the KM literature has been published in a large number of scientific journals with different theoretical orientations. OSC and the SMJ are the most influential journals in this field. It is also observed that the Top Management journals (TMG), in general, are the most influential, given their high volume of citations. Once again, our science mapping and analysis of journals co-citations gives robustness to these results. In addition, these results are understandable because there is a general tendency among researchers to consider these journals' publications as the most prestigious. On the other hand, the most productive journals in this field are the *JKM*, *IJTM* and *KMRP*. However, these journals have not achieved a level of citations and h-index commensurate with other journals. Other journals that have achieved excellent levels of the h-index in KM research are *RPC*, *MSC*, *JMS*, *JIBS* and *MQY*.

According to the bibliometric analyses, this work is useful for obtaining an overview of the state of knowledge management research in the areas of business and management. However, there are several limitations that need to be considered. First, the information presented in this work is purely informative and only provides a general orientation of the field with respect to the various dimensions that have been analyzed. We analyzed some specific types of academic publications obtained from the WoS, namely, articles, reviews, letter and notes. In addition, it is important to consider that along with the WoS, there are other, equally important databases that may contain excellent publications in other journals that are not indexed in the WoS. Therefore, considering the above, other equally important references may not have been included in the performance analysis, which is also the case with some highly cited books by Nonaka or Polanyi. However, our work also includes science mapping that seeks to complement and give robustness to the results as well as to help partially overcome the mentioned limitations. Other limitations are related to non-English speaking researchers. Only documents in English were selected in our document. We must consider that most of the documents in languages other than English are not included in the WoS (Merigó et al., 2016)

and therefore are not analyzed in this paper. Another limitation that should be mentioned is related to indicators, such as the h-index. Although some advantages were mentioned in the text, one of the main limitations of the h-index, for example, is that it does not benefit highly cited researchers with moderate productivity. Therefore, readers should observe the data of this indicator with caution and take into account the other measures and indicators presented in each analysis. Second, the limitations of the WoS database are also transferred to this study. For example, one limitation is that the complete counting system in which papers attributed to multiple authors or affiliations tend to be more important in the analysis compared to those papers that appear with a single author. Science mapping performed with the VOSviewer was used to neutralize this limitation since it uses a fractional counting system. The similarity and consistency between the results obtained from the analysis of performance and science mapping analysis allow us to conclude that there is no significant deviation between the two methods of counting. Although researchers must take these limitations into account, this paper identifies the most significant results of the KM field in the business and management areas. Their importance lies in the information presented in a complete manner and in considering different perspectives so that each reader understands the data according to his/her own interests and priorities.

Finally, it should be noted that quantifying and classifying the literature of a field as extensive as KM is not simple. Excluding other research topics, such as conference proceedings, can make this task more complicated. In addition, the nature of the different research disciplines that intersect with the KM field may have different characteristics and may lead to different interpretations and conclusions that those presented in this study. Therefore, future research should use bibliometric methods to analyze the intersection of the KM field with other disciplines.

Acknowledgements

We would like to thank the anonymous reviewers for their valuable comments, which have improved the quality of the paper.

Appendix 1. Acronyms of tables

R	Acronym	Description
1	% APKM	Percentage of articles published in KM (TPKM / TAP)
2	% KM	Percentage of articles published in KM (TPKM / TPKM-BM)
3	≥500, ≥200, ≥100, ≥50, <50	≥500, ≥200, ≥100, ≥50: articles with more than 500, 200, 100 and 50 citations and articles with less than 50 citations
4	5Y-IF	Impact factor Index 5 Years /// impact index for the last 5 years
5	ACKM	Articles cited in knowledge management
6	C	Name of country
7	C/Y	Citations / Year
8	HKM	H Index based exclusively on knowledge management research
9	HRJ	Journals grouped to their orientation toward human resources
10	IF	Impact factor 2015 Index
11	INNJ	Journals grouped to their orientation toward innovation
12	ISYS	Journals grouped to their orientation toward information systems
13	J	Abbreviated journal names
14	JGT	Journals grouped by theme
15	OPJ	Journals group classificated as other journals within the business and management
16	OY	1984-1990
17	PCKM	Average citations by article in knowledge management
18	Q	Quinquennium
19	Q1	1991-1995
20	Q2	1996-2000
21	Q3	2001-2005
22	Q4	2006-2010
23	Q5	2011-2015
24	MPRJ	Group of the three journals with most productivity
25	T50	Articles in the Top 50
26	TAP	Total articles published by the journal
27	TC	Total number of citations in all areas
28	TCKM	Total number of citations in knowledge management research
29	TMGJ	Group of journals ranked as the top 10 journals in business and management
30	TP	Total Papers in all areas
31	TPKM	Total papers in knowledge management
32	TPKM-BM	Total papers in knowledge management in the business and administration area
33	TPKM / PMH	Total number of papers KM divided by the total millions of inhabitants of the country
34	TCKM / PMH	Total number of citations KM divided by the total millions of inhabitants of the country
35	TPKM-BM	Total papers in business and management
36	YP	Year of publication

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