UNIVERSITAT DE
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The processes of knowledge management:
A bibliometric evolution and assessment models
based on ICTs for SMEs

Magaly Gaviria Marín

PhD in Business

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Date:

November 2018

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A mis padres:

Enrique y Nohelia

Agradecimientos

Al finalizar esta tesis doctoral, es inevitable sentirme agradecida con Dios, por tantas bendiciones, experiencias y personas que permitió que llegaran durante esta etapa de mi vida.

Quiero agradecer de manera especial al profesor Claudio Cruz por aceptar dirigirme en el desarrollo de esta tesis doctoral. Su paciencia y confianza han sido fundamentales para fortalecer mi proceso de formación en la investigación.

Quisiera expresar también mi más sincero agradecimiento al profesor José Carlos Ramos, por acompañarme en la primera etapa de mi doctorado. Así mismo a los profesores José María Merigó y Jorge Matute, quienes tuvieron una enorme generosidad y disponibilidad compartiendo su conocimiento y participando en el desarrollo de esta tesis.

A mis amigos y estudiantes de doctorado, por compartir sus conocimientos, experiencias y sus crisis de investigación, que siempre fueron acompañadas de chocolate, café, té y por supuesto de risas y momentos tan agradables que serán difíciles de olvidar. En especial, agradecer a Fabio, Agustín, Jaime, Milena, María, Edgar, Keivan, Arman y Helen, por compartir su motivación y mostrarme su perseverancia al enfrentar la vida. A Hanny, por compartir sus experiencias y porque, aunque ya no está con nosotros, su sonrisa y alegría siempre la llevaré conmigo.

A los miembros del área de Tecnologías de la Información y Comunicación de la Universitat de Barcelona: mis más sinceros agradecimientos. De manera muy especial agradecer a la unidad de sistemas: Merche, Ana, Margarita, Ángel, Cosme y Dani, quienes me brindaron su apoyo y confianza. Sinceramente, valoro mucho los gratos momentos vividos junto a ustedes.

A mis amigos con quienes he compartido diferentes momentos desde mi llegada a Barcelona. Criss, Tomás, Olivia, Gonzalo, Melisa, Camila, Marc, Claudia, Thanee, Dina, Elkin, Tulia, Jordi, Padre Iván, Sonia, Enrique, Aquiles, Eusebi y Miquel. Sin duda son mi familia en Barcelona. Gracias por sus palabras de aliento, compañía, alegría y aprendizajes.

A mis amigos de Colombia: William, Mafe, Karito, Haider, Karla, Loreny, P. John, Paola, Mauricio, Marco Antonio y José Jaime. Quienes, a pesar de la distancia, siempre me han demostrado su aprecio, compañía, y generosidad para compartir conmigo un espacio de sus vidas.

A mis amigos de Chile, Mónica, Lily, Hugo, Marly, Felipe, Karen, Yony, Paty, Steve, Dorenis, Pablo, Karen, Juan Miguel, Yanina, Ruth, y Hugo. Sus atenciones y oraciones han sido muy importantes en esta etapa.

No puedo dejar de expresar mi más profundo agradecimiento a mi familia. Sus oraciones, comprensión y motivación han sido fundamentales para terminar esta tesis. Su esfuerzo y dedicación en mi formación personal y académica, han sido la base de todo.

A Hugo, gracias por estar en mi vida. Tu incondicionalidad, apoyo, afecto, y comprensión han sido fundamentales para cumplir esta meta. Especialmente, gracias por estar en aquellos momentos difíciles, donde siempre tuve palabras y gestos que motivaron a continuar con alegría y dedicación. Sin duda, este logro también es tuyo.

Un agradecimiento final a los empresarios que participaron de los estudios, su ayuda ha sido un factor fundamental. Gracias por compartir sus experiencias y conocimientos.

A todos, mi mayor reconocimiento y gratitud, por ayudarme y brindarme un espacio de su tiempo durante la realización de tesis doctoral.

Según sea tu fe, así serán las cosas que te sucederán.

General Index

Index of Tables

Index of figures

Chapter 1

Introduction

1.1. Introduction and Presentation of the Problem

Currently, it is suggested that the intellectual resources are a key organizational asset that allows a sustainable competitive advantage over time. In this sense, knowledge is widely recognized as one of the most relevant primary resources in business organizations (Schultz and Leidner, 2002). In light of this, many firms have modified their approach on operational efficiencies towards the acquisition and development of certain resources that around knowledge (Kogut and Zander, 1992; Smith and Hansen, 2002). Therefore, the recognition, acquisition or development of this resource is fundamental to improve business capacity and generate consistent performance. According to the literature, some of the benefits derived from knowledge are the generation of competitive advantages (Drucker, 1993; Montgomery and Wenerfelt, 1997; Nonaka and Takeuchi, 1995), improvements in business dynamics, creation and strengthening of business models (Malhotra, 2000), improvements in the structure and performance of the organization (Kogut and Zander, 1992, 1993, 1995), the improvement of efficiency and effectiveness for the development and delivery of innovative products and services (Gray, 2000), among others.

Knowledge has been studied in many contexts and for many generations, and therefore, its definition and scope has been difficult to establish. Depending on the context in which it has been used, knowledge has been linked to terms related to data, information, intelligence, skills, experiences, ideas, perception, among several others. However, the individual has been highlighted as the main source of knowledge. For example, Nonaka (1991) argues that knowledge is dynamic, relative and subjective, since it emerges from an individual. Boisot (1998), defines knowledge as a capacity based on the information extracted from the data, or the set of expectations that a person has regarding an event. Kim (1993) points out that knowledge starts from the individual, and therefore is not a corporate resource. Alavi and Leidner (2001) refer to knowledge as information helds in peoples' minds. From the previous definitions, is possible to observe that knowledge has been strongly related to the experiences and information acquired by individuals. Nonaka and Takeuchi (1995) also point out that these experiences can be transformed into valuable knowledge for firms. From this perspective and, given the need to handle this knowledge, organizations are increasingly

3

developing a Knowledge Management (KM), which is understood as a process to improve its performance, through design, implementation, maintenance and improvement of a system that allows to internalize personal knowledge in the organization (Davenport et al., 1998).

KM is a discipline that can be observed from various disciplines, since there are a number of fields that have contributed to KM, for example, the cognitive sciences of the social sciences, the information sciences, knowledge engineering, artificial intelligence, and economics (Kakabadse et al., 2003). In fact, some researchers have pointed out that KM is an expansive research, since it has the potential to offer a unifying base for many disciplines (Holsapple and Wu, 2008). If the above is taken into account, and if we adapt to the business sciences, it does not seem strange the significant growth of the investigations.

Currently, many investigations continue searching, clarifying and deepening the nature of KM, generating different approaches mainly related to the evolution of KM processes (Durst and Edvardsson, 2012). In fact, KM has been considered as a dynamic and continuous set of integrated of processes integrated in individuals, teams and structures in all types of organizations. In this way, researchers consider that in a particular organization, individuals and groups may be involved in different aspects of the KM process (Ling-hsing Chang and Lin, 2015). The KM process has been defined by various researchers and there is no clear definition in this regard. For example, Davenport and Prusak (1998) point out that the KM process can be considered as the process of capturing, storing, sharing and using knowledge; or Alavi et al. (2005) indicates that it is a systemic process and organizationally specific to acquire, organize and communicate the tacit and explicit knowledge of the employees so that others can be effective and productive in their work.

Other investigators, among them Kayworth and Leidner (2004), have suggested, that firms perform processes that involve the creation, storage, transfer and application of knowledge. As well as they, other researchers and professionals have considered a wide range of research questions, which include different dimensions of the KM process, but also other aspects that may be connected to it, for example, culture and organizational learning, or

information technologies (ICTs) as a means to store and exchange knowledge. The above will produce results of KM, which in the literature has been related to the improvement of productivity and sales, cost reduction or increase in innovation and quality (Alavi et al., 2005; Durst and Edvardsson, 2012; Edvardsson, 2009; Quintas, 2005).

The above shows that KM has been developing as a field of scientific research of great potential. Literature in this incipient field of research, has managed to progress and position itself remarkably in the area of business, attracting the attention of researchers, professionals and political leaders (Serenko, 2013). In addition, it has been developed with characteristics of a well-defined scientific field and it shows a well-established academic structure. For example, KM has several exclusive journals in the field. Among the most important are mentioned *Journal of Knowledge Management* (JKM), *Journal of Intellectual Capital* (JIC), *Knowledge Management Research & Practice* (KMRP) or *The Learning Organization* (TLO). In addition, KM field researchers have been developing their own classification system for exclusive journals in the field that is updated and published frequently (Serenko and Bontis, 2009).

Another important information, is that it has an interesting network of collaborators such as *International Association for Knowledge Management* (IAKM), through which, it is possible to find a lot of international conferences about KM, among which we mention, for example, the *International Forum on Knowledge Asset Dynamics (IFKAD)*, the *European Conference on Knowledge Management (ECKM)*, the *Annual Conference on Knowledge Management (APQC)*, among others. All this structure has benefited the accelerated growth of the body of literature related to the KM field (Lambe, 2011).

The information submitted shows a consolidated field of research, however, there are also some gaps that in this thesis is intended to address. The objectives of this thesis doctoral are presented to below.

1.2. Investigation objectives

Taking into account the above, the general objective of this doctoral thesis is to examine the impact generated by KM in academic research, as well as helping to understand its link and impact on the performance of SMEs. This thesis is carried out with the motivation of contributing to the literature with some theoretical and empirical studies developed within the limits of the KM field. It is considered that this objective will be possible through the development of the following specific objectives:

- Present an overview of the KM field literature published in Business and Management journals.
- Provide relevant information of the main journal of the KM field – *Journal of Knowledge Management* – analyzing in depth the publications made up to 2016, through different bibliometric tools.
- Based on an exploratory study, the objective is to examine the influence on the web positioning of online information providers (OIPs), based on the diversity of knowledge offered to entrepreneurs through platforms, and of the different Web 2.0 applications.
- To explore the effect of KM mediation between information and communication technology (ICT) capabilities and the performance of small and medium-sized Ibero-American firms.

Through these objectives, it is intended to make four scientific contributions that address the KM field from different methodological perspectives. For example, the first two studies are of a theoretical nature, and these try through bibliometric methodologies, organize and provide relevant information about, i) KM field literature published in Business and Management journals, and ii) literature published in the main journal of the KM field, namely, *Journal of Knowledge Management*.

The other two studies are of an empirical nature and focus on contributing to the KM field using different quantitative methodologies. The first of them, uses a binary logistic regression to explain whether web 2.0 technologies and the diversity of knowledge offered by online information providers (OIPs) influence the web positioning of these OIPs. The second, uses the technique

of partial least squares (PLS) to evidence the important role played by the KM processes in Ibero-American SMEs.

1.3. Structure of the research

The scientific contributions described above constitute the central chapters of this doctoral thesis (see Figure 1.1). Which is presented as a compendium of four scientific contributions that have been sent to different indexed journals and that are at different levels of progress. Taking this into account, we describe below the structure of this doctoral thesis.

Figure 1.1. Structure of the doctoral thesis

Chapter I:
Introduction

Chapter II:
Twenty years of the Journal of Knowledge Management: A bibliometric analysis

Chapter III:
Knowledge management: A global examination based on bibliometric analysis

Chapter IV:
Ranking Web as indicator of knowledge diffusion: an Application for SMEs

Chapter V:
The relationship between ICTs and the performance of SMEs: indirect effects of knowledge management and external flexibility

Chapter VI:
Conclutions

Source: Own Elaboration

After the introduction, two theoretical chapters that use bibliometric methodologies are presented. Bibliometrics is an area of information research that analyzes bibliographic data based on a quantitative approach related to the year of publication, the authors, the country of origin, among others (Broadus, 1987). According to Cobo et al. (2015), bibliometric studies contribute to the progress of science because they allow, evaluate the progress made in a field of study, identify the most reliable sources of scientific publication, establish the academic basis for the evaluation of new developments, identify the main actors scientists, develop bibliometric indexes to assess academic performance, etc. It is so the popularity and number of these studies has grown significantly, publishing, for example, bibliometric studies focused on journals (see for example, Laengle et al., 2017; Merigó et al., 2015; Valenzuela et al., 2017) and in a wide range of topics that involve innovation (Cancino et al., 2017), family business (Benavides-Velasco et al., 2013; Xi et al., 2015) or international entrepreneurship (Baier-Fuentes et al., 2018), among others.

The first of these articles is presented in chapter 2 of this doctoral thesis. This chapter discusses and analyzes from a wide perspective, all KM literature published in Business and Management journals. This article is relevant, since until now, the KM literature had been analyzed focusing only on the articles published in exclusive journals of the KM field. Finally, it is important to emphasize that chapter 2 were accepted for publication in one important journals indexed in the Web of Science, namely, *Technological and Forecasting Social Change* (Q2:2017).

The second of these bibliometric studies, chapter 3, is analyzed from a retrospective point of view, all the publications made by the main journals of the field KM (Serenko and Bontis, 2017), a namely, *Journal of Knowledge Management*. This journal is relevant and leads this field of research since it contains most of the articles considered to be cited in the KM field (Serenko and Dumay, 2015). This chapter also has been accepted for publication in the *Journal of Knowledge Management* (Q2:2017).

Chapters 4 and 5 are empirical in nature and seek, in the first place, to extend the literature centered on knowledge management and then, contribute to a better understanding of knowledge management from one of the factors that

are supposed to be most influential in KM processes, namely, information and communication technologies (ICTs). In this sense, authors such as Soto-Acosta et al. (2014) or Andreeva and Kianto (2012) have highlighted that ICTs involve several tools, that can support and influence the various KM processes.

The chapter 4 analyzes through two logistic regression models, the influence of information and knowledge deposited on the web and the use of the various Web 2.0 applications on the web positioning of online commercial information providers (OIPs). The objective of these logistic models, is to differentiate impact between the amount of knowledge and web applications, regarding the influence of each knowledge and specific application.

The Chapter 5 focuses on Ibero-American small and medium-sized enterprises (SMEs) and seeks to improve understanding, based on a structural model, of the indirect effects of some business capabilities between ICTs and the performance of SMEs. For this, we focus on the knowledge management capabilities and the external flexibility of the SMEs.

Finally, Chapter 6 of this doctoral thesis presents the main conclusions together with the different implications derived from the four contributions. Lastly, this chapter ends with the future lines of research.

A summary of the articles that make up this thesis are presented below in Table 1.1

Table 1.1. KM references in different areas

	Contribution I	Contribution II	Contribution III	Contribution IV
Contribution Title	**Knowledge management: a global examination based on bibliometric analysis**	**Twenty years of the Journal of Knowledge Management: A bibliometric analysis**	**Ranking Web as indicator of knowledge diffusion: an Application for SMEs**	**The effect of ICT on the results of Ibero-American SMEs: An empirical case of the mediating role of knowledge management, external flexibility and innovation.**
Objective	Present an overview of knowledge management research in the areas of business and management (1961-2015).	Offer a bibliometric analysis of the JKM of its scientific publications in its 20 years (1997-2016) of existence.	Examine the influence on the web positioning of online information providers (OIPs), based on the diversity of knowledge offered to entrepreneurs through platforms, and of the different Web 2.0 applications	Explore the effect of KM mediation between information and communication technology (ICTs) capabilities and the performance of small and medium-sized Ibero-American firms
Approach	Quantitative and Qualitative	Quantitative and Qualitative	Quantitative	Quantitative
Research Methodology	This study used a wide set of references related to the KM field from the Web of Science (WoS). In these registers, were applied bibliometric procedures in different units of analysis, such as authors, journals, universities and countries. This analysis used two main bibliometric methods, namely, performance analysis and science mapping. The performance analysis presents indicators, such as the number of publications, the number of citations, and the h-index as a measure that combines the number of publications and citations. Complementary to this, is presented a science mapping analysis, that included techniques, such as bibliographic coupling, co-citation analysis, and co-occurrence of keywords analysis, among others.	This study used Bibliographic data from database Scopus. Several methodologies are used in bibliometric analysis in order to visualize the qualitative and quantitative. For example; (i) quantity indicators, which measure productivity, (ii) quality indicators, which measure the impact and, (iii) structural indicators, which measure the connections between the various scientific actors. In generally, is includes two procedures: performance analysis and science mapping analysis for to establish a profile of the journal. In the performance analysis, is included indicators as: the number of publications, the number of citations and some thresholds of citations, among other related indicators. The science mapping analysis presents analyses of bibliographic coupling, co-citation, and co-occurrence of key words, through VOSviewer software.	In this study, two logistic models are presented to test the hypothesis. The first evaluates the influence of the amount of knowledge (AK) and Web 2.0 applications (AW) on the Web positioning of the OIPs. The second model aims to analyze the specific influence of each type of knowledge and each of the AW in the Web positioning of OIPs. The sample of the OIPs, was the result of the automation of alerts in three specific search engines (Google, Yahoo and Bing). For this, the following keywords were used: "Information for SMEs and Entrepreneurs", "Knowledge for SMEs and Entrepreneurs", "Support for Entrepreneurs", "ICT for Entrepreneurs", "Free Consulting for Entrepreneurs", "Forum for Entrepreneurs", "Help to Entrepreneurs" and "Online Tools for Entrepreneurs". Subsequently, each of the notifications and its respective links were evaluated to determine whether they corresponded to the purpose of the investigation.	This study used the technique of structural equations of second-order. In this study evaluates the direct relationships from ICTs capabilities on some business capabilities. Additionally, the evaluation of mediation of: the knowledge management (KM), and external flexibility (FE), between ICTs and innovation (NN) results is presented. In the first stage, the first-order factors that constitute ICTs and KM. In the second step is estimated a model that used the factor scores (latent variables scores) calculated in the first step for each of the first-order components. Once the second-order variables were established, the measurement model was estimated.

Findings	KM research in business and management has experienced important growth in recent years. The USA is the leader in KM research and has the best indicators of influence and productivity in all of the dimensions that we analyzed. The UK has also a considerable productivity and influence in the field. However, 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. The analysis about universities, show that Asia have not been able to position themselves strongly in the field. Although there are several influential and renowned Asian researchers in this field. With regard to individual researchers, Nonaka is the most influential researcher in this field of research. This author is considered one of the fathers of knowledge management. Others researchers productive and influential, including Audretsch and Von Krogh.	USA and UK are strongly positioned and leads the publications in the JKM with the highest productivity and influence. At the continental level, Europe is widely dominant in the JKM, with 50% of the most productive and influential universities and authors. In this sense, it is important to highlight the weak productivity of developing countries, such as Latin Americans. In relation to the analysis of the universities, it is observed that Cranfield University is the most productive institution and stands out for publishing in the first issues of the JKM. In this sense, during the last ten years and according to the number of citations and the h-index, Griffith University has become a very influential institution in JKM. As for the authors, Serenko and Bontis are the most productive and influential authors publishing in the journal. The JKM's most cited article is entitled "Motivation and barriers to participation in virtual knowledge-sharing communities of practice", co-authored by Ardichvili, Page and Wentling.	Both models showed support for predict the influence of knowledge variables and Web 2.0 applications on the Web positioning of OIPs. The model 1, indicates that the variables, number of Web 2.0 application (AW) and the number of knowledge (AK) deposited in websites, are positive and significant. The model 2, analyzes the specific influence of each of Web 2.0 application (AW) and the types of knowledge (AK) in the positioning of OIPs in greater detail. This model indicates that not all Web 2.0 applications influence our dependent variable in the same way. Social networks (OSN), for example, do not seem to be relevant in the web positioning of OIPs. However, the variables YouTube (YT), blogs (BG) and forums, were positive and significant. In addition, it was found that the RSS (Really Simple Syndication) variable has a positive and significant relationship at 10%. Finally, our results related to the types of knowledge indicate that the technological knowledge variable (KT) has a positive and significant relationship. However, the variables market knowledge (KM) and knowledge of internationalization (KI) do not influence the positioning of OIPs.	The proposed model show a partial participation of the capacities on the results of the SMEs but without a total effect. For example, the ICTs resource has a direct influence on certain capacities of firms, such as KM and EF. However, the only direct positive relationship between the capabilities of the firm and the performance of the firm is through EF. The impact of ICTs on NN is mainly indirect, through KM and EF. In addition, the results show a nonsignificant relationship between KM and both measures of business performance. In fact, a significant positive relationship was found between KM and performance variables through NN. Although there is a significant and positive relationship between EF and sales growth, it is also observed that EF and nonfinancial performance were not found to be related. In addition, just as with KM, it is observed that EF has a significant relationship with both performance variables, but through NN. Another result that is derived and confirmed from this study is the direct relationship between innovation and business performance variables.
Originality/ Practical implications	This study is one of the few bibliometrics studies of knowledge management focused on the Business and Management area, with performance indicators and mapping of science.	This study is one of the first studies to provide an information base of the literature published in JKM. This work is an acknowledgment to all the researchers who have collaborated in these 20 years of JKM.	This study explores the importance of the internet, Web 2.0 applications, the online knowledge, and, online information providers (OIPs) public and private for SMES. In addition, a model for evaluating some variables that can influence the web positioning of online information providers (OIPs) is proposed.	This study helps to understand the indirect effect of ICTs and the performance of SMEs through KM and FE capabilities. It also proposes a theoretical model, which evaluates an integrating vision of the links between ICT, KM, EF and the performance of SMEs.
Publication status	Paper accepted in the journal *Technological and Forecasting Social Change* (**Q2**) https://doi.org/10.1016/j.techfore.2018.07.006 Document presented at the XXVII conference *ACEDE* (Asociación Científica de Economía y Dirección de Empresa) 2017.	Paper accepted in the *Journal of Knowledge Management* (**Q2**) Vol. 22, Issue: 8, pp. 1655-1687, https://doi.org/10.1108/JKM-10-2017-0497	Document accepted and presented at the XXX Annual conference *AEDEM* (European Academy of Management and Business Economics) 2016 Document submitted to journal	Document submitted to journal

Source: Own Elaboration

Chapter 2

Knowledge management: a global examination based on bibliometric analysis

2.1. Introduction

Based on the assertion of the important role of knowledge in the development of business economics and productivity (Polanyi 1967; Drucker 1968), 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

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). Figure 2.1 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).

Figure 2.1. Important steps on the development of knowledge management

First Generation   Second Generation   Third Generation   Fourth Generation

1960s   **90's decade**   **2000's decade**   **2010's decade**

Drucker and Polanyi (1968) link the role of knowledge to economics

The most influential documents emerge in the KM field: Nonaka (1994), Kogut and Zander (1992), Grant (1996)

Some exclusive journal from the KM field appear: Learning Organization (1994), Journal of Knowledge Management (1997)

The first organizations and collaboration networks focused on the KM field emerge: International Forum on Knowledge Asset Dynamics (IFKAD), European Conference on Knowledge Management (ECKM), International Association for Knowledge Management (IAKM), Association for Knowledge Management in Society and Organizations (AGecSO),

The researchers are expected to address the complexities of the KM domain (Serenko and Bontis, 2013).

1975

1994-1996

First Thinkers Machlup (1962), Polanyi (1967), Drucker (1968), Bell (1973),

The most influential Books emerge in the KM field: Nonaka and Takeuchi (1995), Davenport and Prusak (1998)

Other specialized journals in the KM field appear: Journal of Intellectual Capital (2000), Knowledge Management Research and Practice (2003), International Journal of Knowledge Management (2005)

KM's role is identified more as a social process than a management engineering method (Tzortzaki and Mihiotis, 2014; Khasseh and Mokhtarpout 2016)

In the journal "Public Administration Review", the Knowledge Management concept emerges

In this stage, Knowledge is defined as a tool (Arbonies 2001)

In this stage, Knowledge is defined as process (Arbonies 2001)

KM's role is linked to the success of organizations (Arbonies 2001)

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-Marín 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 1983-2005. 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.

2.2. 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 (2017), the WoS contains more than 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; Ikujirō 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 Wigg (1997, 1993) and Alavi (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 (see Figure 2.2). 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).

Figure 2.2. Units analysis of knowledge management
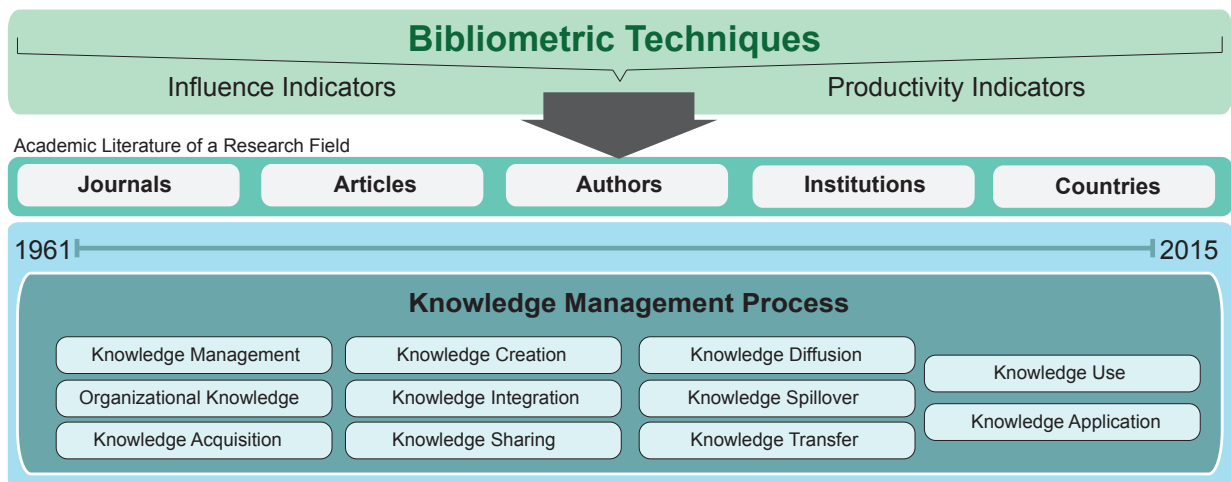
Based on these criteria, 42,795 bibliographical references were obtained. It is important to note that the most productive areas in this field are computer science (with 16,120 documents, representing 37.66% of the overall results) and business economics (with 13,166 documents, representing 30.76% of 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 6,155 studies. In any case, to show the updated global volume of studies focused on KM available in the WOS by research areas, Table 2.1 is presented. It should be noted that the results may vary over time (Cobo et al., 2011a).

Table 2.1. KM references in different areas

	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	16753		Business Economics	7502
2	Business economics	13537		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

Source: Based on WoS 2017. Note that the acronyms of all the indicators are defined in Appendix 1.

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 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

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[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."

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 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.

2.3. Results

2.3.1. 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 (see Table 2.19).

2.3.1.1. Publications and citations in KM research

First, we show the general aspects of the KM research field. Figure 2.1 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, 6,155 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 Figure 2.3, 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 2.4).

Figure 2.3. Number of publications on knowledge management
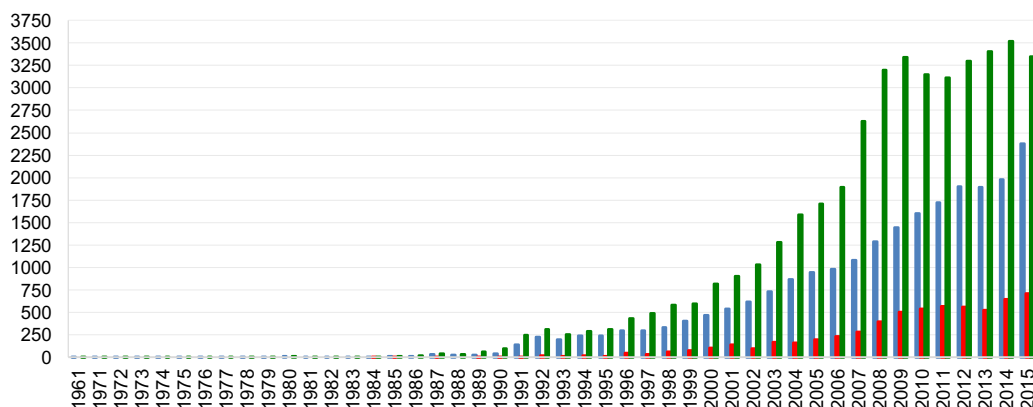
Another way of analyzing the evolution of KM publications is according to the productivity ratio, which is specific to the various research areas. As discussed, our study analyzes academic publications framed in the areas of business and management. The ratio of publications in these areas has increased significantly, demonstrating the transversality and importance that KM offers to other scientific disciplines.

Table 2.2. Evolution of research in the area of business and management

	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	16355	4975	3	33,3%
		23128	6155		100%

Source: Own elaboration based on WoS 2015

According to Table 2.2., 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 2.3 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 2.3 shows that only 3 articles have received more than 3,000 citations, 5.09% of articles have received equal to or more than 100 citations, and 75.5% of articles have received fewer than 25 citations.

Table 2.3. General citation structure by generation of knowledge management research in WoS

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	5,737	6,155	100%

Source: Own elaboration based on WoS 2015

2.3.1.2. 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 field, Table 2.4 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 2.4, 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 more than 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 more than 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 5,000 citations. Those journals include *RPC, JIBS, JMS, MSC* and *MISQ.* All of the journals mentioned above have a fairly strong orientation towards 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).

Table 2.4. The most productive journals in KM research

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	21748	15423	120,49	8,61	8	11	21	19	69	10	3,36	6,137
7	SMJ	110	54	2323	20930	13580	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	1,67
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	15843	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

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 towards 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, 4,142 KM publications were analyzed, which corresponds to 67.3% of all KM publications. These classifications are presented in Table 2.5. 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

31

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 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).

Table 2.5. Temporal evolution by quinquenniums and journals in the KM field.

R	Journal	HKM	TPKM	TCKM	Q5	Q4	Q3	Q2	Q1	OY	JGT
1	JKM	24	404	3052	284	120	-	-	-	-	MPRJ
2	IJTM	21	247	1938	39	103	54	50	1	-	
3	KMRP	15	242	932	152	90	-	-	-	-	
1	OSC	57	128	21748	51	37	28	8	4	-	TMGJ
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	-	-	
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	-	INNJ
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	
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	ISYS
2	JMIS	27	64	3675	18	20	22	4	-	-	
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	-	-	HRJ
2	IJHRM	19	83	1339	38	29	13	3	-	-	
3	HRM	16	38	602	18	18	2	-	-	-	
1	LRP	23	45	2296	14	7	11	12	1	-	OPJ
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	-	-	-	-	
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	-	-	-	-	

Source: Elaborated based on WoS 2015. The abbreviated name of the journal is in table 2.4.

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 2.6.

Table 2.6. Bibliometric indicators by groups of journals

R	JGT	TPKM	HKM	TC
1	MPRJ	893	34	6045
2	INNJ	225	71	20372
3	TMGJ	128	140	81636
4	ISYS	107	54	9546
5	OPJ	45	63	17611
6	HRJ	39	35	3222

Source: Elaborated based on WoS 2015.

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

2.3.1.3. 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 2.7.

Table 2.7. The 50 most influential articles in knowledge management research

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	MISQ	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

R	Title	Authors	J	YP	TC	TCKM	C/Y
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

Source: Elaborated based on WoS 2015. J, abbreviated journal names are found in Table 2.4, 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.

According to Table 2.7, the three most cited and influential articles exceed the threshold of 3,000 citations (Nonaka 1994; Kogut & Zander 1993; Grant 1996). 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 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).

2.3.1.4. 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 2.8 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 2.8 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 & 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 2.8 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 (7,518) 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 3,417 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 2.9 is presented. To perform this analysis, the same groups of journals are used as were used for the analysis presented in Table 2.5.

Table 2.8. The most productive and influential authors in KM research

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	13707	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	-

Source: *Elaborated based on WoS 2015.*

Table 2.9. Most productive authors in the most productive journals grouped by topic

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	2	47 Authors	4	40 Authors	3	3 Authors	2	12 Authors	4

Source: Elaborated based on WoS 2015.

According to Table 2.9, 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 2.10, 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.

Table 2.10. Temporal evolution by quinquennium and authors in the KM field

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	-	-

Source: *Elaborated based on WoS 2015.*

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

2.3.1.5. 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 2.11 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.

Table 2.11. The 50 most productive and influential institutions in KM research

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

According to Table 2.11, 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 they have more than 5,000 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 more than 120 citations.

Harvard University, the University of Texas Austin and INSEAD Business School have more than 4,000 citations, and the average number of citations per article is more than 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 more than 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 2.4. Therefore, the 30 major institutions in KM research are presented in Table 2.12.

According to Table 2.12, 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 2.13. 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.

Table 2.12. The 30 most productive institutions in the 50 most productive journals grouped by theme

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

Table 2.13. Temporal evolution by quinquenniums and institutions in the KM field

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	-

2.3.1.6. 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 2.14 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.

Table 2.14. The 50 most productive and influential countries in KM research

R	Country	HKM	TCKM	TPKM	PCKM	ACKM	T50	≥500	≥200	≥100	≥50	<50	TPKM/PMH	TCKM/PMH
1	USA	161	113564	2060	55,13	4167	39	36	84	115	217	1608	6,41	353,12
2	UK	75	21794	928	23,48	17289	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

Source: Elaborated based on WoS 2015 and datos.bancomundial.org /Jun/2016

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 more than 2,000 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 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 2.15.

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.

Table 2.15. *Most productive countries in the 50 most productive journals grouped by theme*

R	JKM Country	P	KMRP Country	P	IJTM Country	P	TMGJ Country	P	INNJ Country	P	ISYS Country	P	HRJ Country	P	OPJ 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	Norway	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

Finally, to provide a more global picture in terms of productivity per country, Table 2.16 presents the ranking of countries and their evolution over time in terms of their academic production. The ranking is ordered based on the same criteria used previously.

Table 2.16. Temporal evolution by quinquenniums and country in the KM field

R	COUNTRY	HKM	TCKM	TPKM	Q5	Q4	Q3	Q2	Q1	OY
1	USA	161	113564	2060	814	665	344	179	51	7
2	UK	75	21794	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	-	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	-	-	-	-

Source: *Elaborated based on WoS 2015.*

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.

2.3.2. Science mapping of the KM research

The previous section presents a fairly comprehensive performance 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 2.17.

Table 2.17. Most cited documents among papers published on KM field

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. 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
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

Source: *Elaborated based on WoS 2015.* ***Abbreviation****: A: Article, B: Book*

The most cited reference in KM research is that of Cohen (1990) and the book of Nonaka (1995). Note that these data complement the results provided in Table 2.7. Additionally, Table 2.18 presents other books that were highly cited in KM research.

Table 2.18. Most cited books among papers published on KM field

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

Source: *Elaborated based on WoS 2015.*

Another interesting unit to analyze co-citations is through journals. Co-citation of journals (McCain, 1991) seeks to identify journals that are frequently cited. Figure 2.4 presents information supporting this analysis, which is performed using a threshold of eight hundred citations and one hundred most representative connections.

Figure 2.4. Mapping of co-citation of journals
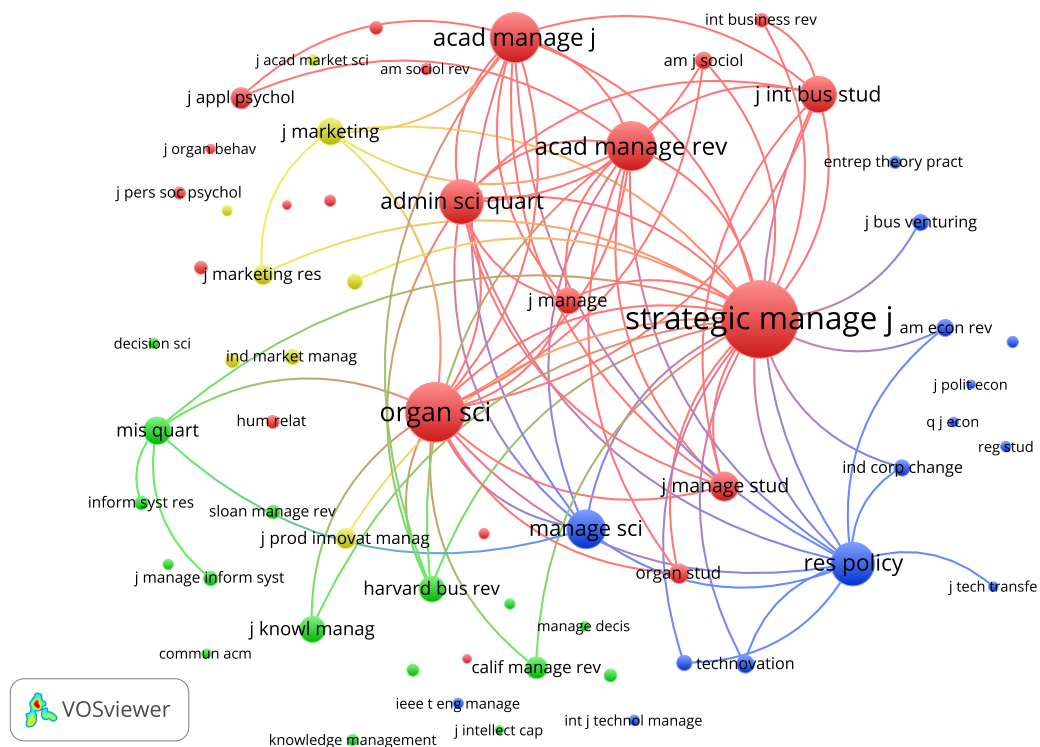
Observe that the most relevant journals in KM research have an orientation on the field of management. The centrality of the SMJ and OSC spheres indicates that they are the journals that lead KM research, and therefore, they possess a wide network of connections. Finally, keep in mind that this result is consistent with the results presented in Table 2.4.

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. Figure 2.5, which presents the results of this analysis, is developed with a threshold of four hundred citations and the one hundred most representative connections.

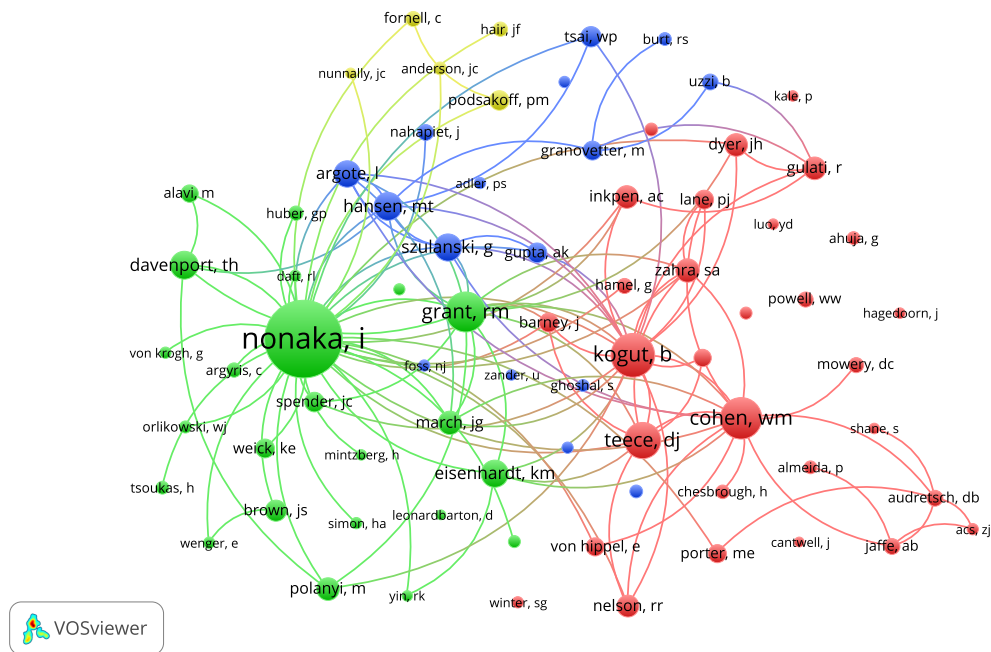*Figure 2.5. Mapping of co-citation of authors*

Figure 2.5 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 2.18.

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.

Figure 2.6 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.

Figure 2.6. Mapping of co-occurrences of keywords (1961-2015)
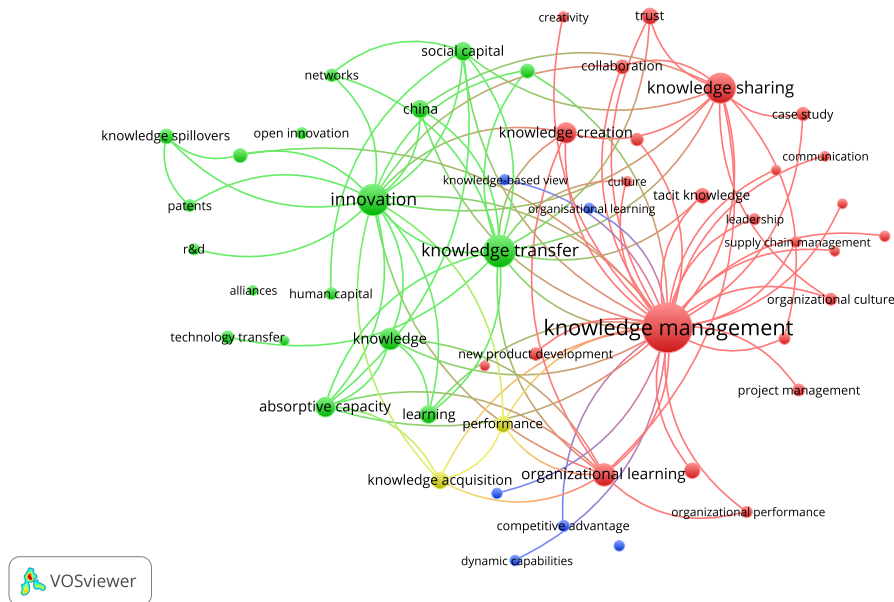
There is a great diversity of concepts, among which knowledge management, knowledge transfer, knowledge sharing, innovation, and organizational learning are the words most frequently used in the field. To observe how the use of these keywords evolves over time, Figures 2.7, 2.8 and 2.9 present the co-occurrences 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.

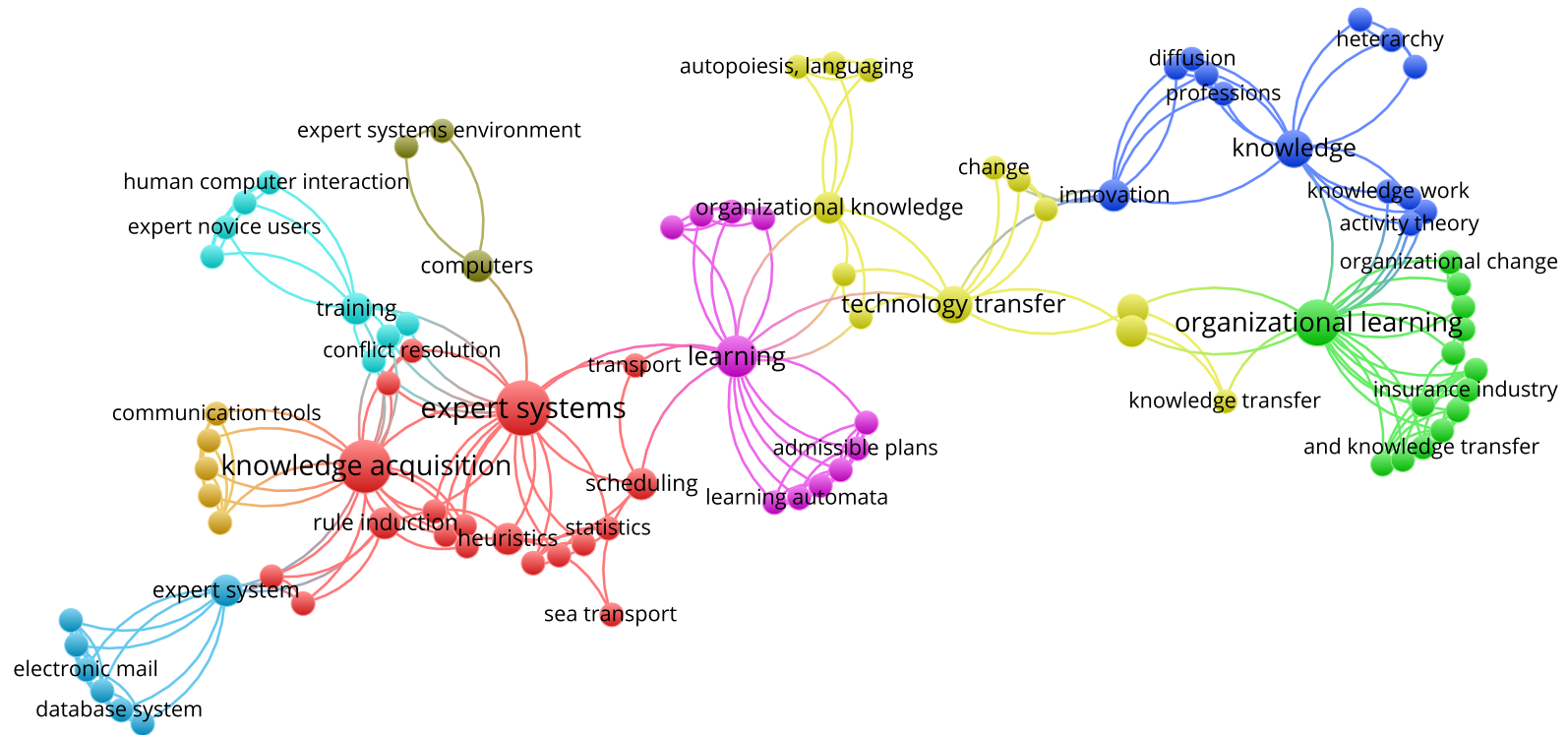*Figure 2.7. Mapping of co-occurrences of keywords (1985-1995)*

autopoiesis, languaging

heterarchy

diffusion

professions

knowledge

change

innovation

knowledge work

activity theory

expert systems environment

organizational knowledge

organizational change

human computer interaction

technology transfer

organizational learning

expert novice users

computers

insurance industry

training

knowledge transfer

and knowledge transfer

conflict resolution

transport

learning

communication tools

expert systems

admissible plans

knowledge acquisition

scheduling

learning automata

rule induction

statistics

heuristics

expert system

sea transport

electronic mail

database system

VOSviewer

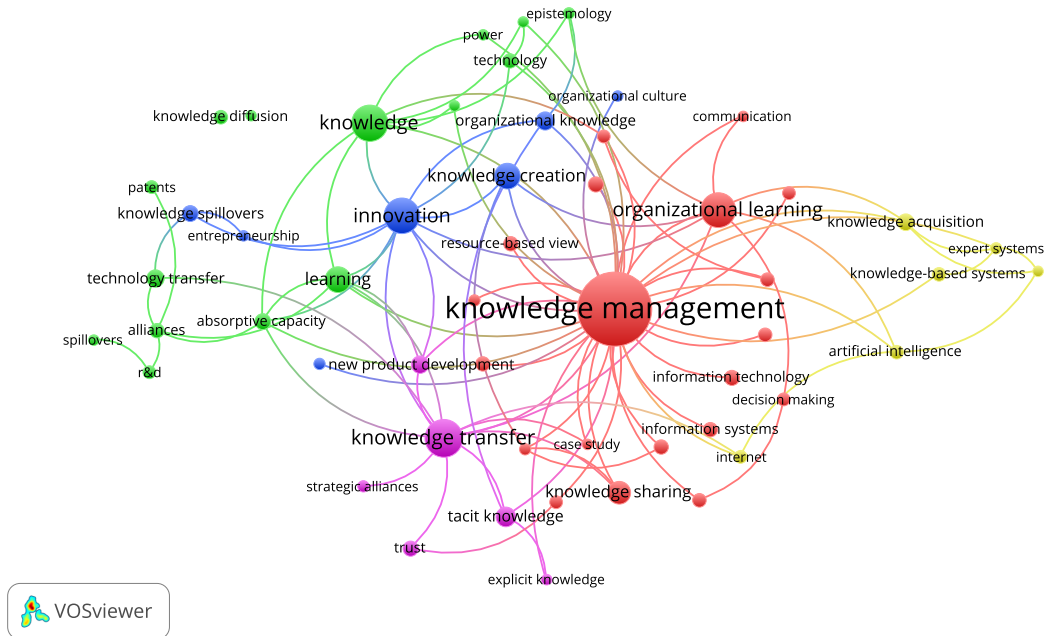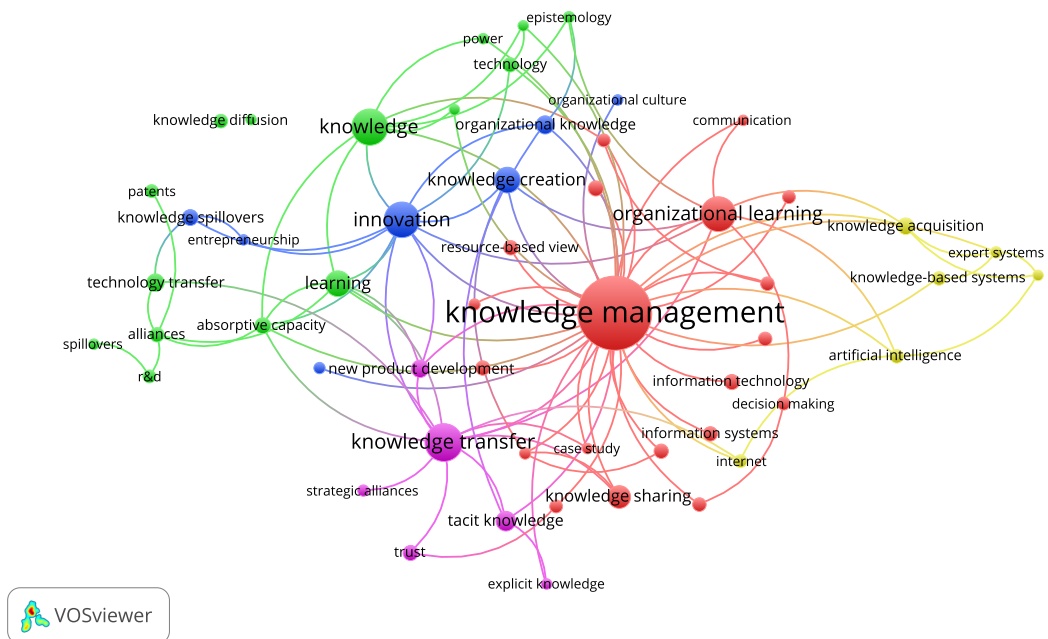*Figure 2.8. Mapping of co-occurrences of keywords (1996-2005)*

Figure 2.9. Mapping of co-occurrences of keywords (2006-2015)

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 Figures 2.8 and 2.9).

2.4. 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 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 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 *MISQ*.

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.

Appendix

Table 2.19. 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 classified 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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Chapter 3

Twenty years of the Journal of Knowledge Management: A bibliometric analysis

3.1. Introduction

Several researchers already affirmed in the 1960s that knowledge would have a key role in both economic development and enterprise productivity (Drucker, 1968; Polanyi, 1966). Currently, thousands of studies have been developed around this concept. Knowledge management (KM) is one of the most discussed topics and has become a topic of general interest in several disciplines related to management, such as the management of information resources (Nissen et al., 2000), human resources (Rastogi, 2000; Wang and Ariguzo, 2004), entrepreneurship and family business (Centobelli et al., 2017; Scuotto et al., 2017), innovation (Bai and Yu, 2017), international business (Kasper et al., 2013), among others. In addition, KM has captured the attention of professionals who implement its fundamental concepts (Serenko et al., 2011) and of researchers and academics who see the potential of this field to unify various disciplines (Holsapple and Wu, 2008).

As a result of the growing attention and importance generated by KM at both the academic and business levels during the last several decades, the "Journal of Knowledge Management" (hereafter JKM) was introduced in 1997. The JKM is a journal interested in the publication of academic research and practical information dealing with best practices regarding all aspects related to KM in organizations. Likewise, one of its main objectives is to identify innovative KM strategies and theoretical and practical framework concepts that could be implemented in real-world situations. JKM publications include quantitative and qualitative research that through extensive studies and/or academic case studies in companies, government agencies and other organizations, show how to develop strategies, tools, techniques and technologies to successfully apply KM in organizations (Soto-Acosta and Cegarra-Navarro, 2016). In addition, the journal is devoted to analysing KM as a firm capability capable of enhancing organizational learning and innovation (Del Giudice and Della Peruta, 2016; Martinez-Conesa et al., 2017).

The first issue of the JKM was published in 1997 under the direction of the founding editor Dr. Rory Chase. Professor Dr. Elias G. Carayannis also served as the editor in chief, and Professor Dr. Manlio del Guidice was recently appointed as the current editor in chief. Since its early beginnings

and under the direction of the different editors, the JKM has had remarkable growth and development, publishing more than 100 issues, 19 of which have been special issues. In addition, the JKM has been indexed in all the major bibliographic databases, including Scopus, since 1997, and more recently and importantly, since 2011, it has been indexed by the Web of Science's Journal Citation Report (JCR). The JKM's JCR impact factor (IF, hereafter) has been growing, and in 2016, it reached its highest IF since it was first indexed in the Web of Science, being ranked 82nd of 193 journals in the subject category of management. This growth has allowed the JKM to position itself as the main journal in the field of KM (Serenko and Bontis, 2017).

In 2016, JKM celebrates its twentieth anniversary. In these instances, it is very common to develop commemorative activities that include the organization of an editorial (Barley, 2016), a review (Van Fleet, 2006) or a special issue (Meyer and Winer, 2014). Schwert (1993) emphasizes the importance of making a bibliometric description of the journal because it provides general historical results that allow the development of a critical evaluation of its impact and evolution. Therefore, the main objective of this study is to offer a bibliometric analysis of the JKM, which will enable us to observe in detail the evolution of its scientific publications. This will allow us to answer the following questions: (1). What are the total number of publications in JKM? (2). What are the core JKM articles? (3) Who are the main researchers, universities, and countries in JKM? (4). What are the core journals used in JKM? (5). What is the affiliations of researchers? (6). What are the topics main in articles of JKM? (7) What are the structural networks among the actors who publish in JKM?

To achieve this goal and answer the previous questions, this work is based on two bibliometric procedures that include a performance analysis and a scientific mapping analysis. The first one is based on the analysis of productivity and influence indicators, such as the number of documents published and citations. Although the *h*-index is also used, which is a composite indicator that seeks to balance the productivity and influence of scientific actors (Hirsch, 2005). The second of them - the science mapping analysis - is carried out through the VOSviewer software (van Eck and Waltman, 2010), which includes bibliographic coupling (Kessler, 1963),

co-citation analysis (Small, 1973), citation, co-authorship and co-occurrence of keywords. This type of analysis is novel and important since it has not been used previously in the JKM, and it will give a comprehensive overview of the journal's main research trends.

The specific analysis of journals through bibliometric methodologies is currently gaining attention among scientific journals. In fact, recently, several bibliometric studies analysing the specific repositories of several journals have been published. For example, *Technovation* (García-Merino et al., 2006) and *Knowledge-Based Systems* (Cobo et al., 2015) published a bibliometric analysis for their twenty-fifth anniversary. Similarly, *Knowledge Management Research and Practice* did so for its tenth anniversary (Walter and Ribière, 2013). Other journals, such as *International Journal of Intelligent Systems* (Merigó et al., 2017) and *Journal of Business & Industrial Marketing* (Valenzuela et al., 2017), included bibliometric studies for their thirtieth anniversary, while still others, such as *Computers & Industrial Engineering* (Cancino et al., 2017) and *European Journal of Operational Research* (Laengle et al., 2017), did so for their fortieth anniversary. Thus, many research journals are celebrating their anniversaries by publishing bibliometric analyses to present an overview of their research trends and more influential publications.

The rest of this paper is organized as follows. In the second section, this work presents the methodology. The third section presents the results of the bibliometric analysis. The fourth section shows the graphical analysis. Finally, in the fifth section, the article analyses the conclusions and limitations of the study.

3.2. Methodology

Several years ago, data collection and bibliometric analysis processes were performed manually (Garfield, 1955). However, currently, these processes have been facilitated thanks to the development of information and communication technologies (Merigó, Gil-Lafuente, et al., 2015). These technologies have also contributed to the development of some methodologies for the analysis of scientific databases, such as

scientometrics (Pritchard, 1969), bibliometrics (Yoon and Lee, 2012), and/or the quantitative study of library materials (Bonilla et al., 2015; Broadus, 1987; Small, 1973).

Bibliometrics help to explore, organize and analyze large amounts of data (Daim et al., 2006). According to Albort-Moran et al. (2017), the bibliometric analyses will make it possible to know the past, understand the advances of the investigations, although, at the same time, allows the development of future lines of research through its indicators (Cadavid-Higuita et al., 2012). The above particularities have promoted the use of bibliometrics in different disciplines. In fact, there are several areas of business and management that have particularly been studied from this perspective, such as management (Podsakoff et al., 2008), social entrepreneurship (Rey-Martí et al., 2016), international entrepreneurship (Baier-Fuentes et al., 2018), business incubator (Albort-Morant and Ribeiro-Soriano, 2016) or knowledge management (Gaviria-Marin et al., 2018), among several others. In addition, this methodology has been applied to other research areas, such as education (Diem and Wolter, 2013) and medicine (Franks et al., 2006). Moreover, to provide an overview of their publications, several journals have recently decided to apply this methodology. Among others, we can mention the *Journal of Business Research* (Merigó, Mas-Tur, et al., 2015), the *European Journal of Marketing* (Martínez-López et al., 2018), the *International Journal of Physical Distribution & Logistics Management* (Ellinger and Chapman, 2016), the *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems* (Wang et al., 2018) or *Information Sciences* (Merigó et al., 2018).

Several methodologies are used in bibliometric analysis in order to visualize the qualitative and quantitative changes in a specific research field. For example, Durieux and Gevenois (2010), mention that bibliometrics involves, (i) quantity indicators, which measure productivity, (ii) quality indicators, which measure the impact and, (iii) structural indicators, which measure the connections between the various scientific actors. Likewise, Cobo et al. (2011), notes that bibliometrics usually includes two procedures: performance analysis and science mapping analysis. The first of these procedures aims to evaluate different groups of scientific actors, such as

countries, universities and authors, by measuring the productivity and impact of their scientific activity. The science mapping analysis focuses on showing the structural and dynamic patterns of scientific research (Börner et al., 2003). According to Barabási et al (2002), the structural indicators allow to observe the formation and evolution of the relations between the diverse actors of a determined scientific body. In summary, bibliometrics has the ability to establish a complete profile of a specific field of study or journal.

In this study, we show an overview of JKM trends, through a bibliometric analysis that includes performance analysis and science mapping. In the performance analysis, included indicators that measure both scientific productivity and the influence of a field of knowledge are included (Garfield, 1955). Note that this is consistent with that described by Durieux and Gevenois (2010). Specifically, we used the number of publications, the number of citations and some thresholds of citations, among other related indicators (Merigó, Gil-Lafuente, et al., 2015; Merigó, Mas-Tur, et al., 2015). In addition, we use the *h*-index that combines into a single indicator of the number of publications and the number of citations[2]. This indicator has become very popular among researchers given its ease of calculation and interpretation (Thelwall, 2008). In this sense, Vanclay (2007) points out that the *h*-index is a robust indicator that is insensitive to a set of poorly cited papers, and therefore represents quite well the performance of a scientific field. In this manner, for an analysis unit that has an *h*-index equal to N, it means that it has N documents cited at least N times (Hirsch, 2005). For example, if an author has an *h*-index of 20, then the author has 20 documents that received at least 20 citations. In summary, keep in mind that the indicators described are very popular among researchers.

This work also presents a science mapping analysis of the JKM bibliographic material. This type of analysis is conducted by using various types of software. Among them we can mention, for example, CitNetExplorer (van Eck and Waltman, 2014), SciMAT (Cobo et al., 2012), Bibexcel (Persson et al., 2009), CiteSpace (Chen, 2006) or VOSviewer (van

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[2] The original definition of the *h*-index, 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 ≤ *h* citations each."

Eck and Waltman, 2010). In this study VOSviewer software was used. This software combines visualization techniques and clustering, which enables the completion of different analyses: bibliographic coupling (Kessler, 1963), co-citation (Small, 1973) and co-occurrence of key words. Bibliographic coupling occurs when two documents cite the same third article; co-citation measures the most cited documents by taking into account when two documents receive a citation of the same third work, whereas co-occurrence of keywords or a co-occurrence network refers to the group of keywords that co-occur in at least two different articles over a period of time with the aim of analysing the most used keywords in the documents (Li et al., 2017). In addition, in some studies, co-citation and co-occurrence analysis are used in a longitudinal framework in order to analyse and follow the evolution of a field of research over consecutive periods of time (Garfield, 1994). Finally, it is important to point that there are other types of analyses, such as the analysis of co-words, which maps the force of association between the elements of information in the textual data, which can be thematic, semantic, conceptual or cognitive (Callon et al., 1983).

Bibliographic data may be obtained from various databases, including SciELO, Google Scholar, Scopus or Web of Science (WoS), since they have the capacity to compile large-scale data and produce statistics based on bibliometric indicators (Archambault et al., 2009). Recently, Scopus has become a good alternative to WoS (Vieira and Gomes, 2009), as it has been designed for bibliographic searches and analysis of citations (Meho and Yang, 2007), enabling it to perform the same search tasks as WoS. In fact, Scopus contains over 69 million records, including approximately 22,000 journals, of which almost 3,500 are freely accessible, as well as over 560 book series, 280 business journals, over 150,000 books and nearly 8 million conference papers pertaining to 100,000 worldwide events (Scopus, 2017). In addition, some researchers have noted that the strength of this database is related to its extensive coverage regarding social sciences research (Mongeon and Paul-Hus, 2016). Although these reasons seem to be sufficient to work with only Scopus references, the process of searching JKM records was performed using both WoS and Scopus databases. However, we realized that WoS only contains JKM records since the year 2011, while Scopus, in contrast, contained bibliographic records since the

journal's creation in 1997. Therefore, the data used in this study were mainly obtained from the Scopus database.

Once we defined the database, it was considered "*Journal of Knowledge Management*" as the only keyword, in order to obtain the bibliographic records of JKM. Additionally, a publication period between 1997 and 2016 and only articles, reviews, notes and letters were included in order to focus on scientific contributions (Merigó et al., 2016). As a result of this process, the search query yielded a sample of 1068 documents.

3.3. Results

3.3.1. Performance analysis

3.3.1.1. Publication and citation structure of JKM

The JKM celebrates 20 years of publishing documents related to all aspects of KM in organizations. The journal was launched in 1997 and presented 4 issues in its first volume. In subsequent years, the number of issues per volume was variable. However, since 2004, the JKM has been publishing six issues per volume annually. Throughout its existence, the JKM has followed the methodology of peer-reviewed evaluation for its research output. These editorial policies have allowed it to position itself as the leading journal in the field of knowledge management, also increasing the number of publications (see Figure 3.1).

In addition, Table 3.1 shows the JKM's progress in relation to the annual and cumulative productivity of the papers and published issues. Additionally, this table makes a comparison of productivity between the two decades of its existence. It is observed that during the first decade (1997-2006), 415 documents were published, while in the second decade (2007-2016), the output was 653 documents. This difference represents an increase of 238 publications (22.4%). It can be observed that the years 2008 and 2009 represent the peak of JKM publications, with more than 70 articles, whereas the year 2016 represents an important moment for the journal, as it exceeded 1000 publications. In total, 20 volumes and 106 numbers containing 1068 documents (964 articles, 104 reviews) have been

published in the JKM thus far. Note that Table 3.1 indicates the amount of issues with the respective number of papers by each of them.

Figure 3.1. Number of JKM publications by year
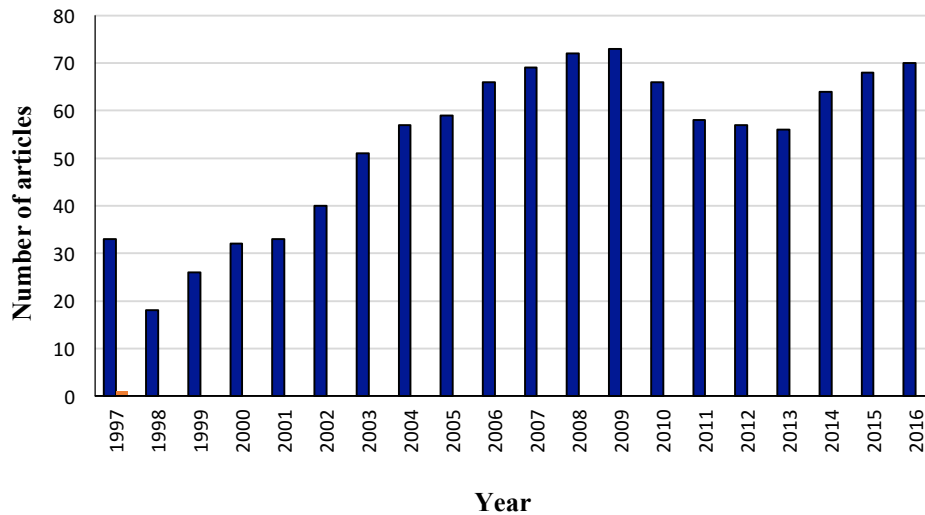
Table 3.1. Annual productivity of the JKM

Period		Volume	Issue						TP	AP	TI	AI
			(1)	(2)	(3)	(4)	(5)	(6)				
Decade 1	1997	Vol 1	9	8	8	8			33	33	4	4
	1998	Vol 2	9	9					18	51	2	6
	1999	Vol 3	8	6	5	7			26	77	4	10
	2000	Vol 4	7	8	8	9			32	109	4	14
	2001	Vol 5	10	7	7	9			33	142	4	18
	2002	Vol 6	8	8	8	7	9		40	182	5	23
	2003	Vol 7	9	10	10	11	11		51	233	5	28
	2004	Vol 8	10	10	10	8	9	10	57	290	6	34
	2005	Vol 9	10	10	10	10	9	10	59	349	6	40
	2006	Vol 10	11	9	11	12	14	9	66	415	6	46
Decade 2	2007	Vol 11	12	9	11	13	13	11	69	484	6	52
	2008	Vol 12	12	12	12	12	14	10	72	556	6	58
	2009	Vol 13	13	9	12	14	13	12	73	629	6	64
	2010	Vol 14	12	11	10	7	9	17	66	695	6	70
	2011	Vol 15	10	10	10	8	9	11	58	753	6	76
	2012	Vol 16	10	10	8	11	10	8	57	810	6	82
	2013	Vol 17	9	10	9	9	9	10	56	866	6	88
	2014	Vol 18	12	12	8	10	13	9	64	930	6	94
	2015	Vol 19	10	13	12	10	13	10	68	998	6	100
	2016	Vol 20	9	11	11	12	15	12	70	1068	6	106

Source: Webpage of JKM; Abbreviations: TP: total papers; AP: accumulated publications; TI: total issues; AI: accumulated issues. Note: the issue column (N), shows the number of papers by issue.

The JKM has a high number of citations, reaching a total of 23,669 citations (see Table 3.2). In this sense, the year 2005 is one of the most important for several reasons. First, the JKM obtained the maximum number of cites per year in 2005, with 3,359 citations. This figure corresponds to 14.2% of the journal's total number of citations. Second, as a consequence, the citations per paper (TC/TP) of the journal in that year accounted for 56,9. Third, the highest *h*-index in the history of the JKM (*h*-index = 32) was reached in 2005. Remember that the h-index seeks to represent in a single indicator both the productivity and influence of a scientific actor in a given scientific field (Alonso et al., 2009).

Table 3.2. Annual citation structure of the JKM

YEAR	TP	TC	≥200	≥100	≥50	≥20	≥10	≥5	≥1	=0	H	TC/TP	IF
1997	33	313	-	1	2	1	4	12	7	6	7	9,48	-
1998	18	248	-	1	-	1	4	2	8	2	7	13,78	-
1999	26	569	-	1	3	2	8	3	6	3	12	21,88	-
2000	32	526	-	1	-	8	3	8	10	2	11	16,44	-
2001	33	937	1	-	3	4	3	11	8	3	11	28,39	-
2002	40	777	1	-	1	5	9	12	9	3	13	19,43	-
2003	51	1012	-	1	5	8	10	8	17	2	16	19,84	-
2004	57	1009	-	2	4	6	6	16	20	3	13	17,70	-
2005	59	3359	3	5	13	24	10	1	3	-	32	56,93	-
2006	66	2002	1	1	11	18	14	11	6	4	25	30,33	-
2007	69	2265	2	1	11	21	15	13	2	4	28	32,83	-
2008	72	1874	-	1	7	24	25	11	3	1	26	26,03	-
2009	73	2380	1	4	10	16	24	12	5	1	25	32,60	-
2010	66	1677	-	1	8	25	14	12	6	-	26	25,41	-
2011	58	1543	-	-	7	26	14	10	1	-	25	26,60	1,248
2012	57	1224	-	1	1	26	16	7	6	-	23	21,47	1,474
2013	56	1016	-	-	4	14	21	11	5	1	19	18,14	1,257
2014	64	461	-	-	-	2	17	19	24	2	12	7,20	1,586
2015	68	359	-	-	-	1	11	20	33	3	11	5,28	1,689
2016	70	118	-	-	-	-	-	4	43	23	4	1,69	2,053
Total	1068	23669	9	21	90	232	228	203	222	63	-	-	-
Percentage papers	100%	-	0,84%	1,97%	8,43%	21,72%	21,35%	19,01%	20,79%	5,90%	-	-	-
Accumulated papers	-	-	9	30	120	352	580	783	1005	1068	-	-	-
Percentage Accumulated papers	100%	-	0,84%	2,81%	11,24%	32,96%	54,31%	73,31%	94,10%	100%	-	-	-

Abbreviations: TP and TC: total papers and citations; ≥200, ≥100, ≥50, ≥20, ≥10, ≥5, and ≥1: number of papers with equal or more than 200, 100, 50, 20, 10, 5, 1 and 0 citations (without accumulating documents from previous thresholds); H = *h*-index; TC/TP: number the citations per paper; IF: impact factor of the Journal Citation Reports.

In the JKM case, the interpretation of the *h*-index, corresponding to the year 2005, means that 32 papers published that year received at least 32 citations. Moreover, 2005 is the first year that the JKM published two special issues. With regard to the citation threshold for the total published papers, 120 documents (11.23%) received at least 50 citations. Additionally, 460 documents (43%) achieved between 10 and 49 citations, while 425

documents (39.8%) obtained between 1 and 9 citations. Finally, 63 documents (5.9%) did not receive citations. it is noteworthy that 23 of these documents (2.2%) correspond to recently published documents in 2016.

Table 3.3. explains in detail the number of authors per document and year published in the JKM. Note that there is a positive trend towards collaboration between researchers who publish in the JKM (see ACR indicator). In the last row, the average number of authors per paper is indicated. Note that 31.6% of the published documents are of individual authorship. It is also observed that the normal trend for this journal is that documents are written by two or three co-authors (33.9% and 23.9%, respectively).

Table 3.3. Total authors per paper

Year	TP	Number of Researchers								CR	TAY	ACR
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8-10**			
1997	33	23	6	1	2	1	-	-	-	10	47	2,40
1998	18	11	6	1		-	-	-	-	7	26	2,14
1999	26	15	7	2	1	1	-	-	-	11	44	2,64
2000	32	17	11	4		-	-	-	-	15	49	2,13
2001	33	14	10	7	1	-	1	-	-	19	65	2,68
2002	40	23	11	4	2	-	-	-	-	17	65	2,47
2003	51	18	19	10	4	-	-	-	-	33	110	2,79
2004	57	22	20	9	4	2	-	-	-	35	137	3,29
2005	59	20	19	9	5	3	2	1	1	39	137	3,00
2006	66	20	24	13	6	3	-	-	-	46	141	2,63
2007	69	29	16	19	4	1	-	-	-	40	135	2,65
2008	72	26	25	14	3	3	1	-	-	46	149	2,67
2009	73	21	23	24	5	-	-	-	-	52	156	2,60
2010	66	16	31	12	5	1	1	-	-	50	140	2,48
2011	58	10	21	22	5	-	-	-	-	48	137	2,65
2012	57	10	18	24	5	-	-	-	-	47	132	2,60
2013	56	10	21	21	3	1	-	-	-	46	128	2,57
2014	64	11	23	19	8	3	-	-	-	53	151	2,64
2015	68	10	27	22	8	-	1	-	-	58	160	2,59
2016	70	12	24	19	9	5	1	-	-	58	160	2,55
Total	1068	338	362	256	80	24	7	1	1	730	2269	
Average		31,6	33,9	23,9	7,5	2,2	0,7	0,1	0,1			

Abbreviations available in Table 3.1, except for CR: research with co-authorship (sum of papers with two or more researchers, does not include singles authors); TAY: total authors by years in JKM; ACR: Average number of authors per year in manuscript with coauthored

Usually, the number of citations is used to provide an overview of the most influential research. The number of citations represents the popularity and influence of each article in the scientific community (Merigó et al. 2017). However, it should be mentioned that this analysis may have some biases since the motivations for citing a document are diverse (Krampen et al., 2007). Table 3.4 shows the 50 most cited JKM publications. Note that in

case of a tie in the number of citations, the most recent document appears first.

The most cited work of the JKM is the one written by Ardichvili, Page and Wentling (2003), which was cited more than six hundred times. Another important issue is that the three items best positioned in this ranking focus on barriers to sharing knowledge in different organizational contexts. For example, Ardichvili et al (2003) develop an empirical study focused on personal motivations to participate in a virtual organizational environment. McDemontt and Dell (2001) empirically study organizational culture as one of the barriers to the exchange of knowledge. Finally, Riege (2005) develops a literature review on the barriers to sharing knowledge, classifying them as individual, organizational and technological. Taking into account the potential of knowledge management to unify diverse areas of knowledge (Holsapple and Wu, 2008), the remaining articles of this list are developed in the intersection with diverse thematic such as the networks, the TICs, the innovation, among others.

Another aspect to highlight in this ranking is that there are six authors who have at least two documents. These six researchers are as follows: Ardichvili, Wentling, Darroch, Wong, Aspinwall and Bhatt. Of these authors, Ardichvili and Wentling are noted for having two documents together within the 20 most cited articles of the JKM. Likewise, Darroch and Bhatt stand out as independent authors possessing 2 articles among the 50 most cited publications.

It is also important to mention the 50 documents most cited by documents published in the JKM (see Table 3.5). The list contains forty-four articles and six books. Of the first three positions on this list, two correspond to books written by Nonaka and Takeuchi (1995) and Davenport and Prusak (1998). The publications of these authors are considered seminal works in the field of KM. In this list, Nonaka has authored or co-authored five documents. This list also reveals the large number of works related to KM's theoretical, conceptual and practical aspects.

Table 3.4. The most-cited documents in the JKM

R	Title	Name of authors	YFT	AGE	TC	TC/AGE
1	Motivation and barriers to participation in virtual knowledge-sharing communities of practice	Ardichvili A., Page V., Wentling T.	2003	13	666	51,23
2	Overcoming cultural barriers to sharing knowledge	McDermott R., O'Dell C.	2001	15	485	32,33
3	Three-dozen knowledge-sharing barriers managers must consider	Riege A.	2005	11	437	39,72
4	Knowledge management in organizations: Examining the interaction between technologies, techniques, and people	Bhatt, G.D.	2001	15	421	28,06
5	Complex acts of knowing: Paradox and descriptive self-awareness	Snowden, D.	2002	14	405	28,92
6	Knowledge management and innovation: Networks and networking	Swan, J., Newell, S., Scarbrough, H., Hislop, D.	1999	17	375	22,05
7	Managing effective knowledge transfer: An integrative framework and some practice implications	Goh S.C.	2002	14	339	24,21
8	Knowledge sharing in context: The influence of organizational commitment, communication climate and CMC use on knowledge sharing	Van Den Hooff, B., Ridder, J.A.	2004	12	318	26,50
9	Knowledge management, innovation and firm performance	Darroch J.	2005	11	292	26,54
10	Managing organizational knowledge as a strategic asset	Bollinger, A.S., Smith, R.D.	2001	15	286	19,06
11	Knowledge Management: An Introduction and Perspective	Wiig, K.M.	1997	19	255	13,42
12	The role of tacit and explicit knowledge in the workplace	Smith, E.A.	2001	15	246	16,40
13	How does knowledge management influence innovation and competitiveness?	Carneiro, A.	2000	16	227	14,18
14	Organizational culture and knowledge sharing: Critical success factors	Al-Alawi A.I., Al-Marzooqi N.Y., Mohammed Y.F.	2007	9	220	24,47
15	Knowledge management initiatives: Learning from failure	Storey, J., Barnett, E.	2000	16	217	13,56
16	A critical review of knowledge management as a management tool	Mårtensson, M.	2000	16	213	13,31
17	Cultural influences on knowledge sharing through online communities of practice	Ardichvili A., Maurer M., Li W., Wentling T., Stuedemann R.	2006	10	205	20,50
18	Knowledge-enabled customer relationship management: Integrating customer relationship management and knowledge management concepts	Gebert, H., Geib, M., Kolbe, L., Brenner, W.	2003	13	202	15,53
19	An empirical study of the important factors for knowledge-management adoption in the SME sector	Wong K.Y., Aspinwall E.	2005	11	200	18,18
20	Strategies for implementing knowledge management: Role of human resources management	Soliman, F., Spooner, K.	2000	16	194	12,12
21	Reviewing the knowledge management literature: Towards a taxonomy	Kakabadse N.K., Kakabadse A., Kouzmin A.	2003	13	192	14,76
22	The role of knowledge management in innovation	du Plessis M.	2007	9	188	20,88
23	Knowledge management in a public organization: A study on the relationship between organizational elements and the performance of knowledge transfer	Omar Sharifuddin Syed-Ikhsan S., Rowland F.	2004	12	186	15,50
24	Sense-making theory and practice: an overview of user interests in knowledge seeking and use	Dervin B.	1998	18	184	10,22
25	WEB 2.0 implications on knowledge management	Levy M.	2009	7	184	26,28
26	Collaborative climate and effectiveness of knowledge work – an empirical study	Sveiby, K.-E., Simons, R.	2002	14	178	12,71
27	A resource-based view of organizational knowledge management systems	Meso, P., Smith, R.	2000	16	176	11,00
28	Harmonisation of knowledge management – comparing 160 KM frameworks around the globe	Heisig P.	2009	7	175	25,00
29	Managing human resources toward achieving knowledge management	Yahya, S., Goh, W.-K.	2002	14	171	12,21
30	Organisational factors and knowledge management within large marketing departments: An empirical study	Bennett, R., Gabriel, H.	1999	17	170	10,00
31	SME and large organisation perceptions of knowledge management: Comparisons and contrasts	Mcadam, R., Reid, R.	2001	15	170	11,33
32	Developing a measure of knowledge management behaviors and practices	Darroch, J.	2003	13	168	12,92
33	Characterizing knowledge management in the small business environment	Wong K.Y., Aspinwall E.	2004	12	167	13.91

34	Integrating knowledge management technologies in organizational business processes: Getting real time enterprises to deliver real business performance	Malhotra, Y.	2005	11	167	15,18
35	Knowledge management and organizational performance: An exploratory analysis	Zack M., McKeen J., Singh S.	2009	7	167	23,85
36	Communities of practice in the distributed international environment	Hildreth P., Kimble C., Wright P.	2000	16	165	10,31
37	The knowledge management sprectrum – understantding the KM landscape	Binney D.	2001	15	165	11,00
38	Knowledge management at SMEs: Five peculiarities	Desouza K.C., Awazu Y.	2006	10	161	10,06
39	Towards knowledge networking	Seufert, A., Von Krogh, G., Bach, A.	1999	17	149	8,76
40	A Socio-Technical View of Knowledge Sharing at Buckman Laboratories	Pan, S.L., Scarbrough, H.	1998	18	147	8,16
41	Organizing knowledge in the knowledge development cycle	Bhatt, G.D.	1999	17	143	8,41
42	The transfer of knowledge and the retention of expertise: The continuing need for global assignments	Bender, S, Fish, A.	2000	16	141	8,81
43	Questions in knowledge management: Defining and conceptualising a phenomenon	Uit Beijerse R.P	1999	17	140	8,23
44	Knowledge management in small and medium-sized companies: Knowledge management for entrepreneurs	Beijerse, R.P.U.	2000	16	136	8,50
45	Managing knowledge: The link between culture and organizational learning	Pérez-López, S., Montes-Peón, J.M., Vázquez-Ordás, C.J.	2004	12	135	11,25
46	Determinants of knowledge sharing using Web 2.0 technologies	Paroutis S., Saleh A.A.	2009	7	134	19,14
47	The Knowledge Agenda	Skyrme D., Amidon D.	1997	19	128	6,73
48	Knowledge, Creativity and Innovation	Gurteen D.	1998	18	128	7,11
49	Integrating complexity theory, knowledge management and organizational learning	McElroy, M.W.	2000	16	123	7,68
50	Why KM projects fail: a multi-case analysis	Chua A., Lam W.	2005	11	124	11,27

Abbreviations: *R: rank; YFP: year first publication; AGE = (Current year: 2016) -YFP); TC: total citations; TC/AGE: citations per year.*

Table 3.5. Most cited documents in JKM publications

R	Cited Reference	Type	Citations	TLS
1	Nonaka, I., Takeuchi, H., (1995); The knowledge creating company; Oxford University Press	B	300	256
2	Davenport, T., Prusak, L., (1998); Working knowledge: how organizations manage what they know; Harvard Business School Press	B	151	149
3	Nonaka, I., A dynamic theory of organizational knowledge creation (1994); Organization Science, 5 (1), pp. 14-37	A	137	137
4	Alavi, M., Leidner, D.E., Knowledge management and knowledge management systems: conceptual foundations and research issues (2001); MIS Quarterly, 25 (1), pp. 107-136	A	101	101
5	Cohen, W., Levinthal, D., Absorptive capacity: a new perspective on learning and innovation (1990); Administrative Science Quarterly, 35 (1), pp. 128-152	A	96	96
6	Grant, R.M., Toward a knowledge based theory of the firm (1996); Strategic Management J, 17, pp. 109-122	A	76	76
7	Nahapiet, J., Ghoshal, S., Social capital, intellectual capital, and the organizational advantage (1998); Academy of Management Review, 23 (2), pp. 242-266	A	67	61
8	Barney, J., Firm resources and sustained competitive advantage (1991); J Management, 17 (1), pp. 99-120	A	66	4
9	Kogut, B., Zander, U., Knowledge of the firm, combinative capabilities, and the replication of technology (1992); Organization Science, 3 (3), pp. 383-397	A	65	64
10	Gold, A., Malhotra, A., Segars, A., Knowledge management: an organizational capabilities perspective (2001); J Management Information Systems, 18 (1), pp. 185-214	A	59	59
11	Szulanski, G., Exploring internal stickiness: impediments to the transfer of best practice within the firm (1996); Strategic Management J, 17, pp. 27-43	A	56	56
12	Polanyi, M., (1966); The tacit dimension; Routledge & Kegan Paul	B	49	44
13	Nonaka, I., The knowledge creating company (1991); Harvard Business Review, 69 (6), pp. 96-104	A	44	42
14	Hansen, M.T., Nohria, N., Tierney, T., What's your strategy for managing knowledge? (1999); Harvard Business Review, 77 (2), pp. 106-116	A	40	40
15	Lave, J., Wenger, E., (1991); Situated Learning: legitimate peripheral participation; Cambridge University Press	B	40	39
16	Teece, D., Pisano, G., Shuen, A., Dynamic capabilities and strategic management (1997); Strategic Management J, 18 (7), pp. 509-533	A	40	38
17	Hansen, M.T., The search-transfer problem: the role of weak ties in sharing knowledge across organization subunits (1999); Administrative Science Quarterly, 44 (1), pp. 82-111	A	35	35
18	Zack, M., Developing a knowledge strategy (1999); California Management Review, 41 (3), pp. 125-145	A	35	35
19	Argote, L., Ingram, P., knowledge transfer: a basis for competitive advantage in firms (2000); Organizational Behavior and Human Decision Processes, 82 (1), pp. 150-169	A	33	33
20	Podsakoff, P.M., Mackenzie, S.B., Lee, J.Y., Podsakoff, N.P., Common method biases in behavioral research: a critical review of the literature and recommended remedies (2003); J Applied Psychology, 88 (5), pp. 879-903	A	32	32
21	Nonaka, I., Konno, N., The concept of 'ba': building a foundation for knowledge creation (1998); California Management Review, 40 (3), pp. 40-54	A	31	29
22	Wenger, E., (1998); Communities of practice: learning, meaning and identity; Cambridge University Press	B	31	30
23	Grant, R.M., Prospering in dynamically-competitive environments: organizational capability as knowledge integration (1996); Organization Science, 7 (4), pp. 375-387	A	30	28
24	March, J., Exploration and exploitation in organizational learning (1991); Organization Science, 2 (1), pp. 71-87	A	30	30
25	Granovetter, M., The strength of weak ties (1973); American J Sociology, 78 (6), pp. 1360-1380	A	29	29
26	Nonaka, I., Toyama, R., Konno, N., SECI, ba and leadership: a unified model of dynamic knowledge creation (2000); Long Range Planning, 33 (1), pp. 5-34	A	28	27
27	Bock, G.W., Zmud, R.W., Kim, Y.G., Lee, J.-N., Behavioral intention formation in knowledge sharing: examining the roles of extrinsic motivators, social-psychological forces, and organizational climate (2005); MIS Quarterly, 29 (1), pp. 87-111	A	27	27
28	Lee, H., Choi, B., Knowledge management enablers, processes, and organizational performance: an integrative view and empirical examination (2003); J Management Information Systems, 20 (1), pp. 179-228	A	27	27
29	Nelson, R., Winter, S., (1982); An evolutionary theory of economic change; Belknap Press	B	27	26
30	Wernerfelt, B., A resource-based view of the firm (1984); Strategic Management J, 5 (2), pp. 171-180	A	27	27
31	Spender, J.C., Making knowledge the basis of a dynamic theory of the firm (1996); Strategic Management J, 17, pp. 45-62	A	26	26
32	Von Krogh, G., Care in knowledge creation (1998); California Management Review, 40 (3), pp. 133-153	A	26	25
33	Argote, L., McEvily, B., Reagans, R., Managing knowledge in organizations: an integrative framework and review of emerging themes (2003); Management Science, 49 (4), pp. 571-582	A	25	25

34	McDermott, R., O'Dell, c., Overcoming cultural barriers to sharing knowledge (2001); J Knowledge Management, 5 (1), pp. 76-85	A	25	24
35	Wasko, M., Faraj, S., Why should i share? examining social capital and knowledge contribution in electronic networks of practice (2005); MIS Quarterly, 29 (1), pp. 35-57	A	25	25
36	Zack, M.H., Managing codified knowledge (1999); Sloan Management Review, 40 (4), pp. 45-58	A	25	24
37	Gupta, A.K., Govindarajan, V., Knowledge flows within multinational corporations (2000); Strategic Management J, 21 (4), pp. 473-496	A	24	24
38	Riege, A., Three-dozen knowledge-sharing barriers managers must consider (2005); J Knowledge Management, 9 (3), pp. 18-35	A	24	24
39	Fornell, C., Larcker, D.F., Evaluating structural equation models with unobservable variables and measurement error (1981); J Marketing Research, 18 (1), pp. 39-50	A	23	23
40	Ruggles, R., The state of the notion: knowledge management in practice (1998); California Management Review, 40 (3), pp. 80-89	A	23	21
41	Serenko, A., Bontis, N., Global ranking of knowledge management and intellectual capital academic journals (2009); J Knowledge Management, 13 (1), pp. 4-15	A	23	22
42	Davenport, T.H., De Long, D.W., Beers, M.C., Successful knowledge management projects (1998); Sloan Management Review, 39 (2), pp. 43-57	A	21	5
43	Wang, S., Noe, R.A., Knowledge Sharing: a review and directions for future research (2010); Human Resource Management Review, 20 (2), pp. 115-131	A	21	21
44	Zahra, S.A., George, G., Absorptive capacity: a review, reconceptualization, and extension (2002); Academy Management Review, 27 (2), pp. 185-203	A	21	21
45	Cabrera, A., Collins, W.C., Salgado, J.F., Determinants of individual engagement in knowledge sharing (2006); International J Human Resource Management, 17 (2), pp. 245-264	A	20	20
46	De Long, D.W., Fahey, L., Diagnosing cultural barriers to knowledge management (2000); Academy Management Executive, 14 (4), pp. 113-127	A	20	20
47	Earl, M., Knowledge management strategies: toward a taxonomy (2001); J Management Information Systems, 18 (1), pp. 215-233	A	20	19
48	Zander, U., Kogut, B., Knowledge and the speed of the transfer and imitation of organizational capabilities: an empirical test (1995); Organization Science, 6 (1), pp. 76-92	A	20	20
49	Eisenhardt, K.M., Building theories from case study research (1989); Academy Management Review, 14 (4), pp. 532-550	A	19	19
50	Brown, J.S., Duguid, P., Knowledge and organization: a social-practice perspective (2001); organization science, 12 (2), pp. 198-213	A	18	17

Abbreviations: *type (A: article; B: book); TLS: total link strength.*

Another interesting analysis is to identify who cites the JKM. Table 3.6 reports the fifty journals with the largest number of articles citing JKM publications. Notice that the only requirement is having a paper with at least one citation referring to the JKM, although the journal can be cited several times. This list is also organized by quinquennium.

Table 3.6. Most cited documents in JKM publications

R	Journal	TP	Q1	Q2	Q3	Q4
1	Journal of Knowledge Management	557	17	91	182	267
2	Knowledge Management Research and Practice	132	0	8	44	81
3	Proceedings of the European Conference on Knowledge Management	103	0	19	84	0
4	Vine	99	0	3	38	58
5	Journal of Information and Knowledge Management	96	0	11	28	57
6	Journal of Intellectual Capital	81	5	10	18	48
7	International Journal of Knowledge Management	79	0	0	27	52
8	Knowledge and Process Management	72	0	0	17	55
9	Learning Organization	72	1	13	30	28
10	International Journal of Knowledge Based Development	63	0	0	18	45
11	Expert Systems with Applications	61	0	5	22	34
12	Computers in Human Behavior	58	0	0	8	50
13	Management Decision	56	0	5	19	32
14	Espacios	53	0	0	3	50
15	International Journal of Knowledge Management Studies	51	0	2	22	27
16	Industrial Management and Data Systems	46	0	3	17	26
17	International Journal of Information Management	46	0	0	15	31
18	Business Process Management Journal	44	0	4	17	23
19	Journal of Business Research	44	0	1	2	41
20	International Journal of Innovation and Learning	41	0	2	24	15
21	International Journal of Technology Management	38	0	6	20	12
22	Asian Social Science	36	0	0	1	35
23	International Journal of Project Management	35	0	1	4	30
24	International Journal of Knowledge Management	33	0	17	16	0
25	International Journal of Knowledge Culture and Change Management	31	0	0	23	8
26	Knowledge Management and E Learning	29	0	0	6	23
27	Service Industries Journal	28	0	0	12	16
28	International Journal of Knowledge and Learning	27	0	3	14	10
29	World Applied Sciences Journal	27	0	0	3	24
30	Information and Management	25	0	1	3	21
31	International Journal of Human Resource Management	25	0	1	8	16
32	International Journal of Innovation Management	25	0	0	4	21
33	Decision Support Systems	24	1	1	6	16
34	Journal of Enterprise Information Management	24	0	3	10	11
35	International Journal of Business Information Systems	23	0	0	9	14
36	Journal of Workplace Learning	23	1	6	8	8
37	International Business Management	22	0	0	0	22
38	International Journal of Production Research	22	0	0	5	17
39	Iranian Journal of Information Processing Management	22	0	0	0	22
40	Journal of Manufacturing Technology Management	22	0	2	5	15
41	International Journal of Learning and Intellectual Capital	21	0	2	12	7
42	Journal of Information Science	21	1	1	13	6
43	Total Quality Management and Business Excellence	20	0	2	9	9
44	Technological Forecasting and Social Change	19	0	0	7	12
45	Information Development	18	0	1	1	16
46	International Journal of Business Innovation and Research	18	0	0	7	11
47	International Journal of Managing Projects in Business	18	0	0	4	14
48	Journal of Management Development	18	0	3	5	10
49	Management Research Review	18	0	0	5	13
50	Perspectivas em Ciencia da Informacao	18	0	0	10	8

Abbreviations available in Table 3.2, except for Q = quiquennium: number of papers published in the JKM in the period considered (Q1: 1997-2001; Q2: 2002-2006; Q3: 2007-2011; Q4: 2012-2016).

In this list it is observed that the first researchers to publish in JKM (Q1), include references from the *Journal of Intellectual Capital*, *Learning Organization*, *Decision Support Systems*, *Journal of Workplace Learning* and *Journal of Information Science*. In the following periods there is an increase of new journals citing JKM, mainly from fields such as Knowledge Management, Business Management and Computer Systems. Another relevant aspect is that the JKM reaches the highest position with an increasing trend of self-cites over time. This is quite logical since journals often quote themselves. The journal that gives the second most citations to the JKM is "Knowledge Management Research and Practice". Finally, there is a positive trend of new journals citing the JKM.

Moving forward in this perspective, Table 3.7 presents the number of articles that mention JKM according to the year, author, university and country. Note that, although they are presented in a single table, the data must be analyzed independently according to each analysis unit (year, author, university and country).

Table 3.7. Citing articles classified by year, authors, universities and countries

R	Years	TP	Author	TP	University	TP	Country	TP
1	2016	1,192	Bontis, N.	41	U. Tech. Malaysia	73	United States	1056
2	2015	979	Akhavan, P.	30	Multimedia U.	66	United Kingdom	984
3	2014	827	Serenko, A.	28	Islamic Azad U.	66	Australia	560
4	2013	752	Yigitcanlar, T.	26	Hong Kong Polytechnic U.	62	China	500
5	2012	703	Ooi, K.B.	23	Loughborough U.	60	Spain	471
6	2011	562	Metaxiotis, K.	21	U. Tehran	60	Malaysia	403
7	2010	505	Grimaldi, M.	20	Queensland U. Tech.	58	Taiwan	343
8	2009	427	Kant, R.	20	McMaster U.	55	Canada	342
9	2008	332	Cegarra-Navarro, J.G.	18	U. Tech. Lappeenranta	50	Iran	297
10	2007	226	Chong, S.C.	18	Tampere U. Technology	48	Italy	281
11	2006	153	Ergazakis, K.	18	U. Malaya	46	Finland	269
12	2005	106	Wong, K.Y.	18	Nanyang Tech. U.	46	India	257
13	2004	102	Soto-Acosta, P.	17	McMaster U.	44	Germany	219
14	2003	65	Cricelli, L.	16	U. Valencia	44	Brazil	213
15	2002	57	Kianto, A.	16	City U. Hong Kong	44	Netherlands	173
16	2001	39	Schiuma, G.	16	RMIT U.	43	Sweden	154
17	2000	14	Lin, B.	15	Cranfield U.	43	South Korea	145
18	1999	1	Bolisani, E.	14	Griffith U.	42	France	144
19	1998	5	Lytras, M.D.	14	U. Manchester	42	Greece	130
20	1997	3	McAdam, R.	14	U. Granada	41	New Zealand	119
21	-	-	Scarso, E.	14	Northern U. Malaysia	40	South Africa	105
22	-	-	Carrillo, F.J.	13	National Cheng Kung U.	37	Singapore	89
23	-	-	Durst, S.	13	U. Stud Padova	36	Turkey	88
24	-	-	Jafari, M.	13	Tech. Monterrey	36	Portugal	87
25	-	-	Lin, H.F.	13	U. Murcia	35	Thailand	85
26	-	-	Lönnqvist, A.	13	U. Sao Paulo - USP	34	Denmark	82
27	-	-	Oliveira, M.	13	National Tech. U. Athens	33	Norway	77
28	-	-	Singh, M.D.	13	U. Politec Valencia	33	Mexico	67
29	-	-	Andreeva, T.	12	Brunel U. London	33	Ireland	66
30	-	-	Chua, A.Y.K.	12	Aston U.	33	Pakistan	63
31	-	-	Chong, C.W.	11	Ulster U.	33	Austria	63
32	-	-	Gonzalez, R.V.D.	11	Iran U. Science and Tech.	32	United Arab Emirates	61
33	-	-	Laihonen, H.	11	U. Putra Malaysia	32	Japan	59
34	-	-	Psarras, J.	11	U. Federal Santa Catarina	31	Poland	59
35	-	-	Tseng, S.M.	11	U. Queensland	31	Switzerland	58
36	-	-	Boateng, H.	10	Lakehead U.	31	Indonesia	56
37	-	-	Colomo-Palacios, R.	10	Deakin U.	31	Slovenia	55
38	-	-	Davison, R.M.	10	MARA U. Tech.	30	Saudi Arabia	51
39	-	-	Edwards, J.S.	10	National U. Singapore	30	Israel	47
40	-	-	Koskinen, K.U.	10	Aalto U.	30	Jordan	46
41	-	-	Lee, G.G.	10	U. Oulu	29	Lithuania	44
42	-	-	Martins, M.F.	10	U. Sevilla	29	Colombia	43
43	-	-	Rowley, J.	10	U. Oviedo	29	Russian Federation	40
44	-	-	Tsui, E.	10	U. Salford	29	Nigeria	38
45	-	-	Urbancová, H.	10	U. Science Malaysia	29	Belgium	37
46	-	-	Dumay, J.	9	National U. Malaysia	28	Egypt	33
47	-	-	Grandinetti, R.	9	U. Nottingham	28	Czech Republic	33
48	-	-	Holsapple, C.W.	9	Payame Noor U.	28	Romania	23
49	-	-	Lee, V.H.	9	Copenhagen Business Sch.	28	Vietnam	22
50	-	-	Lin, C.	9	U. South Australia	28	Ghana	20

Abbreviations available in Table 3.2.

From the beginning of JKM (1997) until 2016, 7050 articles have cited JKM. Keep in mind that when a scientific actor cites some article published in JKM, he is citing JKM. In the table, note that more than 50% of the articles that have been cited to JKM have done so in the last 4 years. This shows the

growing influence achieved by JKM. During the period under review, the lead author in citing JKM is Bontis with 41 of his documents. Likewise, a great diversity of universities around the world has quoted JKM. Of these universities, the University of Technology Malaysia stands out for citing 73 JKM documents. Finally, as expected, the USA and the United Kingdom are the two countries with the highest number of documents citing JKM publications.

3.3.1.2. Main authors, institutions and countries

In this section an analysis of data related to the main authors, institutions and countries that publish in the JKM is presented.

Table 3.8 presents the number of publications of the most productive authors in the JKM, and also shows its general productivity in academic journals. To observe the performance of these authors, the h-index of each author is included, along with the total number of publications, the number of citations, among other bibliometric indicators. This table also gives information on the tendency of authors to publish individually (SA). Note in case of a tie in productivity (TP), the number of citations per author is taken into account.

Table 3.8 indicates that the most productive authors in the JKM (TP) are Serenko, with 12 papers, followed by Bontis, with 11 papers. However, it should be noted that Bontis is a very productive author in other journals as well and is a highly cited author. The other interesting fact is that Serenko and Bontis are researchers who usually publish together. In fact, they have published jointly on 8 occasions so far. A general overview of their work shows a preference for research in areas such as KM, intellectual capital, and scientometrics methodologies, among others. Additionally, regarding cited authors (TC), Andreas Riege is the most cited author in the list, with 586 citations, followed by Kuan Yew Wong, with 453, and Serenko and Bontis, with more than 350 citations each.

Table 3.8. Most-productive and influential authors publishing in the JKM

R	Author Name	University	C	JKM									General Description					
				TP	LA	SA	YFT	TC	C/P	H	T50	C-JKM	TP	TC	C/P	H	C-G	CA
1	Serenko, A.	Lakehead U.	CAN	12	9	1	2007	380	32	10	1	246	86	1978	23	24	1403	34
2	Bontis, N.	McMaster U.	CAN	11	3	0	2003	364	33	8	1	259	105	4991	48	30	3304	91
3	Carrillo, F.J.	Tech. Monterrey	MEX	9	2	5	1997	65	7	6	0	46	32	145	5	7	106	17
4	Chase, R.L.	Milton Keynes Council	UK	8	0	8	2006	1	0	1	0	1	10	1	0	1	1	0
5	Metaxiotis, K.	U. Piraeus	GRE	7	2	0	2004	179	26	6	1	149	113	1146	10	17	958	64
6	Sun, P.Y.T.	U. Waikato	NZL	6	1	1	2005	199	33	4	1	192	15	359	24	10	342	6
7	Ergazakis, K.	National Tech. U. Athens	GRE	6	3	0	2004	173	29	6	1	146	41	442	11	12	362	27
8	Massingham, P.	U. Wollongong	AUS	6	1	4	2004	107	18	5	0	100	18	183	10	7	168	8
9	Schiuma, G.	U. Arts London	UK	5	2	0	2008	148	30	5	0	128	2	26	13	2	65	4
10	Kianto, A.	U. Tech. Lappeeranta	FIN	5	1	0	2011	142	28	3	0	133	47	548	12	12	429	40
11	McAdam, R.	Ulster U.	UK	5	3	0	2001	112	22	5	0	108	174	2371	14	25	2118	111
12	Shariq, S.Z.	Stanford U.	USA	5	0	3	1997	28	6	3	0	26	9	36	4	3	33	10
13	Chatzkel, J.	Mayfield Village	USA	5	0	5	2002	17	3	3	0	17	20	97	5	5	89	6
14	Riege, A.	E.ON Düsseldorf	DEU	4	1	2	2005	586	147	4	1	563	8	714	89	6	690	6
15	Chua, A.Y.K.	Nanyang Tech. U.	SGP	4	2	1	2005	235	59	5	1	234	135	1565	12	22	1347	63
16	Heisig, P.	U. Applied Sciences Potsdam	DEU	4	1	1	2004	195	49	2	1	192	22	255	12	5	247	39
17	Yigitcanlar, T.	Queensland U. Tech.	AUS	4	2	1	2007	195	49	4	1	140	103	1041	10	17	526	82
18	Lytras, M.D.	American College Greece	GRE	4	2	1	2002	150	38	3	0	147	130	1222	9	20	887	117
19	Psarras, J.	National Tech. U. Athens	GRE	4	0	0	2004	142	36	4	1	130	224	2723	12	26	2090	146
20	Herschel, R.T.	U. Philadelphia	USA	4	2	0	2001	95	24	4	0	95	17	385	23	8	375	19
21	Wiig, K.M.	Knowledge Research Inst.	USA	4	0	4	1997	90	23	4	0	90	19	787	41	9	743	12
22	Senoo, D.	Tokyo Inst. Tech.	JPN	4	0	0	2008	84	21	3	0	80	29	405	14	7	383	26
23	Magnier-Watanabe, R.	U. Tsukuba	JPN	4	3	0	2008	81	20	3	0	78	30	165	6	7	154	16
24	Lee, W.B.	Hong Kong Polytechnic U.	HKG	4	0	0	2005	68	17	3	0	65	431	5813	13	42	4325	42
25	Petruzzelli, A.M.	Polytech Bari	ITA	4	3	1	2007	60	15	4	0	54	52	509	10	14	385	26
26	Mentzas, G.	National Tech. U. Athens	GRE	4	0	0	2004	57	14	3	0	57	183	1483	8	19	1349	140
27	Sáenz, J.	U. Deusto	ESP	4	2	0	2006	54	14	3	0	53	25	175	7	6	167	12
28	Scarso, E.	U. Padua Studies	ITA	4	1	0	2009	50	13	3	0	49	49	296	6	9	269	18
29	Bolisani, E.	U. Padua Studies	ITA	4	2	0	2009	50	13	3	0	49	59	301	5	8	271	33
30	Dumay, J.	Macquarie U.	AUS	4	0	0	2015	49	12	5	0	33	53	1092	21	17	543	42
31	López-Sáez, P.	U. Complutense Madrid	ESP	4	1	0	2010	48	12	4	0	48	21	310	15	8	303	13
32	Giudice, M.D.	Paris Sch. Business	FRA	4	2	0	2014	35	9	3	0	30	8	47	6	3	38	10
33	Smith, A.D.	Robert Morris U.	USA	4	2	2	2002	27	7	3	0	27	200	1646	8	21	1063	29

34	Suh, E.	Pohang U. Science and Tech.	KOR	4	0	0	2003	27	7	2	0	26	46	1338	29	15	1239	50
35	Millar, C.C.J.M.	Hult International Business Sch.	USA	4	2	0	2004	26	7	2	0	26	41	245	6	7	239	38
36	Wong, K.Y.	U. Malaysia Tech.	MAL	3	2	0	2004	453	151	5	1	418	143	2118	15	20	1764	137
37	Levy, M.	Bar-Ilan U.	ISR	3	0	3	2009	246	82	3	1	244	4	246	62	3	244	0
38	Kimble, C.	KEDGE Business Sch.	FRA	3	1	0	2000	244	81	3	1	236	67	748	11	11	684	42
39	Awazu, Y.	Lille U.	FRA	3	0	1	2004	198	66	2	1	198	32	505	16	13	487	19
40	Andreeva, T.	Polytech. Bari	IRL	3	2	0	2011	164	55	3	1	156	22	231	11	6	209	17
41	Bhatt, G.D.	Morgan State U.	USA	3	0	3	2000	139	46	3	1	128	25	1022	41	13	971	16
42	Durst, S.	U. Skovde	SWE	3	2	0	2012	133	44	2	1	120	36	226	6	7	191	39
43	Liebowitz, J.	Harrisburg U. Science Tech.	USA	3	0	2	2000	110	37	2	1	110	115	1413	12	20	1326	83
44	Rowley, J.	Manchester Metropolitan U.	UK	3	0	0	2010	105	35	3	0	92	219	3512	16	32	3220	88
45	Eppler, M.J.	U. St. Gallen	SWI	3	2	0	2007	94	31	3	1	93	75	1697	23	15	1519	48
46	Ganesh, L.S.	Indian Inst. Tech.	IND	3	0	0	2009	88	29	2	0	88	31	961	31	30	900	30
47	Lerro, A.	U. Basilicata	ITA	3	2	0	2008	82	27	3	0	75	30	305	10	10	249	10
48	Murray, A.	Applied Knowledge Sciences	USA	3	0	0	2004	69	23	3	0	69	7	80	11	4	78	6
49	Stankosky, M.	Hong Kong Polytech. U.	CHI	3	0	0	2004	69	23	3	0	69	32	171	5	7	171	22
50	Ordóñez de Pablos, P.	U. Oviedo	ESP	3	2	1	2002	65	22	3	0	65	169	1132	7	20	817	131

Abbreviations available in Table 3.4 except for LA: lead author; SA: single author; C/P = citation per paper; H = h-index; Top 50 = papers among the fifty most cited; C-JKM: cited by the JKM; C-G: cited generally; CA: total co-authors; countries (AUS: Australia; CAN: Canada; CHE: Switzerland; CHI: China; DEU: Germany; ESP: Spain; FIN: Finland; FRA: France; GRC: Greece; IND: India; IRL: Ireland; ISR: Israel; ITA: Italy; JPN: Japan; KOR: South Korea; MEX: Mexico; MYS: Malaysia; NZL: New Zealand; SGP: Singapore; SWE: Sweden; UK: United Kingdom; USA: United States).

Another interesting issue is the analysis of the more influential and productive universities and institutions publishing in the JKM. With this objective in mind, Table 3.9 indicates the most productive universities within the journal. This table also presents other indicators such as the year they began publishing in the JKM (YFP), total citations (TC), the *h*-index and citation thresholds. Additionally, it shows the ranking of the university in the Academic Ranking of World Universities (ARWU) and in the Quacquarelli & Symonds (QS) university ranking.

The results revealed that the most productive universities in the JKM are Cranfield University, with 14 papers, and the Technologic Institute of Monterrey, with 13 papers. Note that both universities commenced publishing in the journal from the first year the journal was launched. It is also noteworthy that the Technologic Institute of Monterrey is one of the two Latin American university in this ranking. At the regional level, European universities are the most productive in the JKM, followed by those of Oceania, America and Asia. Moreover, among the universities with more citations (TC) are Griffith University, with 846 citations, the Cranfield University, with 406 citations, and the University of Lakehead, with 402 citations.

Although it depends on many variables, it is likely that these results are obviously obtained by the human capital hired by the universities and the networks they generate. For example, the documents of Andreas Riege, in Griffith U., or Alexander Serenko, in Lakehead U., have helped to position their universities as the most influential institutions in JKM. When considering the *h*-index, Lakehead University and Nanyang University of Technology are the best positioned universities. It should also be noted that the Campania University Luigi Vanvitelly is in thirty-third place and is the institution that most recently started to publish in the JKM (2012). Finally, it is observed that only 24% of universities are ranked in the top 300 of the Academic Ranking of World Universities (ARWU). In this same ranking stand Stanford University and the University of Manchester that are, within the Top 50.

Table 3.9. The productive and influential institutions publishing in the JKM

R	Institution	Country	YFP	TP	TC	H	C/P	≥100	≥50	≥25	≥5	≥1	ARWU	QS	T50
1	Cranfield U.	UK	1997	14	406	7	29	1	1	3	4	4	-	-	1
2	Tech. Monterrey	MEX	1997	13	112	7	9	0	0	1	8	3	-	238	-
3	Lakehead U.	CAN	2007	13	402	11	31	0	3	3	5	2	-	-	1
4	Nanyang Tech. U.	SGP	2001	12	320	11	27	1	0	3	8	0	101-150	13	1
5	Hong Kong Polytechnic U.	CHI	2005	11	251	8	23	0	0	5	4	1	301-400	116	-
6	Macquarie U.	AUS	2000	11	167	8	15	0	0	1	10	0	201-300	229	-
7	McMaster U.	CAN	2003	11	365	8	33	0	3	3	3	2	83	149	1
8	Griffith U.	AUS	2005	10	846	8	84	1	4	2	2	1	301-400	329	-
9	National Technical U. Athens	GRE	2001	10	231	8	23	0	1	2	6	1	-	376	1
10	U. Manchester	UK	2003	9	162	6	18	0	1	0	5	2	35	33	1
11	Queensland U. Tech.	AUS	2004	9	284	7	32	0	3	1	4	1	201-300	263	1
12	Copenhagen Business Sch.	DNK	1999	9	159	7	18	0	0	2	6	1	-	-	-
13	Loughborough U.	UK	2004	8	297	6	37	1	1	0	6	0	-	228	1
14	Stanford U.	USA	1997	8	65	5	8	0	0	1	4	2	2	3	-
15	Lappeenranta U. Tech.	FIN	2002	8	158	4	20	0	2	0	1	5	-	-	1
16	U. Murcia	ESP	2007	7	112	5	16	0	0	3	2	1	-	701	-
17	U. Padova	ITA	2009	7	124	5	18	0	0	2	3	1	-	309	-
18	George Washington U.	USA	2004	7	171	7	24	0	1	2	3	1	301-400	327	-
19	U. Waikato	NZL	2005	7	204	4	29	1	0	2	1	3	-	338	1
20	U. Oviedo	ESP	1999	7	104	5	15	0	0	1	4	2	-	-	-
21	Tampere U. Tech.	FIN	2003	7	83	6	12	0	0	1	5	1	-	356	-
22	Japan Advanced Inst. Sci. Tech.	JPN	2003	7	176	6	25	0	0	3	3	1	-	-	-
23	U. Wollongong	AUS	2003	7	109	5	16	0	0	2	3	2	301-400	243	-
24	Ulster U.	IRL	2003	7	159	7	23	0	1	1	5	0	-	551-600	-
25	Stockholm Sch. Economics	SWE	2000	7	91	5	13	0	0	1	4	2	-	-	-
26	U. Tech. Sydney	AUS	2000	7	76	5	11	0	0	2	4	1	301-400	218	-
27	U. St. Gallen	SWI	1999	7	239	6	34	0	2	1	3	1	-	329	1
28	Victoria U. Wellington	NZL	2003	6	116	5	19	0	1	0	4	0	301-400	229	-
29	U. Maine	USA	2001	6	104	5	17	0	1	0	4	1	-	-	-
30	U. Newcastle	AUS	2010	6	95	4	16	0	0	2	2	1	301-400	256	-
31	Bangkok U.	THA	2008	6	55	4	9	0	0	0	3	3	-	-	-
32	U. Twente	NDL	2004	6	26	2	4	0	0	0	2	1	301-400	188	-
33	U. Warwick	UK	1998	6	266	4	44	1	1	1	1	2	151-200	48	1
34	U. Campania Luigi Vanvitelli	ITA	2012	6	57	4	10	0	0	1	2	3	-	-	-
35	U. Complutense Madrid	ESP	2010	6	86	5	14	0	0	0	6	0	301-400	226	-
36	SKEMA Business Sch.	FRA	2004	6	95	4	16	0	1	0	3	1	-	-	-
37	U. Castilla-La Mancha	ESP	2011	5	125	5	25	0	1	0	4	0	-	-	-
38	U. Deusto	ESP	2006	5	81	4	16	0	0	1	3	1	-	-	-
39	Vrije U. Amsterdam	NDL	2007	5	114	4	23	0	1	1	2	1	-	176	-
40	Morgan State U.	USA	2000	5	197	5	39	0	1	2	1	1	-	-	1
41	Brunel U. London	UK	2001	5	41	3	8	0	0	1	1	2	401-500	331	-
42	U. Basilicata	ITA	2008	5	149	5	30	0	0	4	1	0	-	-	-
43	U. North Texas	USA	2008	5	91	5	18	0	1	0	4	0	301-400	-	-
44	U. Sydney	AUS	2005	5	92	4	18	0	0	2	2	1	82	45	-
45	Polytechnic Bari	ITA	2008	5	76	5	15	0	0	1	4	0	-	-	-
46	U. Stockholm	SWE	2000	5	55	4	11	0	0	1	2	2	81	182	-
47	Curtin U.	AUS	2007	5	96	5	19	0	0	2	3	0	201-300	284	-
48	Korea Adv. Inst. Sci & Tech.	KOR	2005	5	133	3	27	0	1	1	1	1	201-300	43	-
49	Chalmers U. Tech.	SWE	2006	4	102	4	25	0	1	1	2	0	201-300	132	-
50	U. Sao Paulo	BRA	2012	4	67	4	17	0	0	1	2	1	101-150	143	-

Abbreviations available in Tables 1 and 8, except for ARWU = academic ranking of world universities (only the top 500); QS = world university rankings (only the top 800); countries (DNK: Denmark; THA: Thailand).

To continue characterizing the JKM, Table 3.10 shows the most productive and influential countries that normally, through their institutions and researchers, publish in the journal. The indicators that are presented by country are the total number of papers (TP), total number of citations (TC) and the *h*-index (H), and the productivity of each country during the four quinquenniums of the journal's existence. Finally, Table 3.10 displays the quantity of papers and citations per million inhabitants. Note that the listing is organized by each country's productivity, though in the case of a tie in productivity, the number of citations is presented.

Table 3.10. Temporal evolution of the publications classified by country

R	Country	TP	TC	H	C/P	Q1		Q2		Q3		Q4		P/Po	C/Po	T50
						TP	TC	TP	TC	TP	TC	TP	TC			
1	United States	229	5573	39	24,34	57	1283	72	2360	65	1638	35	292	0,7	17,25	12
2	United Kingdom	163	3842	34	23,57	39	487	42	1630	48	1362	34	363	2,5	58,38	11
3	Australia	99	2217	25	22,39	13	120	25	946	29	786	32	365	4,1	92,60	2
4	Spain	70	1113	20	15,90	1	13	21	354	22	560	26	186	1,5	23,92	1
5	China (Hong Kong)	47	825	17	17,55	1	17	8	252	14	350	24	206	0,0	0,60	-
6	Italy	46	681	16	14,80	-	-	3	103	13	239	30	339	0,8	11,24	-
7	Canada	45	1165	17	25,89	2	21	6	394	13	493	24	257	1,2	32,16	2
8	Germany	45	1059	19	23,53	4	47	17	359	14	549	10	104	0,5	12,79	3
9	France	38	403	11	10,61	1	14	8	50	8	269	21	70	0,6	6,01	1
10	Finland	31	709	15	22,87	-	-	8	236	9	305	14	168	5,6	128,83	3
11	Netherlands	29	603	13	20,79	2	165	10	249	7	148	10	41	2,9	60,20	2
12	Sweden	27	320	10	11,85	5	52	8	136	6	106	8	26	2,7	32,02	-
13	India	25	490	11	19,60	0	0	3	131	13	292	9	67	0,0	0,37	-
14	Taiwan	25	475	12	19,00	0	0	4	28	8	328	13	119	1,1	20,18	-
15	South Korea	25	339	11	13,56	0	0	8	113	6	153	11	73	0,5	6,65	-
16	New Zealand	24	973	15	40,54	0	0	7	589	9	311	8	73	5,1	205,01	3
17	Japan	22	325	10	14,77	0	0	6	34	12	279	4	12	0,2	2,56	-
18	Malaysia	21	705	13	33,57	0	0	4	379	4	173	13	153	0,7	22,27	2
19	Greece	19	523	12	27,53	1	7	10	325	8	191	0	0	1,8	48,62	1
20	Denmark	19	335	10	17,63	4	28	7	163	2	90	6	54	3,3	58,27	1
21	Singapore	18	407	12	22,61	1	13	3	39	10	253	4	102	3,2	72,59	1
22	Brazil	16	186	8	11,63	1	1	2	4	5	117	8	64	0,1	0,90	-
23	Switzerland	15	350	8	23,33	2	35	4	143	4	153	5	19	1,8	41,58	1
24	Mexico	15	124	7	8,27	1	7	5	29	7	87	2	1	0,1	1,02	-
25	Israel	13	485	9	37,31	1	3	5	154	6	318	1	10	1,5	56,76	2
26	Austria	11	176	7	16,00	0	0	1	28	7	114	3	34	1,3	20,06	-
27	Thailand	10	94	5	9,40	0	0	3	51	0	0	7	43	0,1	1,37	-
28	South Africa	9	364	7	40,44	0	0	3	41	3	270	3	53	0,2	6,51	1
29	Norway	9	79	6	8,78	1	0	1	6	3	45	4	28	1,7	15,02	-
30	Iran	9	50	5	5,56	0	0	0	0	3	20	6	30	0,1	0,62	-
31	Portugal	7	210	6	30,00	2	48	1	71	1	37	3	54	0,7	20,37	1
32	United Arab Emirates	6	52	5	8,67	0	0	2	13	2	19	2	20	0,6	5,61	-
33	Russian Federation	5	257	4	51,40	0	0	1	90	1	58	3	109	0,0	1,79	2
34	Turkey	5	188	5	37,60	0	0	0	0	4	179	1	9	0,1	2,36	1
35	Ireland	5	137	5	27,40	0	0	1	13	3	67	1	57	1,0	28,69	-
36	Slovenia	4	122	4	30,50	0	0	2	122	0	0	0	0	1,9	59,05	-
37	Poland	4	63	3	15,75	0	0	0	0	2	49	2	14	0,1	1,66	-
38	Saudi Arabia	4	50	4	12,50	0	0	0	0	2	46	2	4	0,1	1,61	-
39	Bahrain	3	265	3	88,33	0	0	0	0	3	265	0	0	2,3	204,79	1
40	Liechtenstein	3	135	3	45,00	0	0	0	0	0	0	3	135	79,3	3570,01	1
41	Colombia	3	82	3	27,33	0	0	0	0	2	58	1	24	0,1	1,70	-

42	Egypt	3	57	3	19,00	0	0	0	0	1	44	2	13	0,0	0,63	-
43	Nigeria	3	37	3	12,33	0	0	0	0	0	0	3	37	0,0	0,20	-
44	Belgium	3	18	2	6,00	1	1	0	0	1	13	1	4	0,3	1,58	-
45	Jamaica	2	279	2	139,50	0	0	0	0	2	279	0	0	0,7	99,15	2
46	Iceland	2	105	1	52,50	0	0	0	0	0	0	2	105	5,9	310,33	1
47	Georgia	2	37	2	18,50	0	0	2	37	0	0	0	0	0,5	9,95	-
48	Peru	2	22	2	11,00	0	0	0	0	1	11	1	11	0,1	0,71	-
49	Pakistan	2	19	2	9,50	0	0	1	8	1	11	0	0	0,0	0,10	-
50	Lebanon	2	15	2	7,50	0	0	0	0	1	7	1	8	0,3	2,51	-

Abbreviations available in Tables 6 and 8, except for P/Po and C/Po = papers and cities per million inhabitants.

According to the results presented in Table 3.10, there is great diversity of countries that publish in the JKM. It should be noted that the scientific productivity of countries can vary depending on economic and/or political factors, among others (Gkypali et al., 2016; Ynalvez and Shrum, 2010). The USA, for example, is the country with the most investment in R&D. Therefore, it is not surprising that it leads the ranking of the most productive countries in JKM, with 229 papers. It is followed by the United Kingdom with 163 papers. It should also be noted that these countries occupy the most influential positions with an *h*-index of 39 and 34 respectively. In addition, these two countries have the largest number of papers in the top 50 most cited articles in the journal. Another interesting fact is that both the USA and United Kingdom have had a high participation rate since the early years of the JKM. However, it is observed that both countries have significantly decreased their productivity in the last period. For example, the USA decreased 47% of its productivity in the last five years (Q4). This is explained by the outstanding productivity of countries such as France, Italy, Malaysia and China, among others. Although it could also be explained by the internationalization of JKM. Finally, note that one of the most productive countries by inhabitant in the JKM is Liechtenstein, although this result is less significant given the population size of this country. Other countries highlighted in this regard are Iceland, Finland and New Zealand.

3.3.2. Science mapping analysis of JKM

The previous section presented some performance indicators of the JKM. To continue characterizing the JKM, this section carries out a science mapping analysis with the bibliographic material. This methodology tries to provide a spatial representation of how the different scientific actors of a dynamically changing field of knowledge relate to each other (Small, 1997). In addition it can be used as a complementary approach to bibliometric performance

indicators (Cobo et al., 2012). Therefore, in order to obtain a more complete and complementary image of the results previously shown, the graphic mapping of the main scientific actors that publish in JKM are presented in this section.

To achieve this goal, this work uses VOSviewer software (van Eck and Waltman, 2010), which visualizes the bibliographic material through bibliographic coupling (Kessler, 1963, 1965), co-occurrence of keywords (Callon et al., 1983), and the analysis of citations and co-citations (Small, 1973). Note that the bibliographic coupling analyzes the papers they cite (Cobo et al., 2011). This occurs when two papers published in a journal cite the same third paper. In the figure, these two papers appear connected but not the third unless they also have a significant degree of bibliographic linkage through other papers. Therefore, for the purposes of this research, the bibliographic coupling will represent the highest productivity in JKM and shows how this research is connected with others (Merigó et al., 2016). On the other hand, the shared citations or co-citations study the cited papers and occur when two papers receive a citation by a third paper that has been published. The figure shows the two papers that have been cited by the article published in the journal but not the latter article. In the case of this study, the co-citation shows the most cited studies in JKM and their connections. The analysis of citations represents the sum of the citations that one scientific actor grants to another and vice versa. Finally, the generated maps are interpreted by observing the frequency, size and centrality of the analysed factors.

We start this science mapping by referring to co-citation in the JKM. Remember that the purpose of co-citation is to detect when two documents from two different journals receive a citation of the same document from a third journal. The results in Figure 3.2 are presented with a threshold of 30 citations and the 100 most representative co-citation connections. According to Figure 3.2, four clusters are visualized that distinguish the relationships of the journals most cited by JKM documents. Each of these clusters have a significant number of nodes. Note that JKM is the most cited magazine and has the largest network. These results are frequent in the analysis of journal co-citations since authors usually cite articles from the same source. *Organization Science* and *Strategic Management Journal* are equally well

cited. Also note that most of the journals correspond to the management area and, to a lesser extent, to other areas of business, strategy, and social sciences, such as information systems, human resources and sociology. This shows the interest of the different areas of business management in the KM field, but also highlights the breadth of topics related to businesses that are published and cited in JKM.

To complement the analysis of Figure 3.2, Table 3.11 presents the fifty most cited journals or books by documents published in the JKM. This table also presents the global position of the journals along with the temporal evolution of these during the two decades of JKM's existence.

Figure 3.2. Co-citation of Journal cited in the JKM

Table 3.11. Most cited journals and books in the JKM

R	Global Journal	Cit	CLS	1997-2006 Journal	Cit	CLS	2007-2016 Journal	Cit	CLS
1	Journal of Knowledge Management	3257	2497	Strategic Management Journal	408	339	Journal of Knowledge Management	2528	1922
2	Strategic Management Journal	1772	1524	Journal of Knowledge Management	404	286	Strategic Management Journal	1291	1111
3	Organization Science	1505	1356	Harvard Business Review	303	263	Organization Science	1125	1015
4	Academy of Management Review	826	782	Organization Science	279	249	Academy of Management Review	640	603
5	Harvard Business Review	819	750	California Management Review	259	233	Academy of Management Journal	556	525
6	California Management Review	729	682	Academy of Management Review	155	147	Administrative Science Quarterly	543	511
7	Administrative Science Quarterly	707	666	Administrative Science Quarterly	136	128	MIS Quarterly	534	494
8	Academy of Management Journal	685	649	Sloan Management Review	127	118	Management Science	472	449
9	MIS Quarterly	677	626	Academy of Management Journal	90	86	Harvard Business Review	459	437
10	Management Science	582	556	Management Science	81	79	California Management Review	443	423
11	Journal of Management Studies	457	437	Long Range Planning	79	74	Journal of Management Studies	375	357
12	Journal of Management Information Systems	437	416	Journal of Management Studies	66	63	Research Policy	325	282
13	Research Policy	380	333	Journal of Management Information Systems	63	60	Journal of Management Information Systems	322	307
14	Sloan Management Review	327	312	European Management Journal	61	58	Journal of Intellectual Capital	260	233
15	Journal of Intellectual Capital	326	298	MIS Quarterly	57	53	Knowledge Management Research & Practice	246	234
16	Journal of Management	320	313	Expert System with Applications	52	40	Journal of Management	245	239
17	Knowledge and Process Management	302	291	Communications of the ACM	51	43	Knowledge and Process Management	232	222
18	Knowledge Management Research & Practice	292	279	Journal of International Business Studies	48	43	Journal of International Business Studies	222	202
19	Long Range Planning	280	271	The Knowledge-Creating Company	48	46	Organization Studies	197	191
20	Journal of International Business Studies	275	250	Journal of Marketing	47	42	Long Range Planning	188	183
21	Organization Studies	248	241	Journal of Management	45	44	Sloan Management Review	187	182
22	Expert Systems with Applications	217	203	Working Knowledge: How Organizations Manage What They Know	45	45	The Learning Organization	173	162
23	Journal of Applied Psychology	211	199	Journal of Intellectual Capital	44	43	Journal of Applied Psychology	170	160
24	The Learning Organization	207	195	Knowledge and Process Management	43	42	Expert Systems with Applications	159	149
25	Journal of Marketing	197	181	Organizational Dynamics	42	41	Journal of Marketing	142	129
26	Working Knowledge: How Organizations Manage What They Know	189	189	The Tacit Dimension	42	41	Management Decision	137	133
27	European Management Journal	185	181	The Knowledge-Creating Company: How Japanese Companies Create The Dynamics of Innovation	41	39	Technovation	136	129
28	International Journal of Information Management	183	178	Research Policy	40	37	Working Knowledge: How Organizations Manage What They Know	130	130
29	Management Decision	177	171	American Journal of Sociology	38	36	International Journal of Information Management	129	126
30	Decision Support Systems	162	158	Academy of Management Executive	37	36	Information & Management	123	118

R	Global Journal	Cit	CLS	1997-2006 Journal	Cit	CLS	2007-2016 Journal	Cit	CLS
31	Technovation	162	154	Organization Studies	37	36	Human Relations	121	117
32	Human Relations	158	153	The Knowledge Creating Company	35	33	American Journal of Sociology	119	115
33	Information & Management	158	152	Fortune	33	30	European Management Journal	119	117
34	American Journal of Sociology	157	152	Human Relations	32	31	Journal of Business Research	119	115
35	The Tacit Dimension	157	156	Computerworld	31	25	Decision Support Systems	113	111
36	The Knowledge-Creating Company: How Japanese Companies Create The Dynamics of Innovation	143	140	Decision Support Systems	30	29	Industrial and Corporate Change	110	107
37	Industrial and Corporate Change	142	139	Knowledge Management	30	27	The Tacit Dimension	108	108
38	Journal of Business Research	141	137	Management Decision	29	26	Journal of Information Science	106	104
39	Journal of Marketing Research	135	130	Post-Capitalist Society	28	28	Journal of Marketing Research	104	102
40	Information Systems Research	134	131	American Sociological Review	27	24	Organizational Behavior and Human Decision Processes	101	99
41	Organizational Behavior and Human Decision Processes	134	131	An Evolutionary Theory of Economic Change	26	26	Information Systems Research	98	97
42	Communications of the ACM	126	117	Industrial and Corporate Change	26	25	Journal of Knowledge Management Practice	97	90
43	Journal of Information Science	126	124	International Journal of Information Management	25	24	The Knowledge-Creating Company: How Japanese Companies Create The Dynamics of Innovation	96	96
44	Academy of Management Executive	122	121	International Journal of Technology Management	25	24	Industrial Management & Data Systems	95	91
45	Industrial Management & Data Systems	120	115	Knowledge Management Handbook	25	24	Journal of Product Innovation Management	94	89
46	International Journal of Technology Management	118	116	The New Organizational Wealth: Managing And Measuring Knowledge-Based Assets	24	24	International Journal of Technology Management	87	85
47	The Knowledge-Creating Company	114	112	American Economic Review	23	21	British Journal of Management	86	85
48	Journal of Product Innovation Management	113	108	Working Knowledge	23	23	Journal of the American Society for Information Science and Technology	86	83
49	Organizational Dynamics	112	111	Organizational Behavior and Human Decision Processes	22	21	Human Resource Management	84	81
50	Human Resource Management	107	103	Intellectual Capital: The New Wealth of Organizations	21	21	Scientometrics	84	73

Abbreviations available in Table 3.4, except for; Cit: total citations in the JKM; CLS: co-citation links

Another important issue is the analysis of the co-citation of authors most cited in the JKM. Figure 3.3 presents the data with a threshold of 50 citations and 100 co-citation connections among authors.

Figure 3.3. Co-citation of authors cited in the JKM
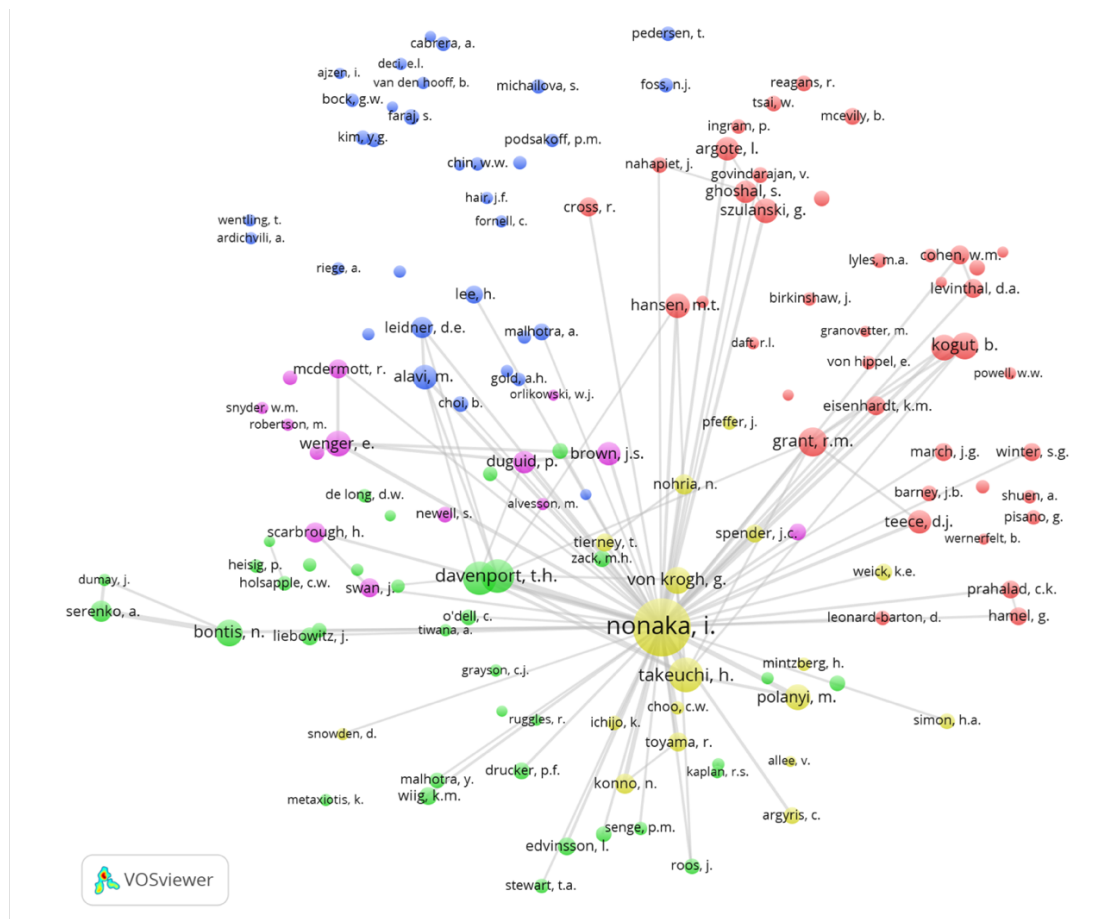
The results included in Figure 3.3 are similar to those presented in Table 3.5, although this figure focuses on the most cited authors. Additionally, this figure sheds light on the connections network of authors. According to this, Nonaka has the most extensive network. This author is also the most cited in the JKM, followed by Takeuchi, von Krog and Davenport, among others. In the 20 years of JKM, these authors have become the core of the journal's publications. Although it should also be mentioned that several of its documents are considered fundamental in the KM field. Finally, several researchers who have begun to generate research networks are observed in the periphery of the figure.

Another interesting topic to analyze and contrast with the results of the bibliometric performance analysis is the bibliographic coupling of the countries that publish in the journal. This will allow for the identification of the most productive countries that tend to use the same literature. Figure 3.4 shows the results considering a minimum threshold of 5 papers and the 50 most representative bibliographic link connections.

Figure 3.4. Bibliographic coupling of countries that publish in the JKM
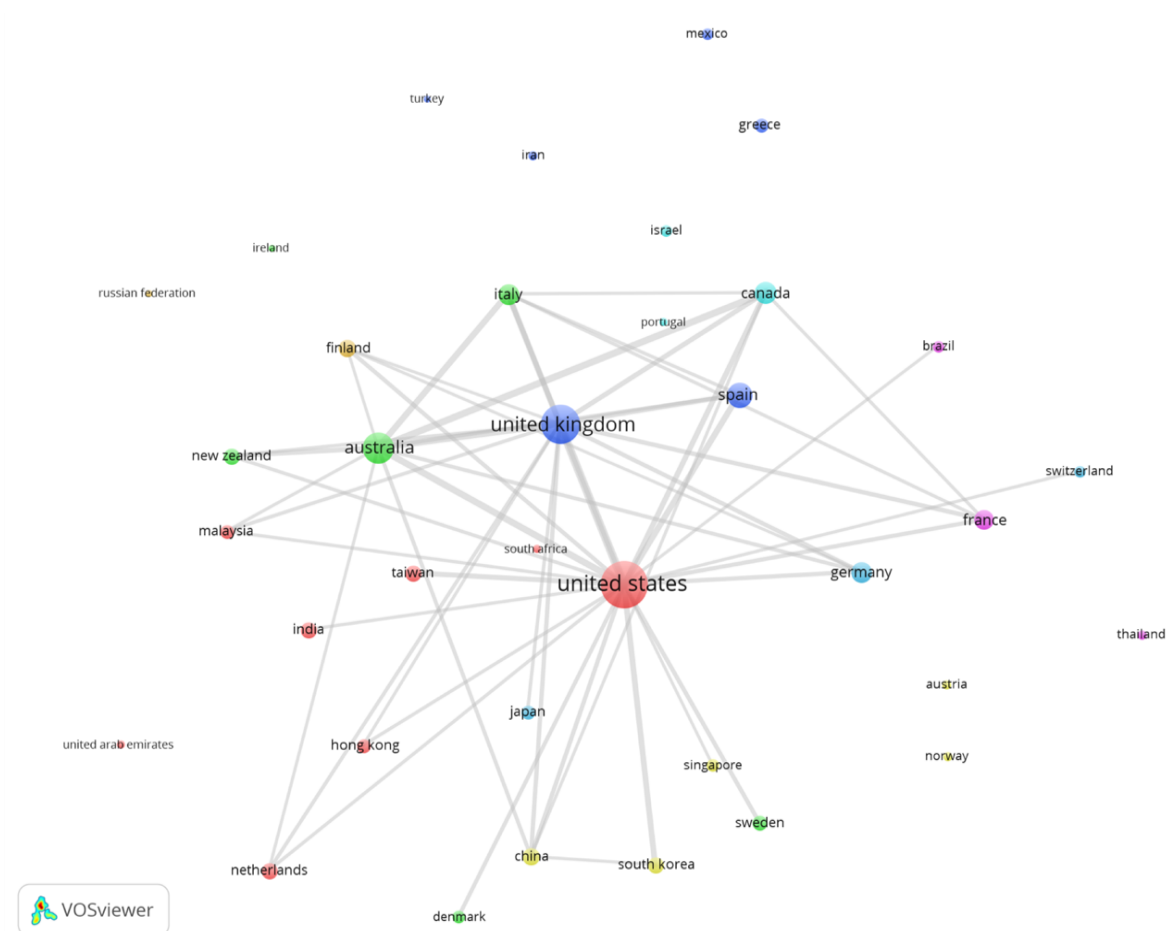
The results are consistent with what is shown in Table 3.10. The figure show how each one of the countries connects with others. It is also possible to clearly observe that USA and UK form two important nuclei of the journal. Their centrality and closeness indicate that they work on similar topics, which have influenced the development of documents from various countries, such as Australia, Spain, Italy, among others.

Very similar to the previous analysis, Figure 3.5 shows the citations made between countries that have published in the JKM. The network shown in this figure represents the countries that are citing each other. In this sense, citations represent the sum between the citations that country A cites to country B and vice versa. In general, it is observed that the USA, United Kingdom and Australia have an intense network of citations among them.

Figure 3.5. Citation analysis of countries publishing in the JKM
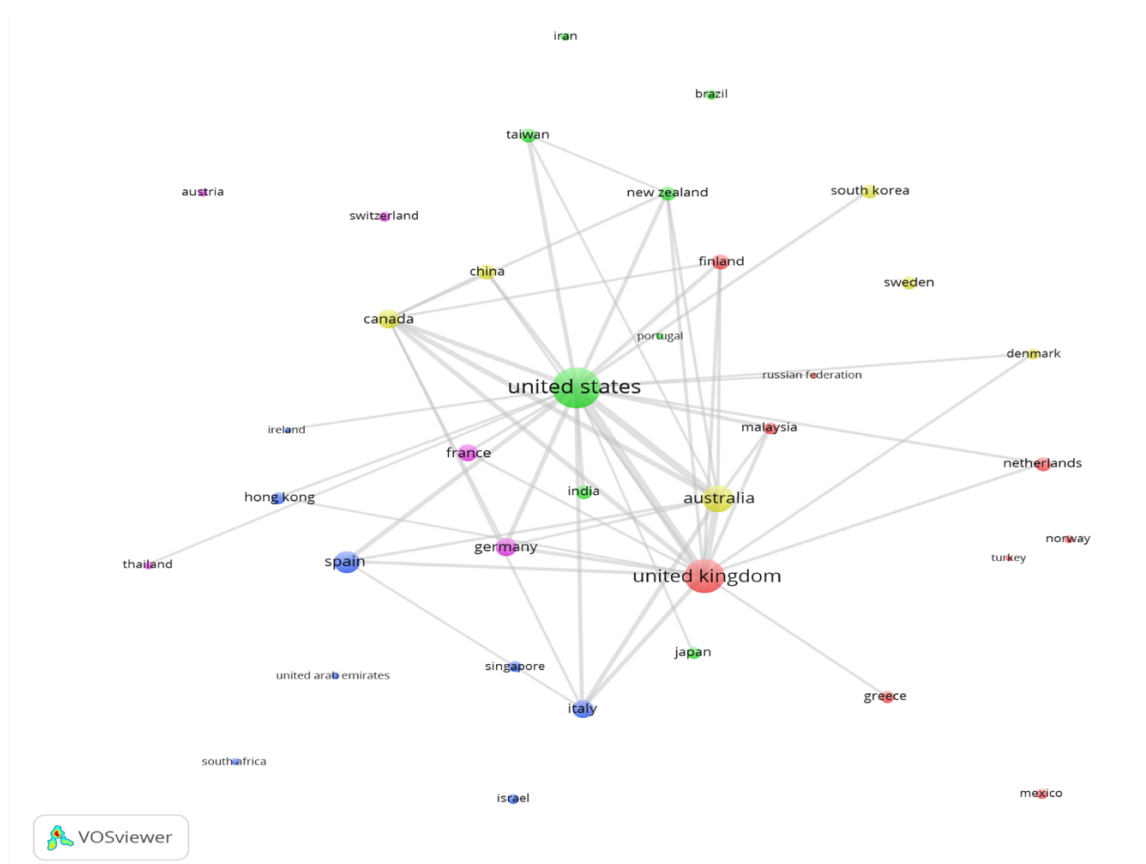
Figure 3.6 shows co-authorship relations between countries. Note that this figure shows the co-authorship relationships between the countries that publish in JKM. The results show that there is extensive collaboration between the United Kingdom and Australia. This finding could be explained by the historical links between Australia and the UK. Although the USA also has an extensive network of co-authorship with several other countries in the world. While it is true that an intense connection between the countries of the same region would be normal, Figure 3.6 shows in general, a lack of intensity

111

of these relationships between countries, such as European or Latin American.

Figure 3.6. Co-authorship of countries that publish in the JKM
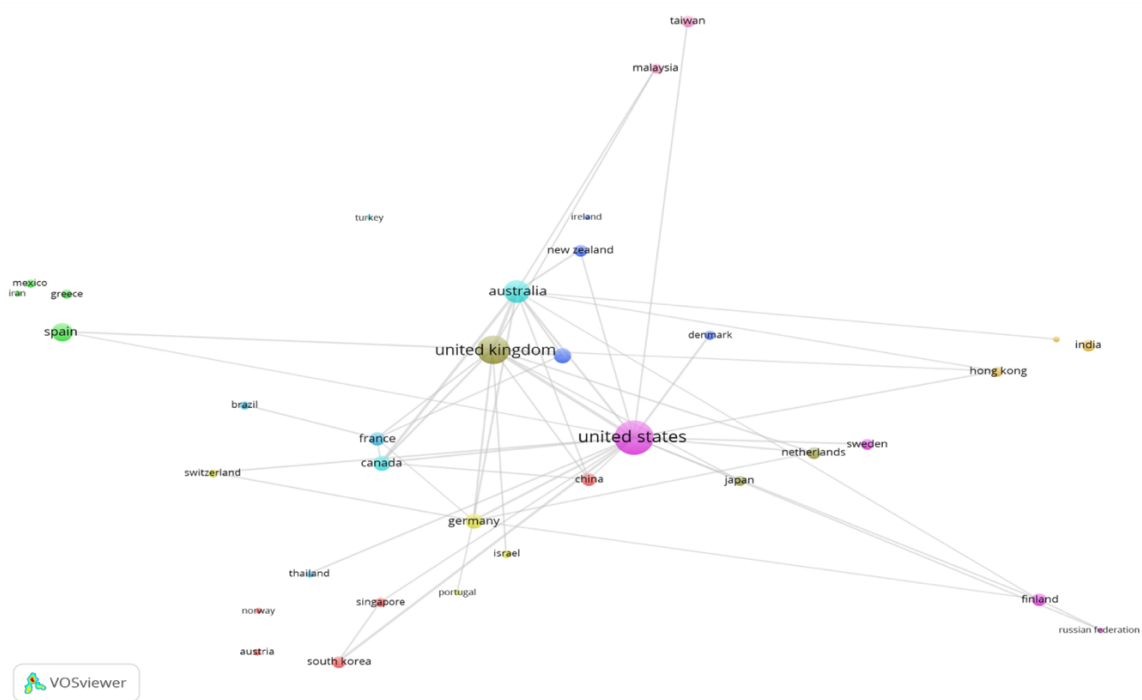
The following figures analyse the co-occurrence of keywords presented in JKM publications. It is important to remember that keywords are assigned by the authors and that the co-occurrence of keywords shows the frequency with which keywords appear next to others in published documents. Considering a wide perspective, Figure 3.7 presents the most used keywords and their distinct relationships in the documents published in the JKM. The size of the circles, which represent a keyword, are larger according to the relevance of this word in JKM. The results of Figure 7 are presented with a threshold of five occurrences and the top one hundred most frequent co-occurrences.

Figure 3.7. Co-ocurrence of author keywords of documents published in the JKM
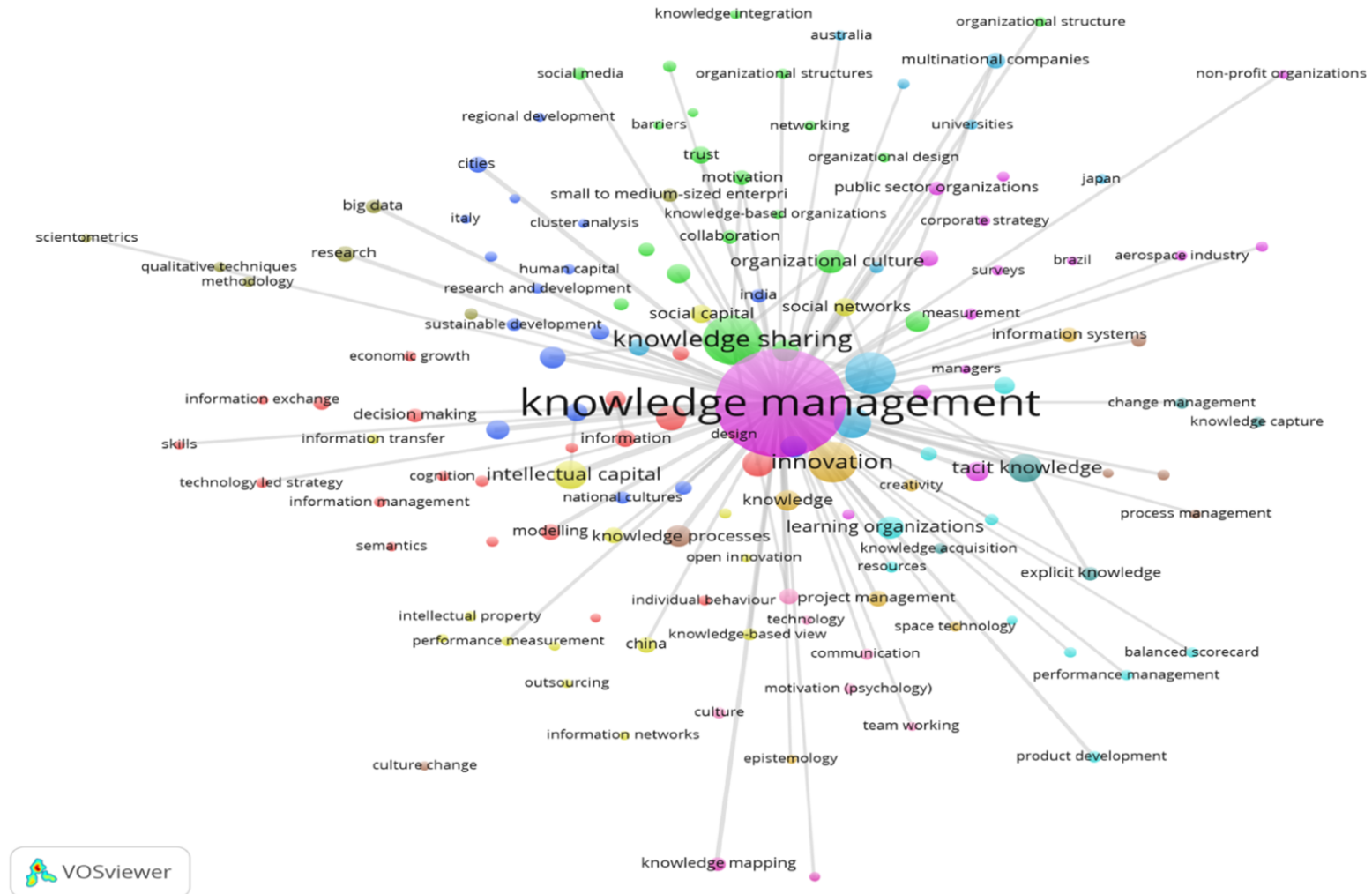
It is observed that the JKM uses a great variety of keywords. However, it is clearly observed that the words "Knowledge Management" are at the centre of the figure and have the highest co-occurrence index in the JKM. Certainly, this result can be explained by the scientific domain of the journal. In addition, in the perimeter of the Figure there are other keywords that represent the amplitude of the emerging topics that have been published in JKM. It is expected, therefore, that JKM will promote research on these issues in order to continue explaining the different phenomena that affect the KM field.

Alternatively, Figures 3.8 and 3.9 present a longitudinal analysis of the concurrency of keywords in each of the decades of existence of the JKM. In performing this analysis, it is possible to identify the trends in different topics that have been published during the existence of the JKM. Likewise, this procedure prevents the overlapping of keywords.

Figure 3.8 presents the co-occurrence of keywords during the first decade of the JKM (1997-2006). From this figure, it is observed that the words "Innovation", "Intellectual Capital", and "Tacit Knowledge" are some of the words most used during the first decade of life of the JKM. As mentioned above, Figure 3.9 shows the most used keywords and their relationships during the second decade (2007-2016) of the JKM. The figure shows that keywords such as "Knowledge Sharing", "Knowledge Transfer", "Innovation" and "Knowledge Creation", have an intense relationship among them. These keywords are positioned as important topics during the second decade of the existence of the JKM. Table 3.12 presents, in greater detail, the 50 most used keywords during the twenty years of the existence of the JKM. Notice that the results derived from Table 3.12 are very similar to those shown in Figures 3.7, 3.8 and 3.9.

Figure 3.8. Co-ocurrence of author keywords of documents published in the JKM (1997-2006)
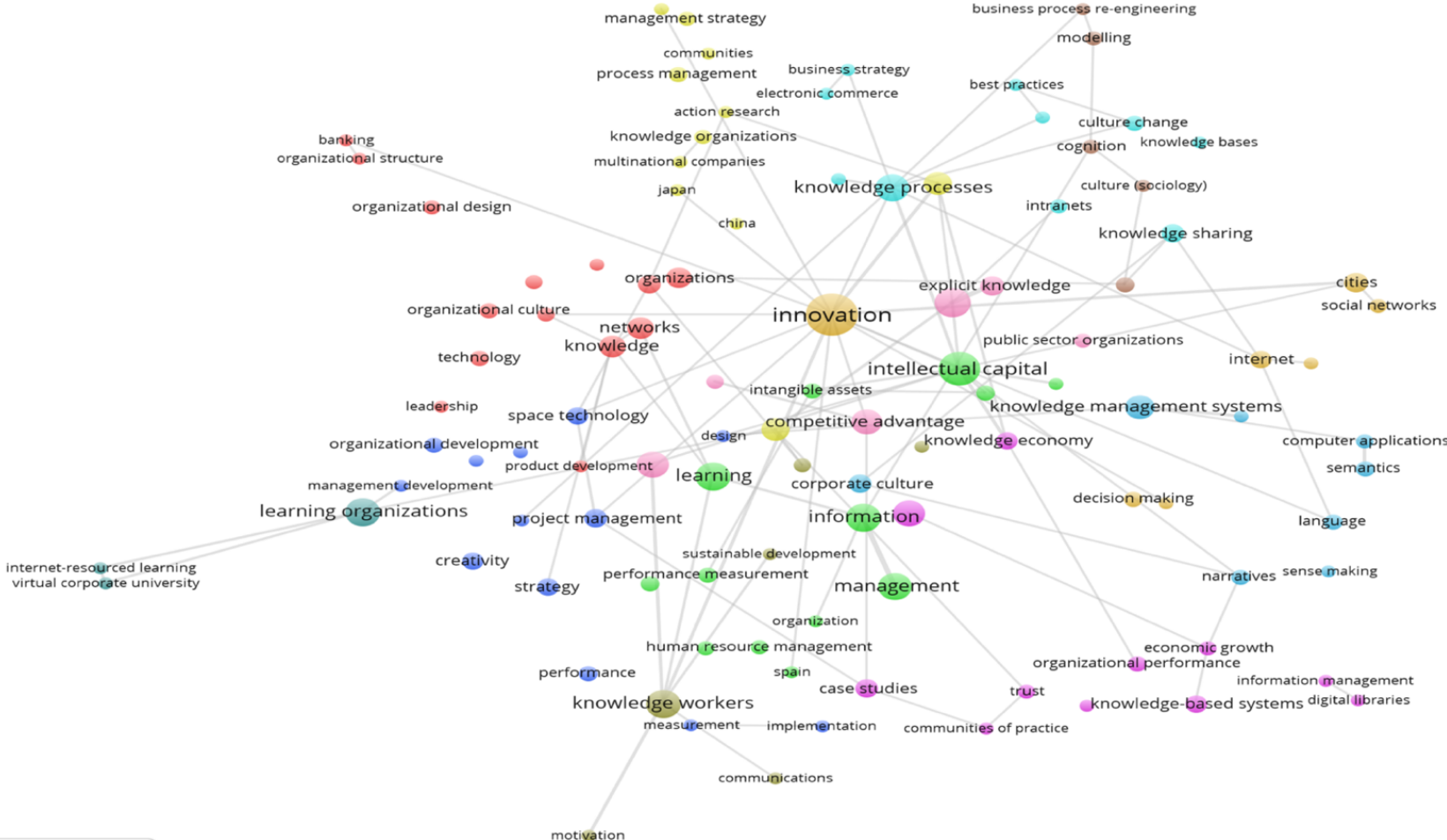
Figure 3.9. Co-ocurrence of author keywords of documents published in the JKM (2007-2016)
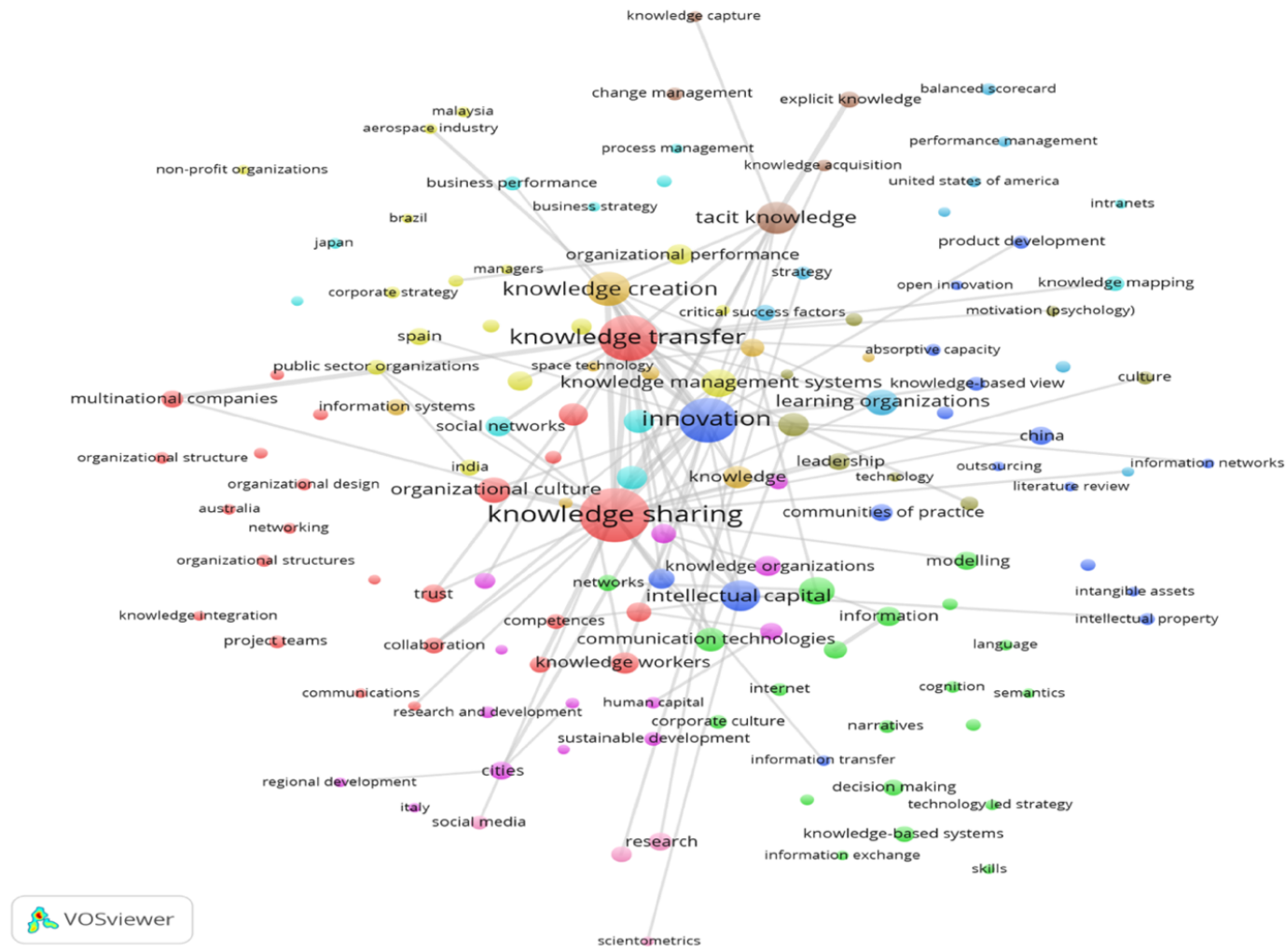
Table 3.12. Most common keyword occurrences in the JKM

R	Global			1997-2006			2007-2016		
	Keyword	**OC**	**TLS**	**Keyword**	**OC**	**TLS**	**Keyword**	**OC**	**TLS**
1	Knowledge management	670	579	Knowledge management	238	208	Knowledge management	405	359
2	Knowledge sharing	140	127	Innovation	36	36	Knowledge sharing	127	115
3	Knowledge transfer	98	92	Intellectual capital	23	23	Knowledge transfer	85	80
4	Innovation	96	95	Tacit knowledge	18	18	Innovation	60	58
5	Knowledge creation	55	52	Information	17	17	Knowledge creation	41	40
6	Tacit knowledge	48	46	Learning organizations	17	16	Tacit knowledge	28	27
7	Intellectual capital	47	45	Knowledge workers	17	15	Organizational culture	27	27
8	Knowledge management systems	38	36	Learning	16	15	Communication technologies	23	23
9	Learning	36	34	Knowledge processes	15	15	Intellectual capital	23	22
10	Organizational culture	33	33	Management	15	15	Knowledge management systems	21	20
11	Learning organizations	31	27	Information technology	14	14	Social capital	20	20
12	Organizations	28	28	Organizational learning	14	13	Organizations	19	19
13	Communication technologies	28	27	Competitive advantage	13	13	Learning	19	17
14	Information technology	27	26	Knowledge management systems	12	12	Knowledge organizations	17	17
15	Knowledge processes	26	24	Knowledge creation	11	11	Social networks	16	15
16	Knowledge	24	24	Knowledge transfer	11	10	Organizational performance	14	14
17	Organizational learning	24	22	Knowledge	10	9	Learning organizations	14	13
18	Knowledge workers	22	20	Networks	10	8	China	13	13
19	Knowledge organizations	21	21	Organizations	9	9	Knowledge economy	13	13
20	Organizational performance	21	21	Cities	8	8	Research	13	13
21	Social capital	20	20	Explicit knowledge	8	8	Trust	13	13
22	Social networks	20	18	Case studies	7	7	Modelling	12	12
23	Knowledge economy	19	19	Corporate culture	7	7	Multinational companies	12	12
24	Case studies	18	18	Information systems	7	7	Communities of practice	12	11
25	Competitive advantage	18	18	Knowledge sharing	7	7	Information technology	12	11
26	Information	18	17	Project management	7	7	Critical success factors	11	11
27	Management	17	17	Internet	6	6	Knowledge	11	11
28	Trust	17	16	Knowledge economy	6	6	Knowledge processes	11	11
29	Cities	16	16	Space technology	6	6	Leadership	11	11
30	Modelling	16	16	Strategy	6	6	Spain	11	11
31	Project management	16	16	Creativity	6	5	Organizational learning	10	9
32	Research	16	16	Knowledge-based systems	6	4	Case studies	10	10
33	China	16	15	Communication technologies	5	5	Human resource management	10	10
34	Multinational companies	15	15	Culture change	5	5	India	10	10
35	Communities of practice	15	14	Decision making	5	5	Knowledge-based view	10	10
36	Human resource management	14	14	Intangible assets	5	5	Motivation	9	9
37	Spain	14	14	Intellectual property	5	5	National cultures	9	9
38	Leadership	14	13	Language	5	5	Project management	9	9
39	Information systems	13	13	Organizational culture	5	5	Competences	9	8
40	Motivation	13	13	Organizational development	5	5	Cities	8	8
41	Performance	13	12	Organizational performance	5	5	Collaboration	8	8
42	Collaboration	12	12	Performance measurement	5	5	Communities	8	8
43	Critical success factors	12	12	Process management	5	5	Performance	8	8
44	Explicit knowledge	12	12	Resources	5	5	Small to medium-sized enterprises	8	8
45	India	12	12	Semantics	5	5	Social media	8	7
46	Knowledge-based systems	12	12	Narratives	5	4	Absorptive capacity	7	7
47	Small to medium-sized enterprises	12	12	Performance	5	4	Culture	7	7
48	Big data	12	11	Technology	5	4	Knowledge acquisition	7	7
49	Decision making	12	11	Collaboration	4	4	Knowledge mapping	7	7
50	Networks	12	10	Cognition	4	4	Organizational structures	7	7

Abbreviations available in Table 3.4, except for; C = occurrences; TLS = total link strength

3.4 Conclusions

The JKM focuses on the KM field, and in its 20 years of existence it has managed to position itself as the main journal in this field of research (Serenko and Bontis, 2017). The objective of this work is to present a bibliometric analysis of all the scientific documents published by the journal during this period of time (1997-2016). The development of this study responds to a current gap in the journal, which does not have studies that analyze its own literature.

From a general perspective, this study provides an information base of the main theoretical and empirical references published during the twenty years of JKM. But in addition, it provides a methodology that researchers can replicate to obtain updated information from their respective fields of research. This article, therefore, is relevant for researchers of various disciplines, but particularly for those who follow the JKM journal, as well as those who are dedicated to the field of knowledge management.

By using the Scopus database, 1,068 JKM documents were collected and analysed. The results were obtained from two procedures: first, a performance analysis involving both productivity and influence indicators, second, a science mapping analysis of the different actors that are linked to the JKM. Regarding the performance analysis, this paper presents indicators of productivity and the influence of the main countries, institutions and authors publishing in the JKM. The main indicators used were the number of articles, which represents productivity, and the number of citations that represent influence. In addition, the *h*-index is used, which is a composite index, which seeks a balance between the number of citations and the number of publications.

According to the results, this work shows that the USA and UK are strongly positioned and leads the publications in the JKM with the highest productivity and influence. Even so, both countries have decreased their publications in JKM in recent years. This is explained by the internationalization of JKM and by the increase in publications from new countries such as France, Italy, Malaysia or China, among others. At the continental level, Europe is widely dominant in the JKM, with 50% of the

most productive and influential universities and authors. In this sense, it is important to highlight the weak productivity of developing countries, such as Latin Americans. Therefore, in order to enrich the body of literature, JKM should devote efforts to promote the research of knowledge management in emerging economic contexts.

In relation to the analysis of the universities, it is observed that Cranfield University is the most productive institution and stands out for publishing in the first issues of the JKM. However, during the last ten years and according to the number of citations and the h-index, Griffith University has become a very influential institution in JKM. As for the authors, we can mention that Serenko and Bontis are the most productive and influential authors publishing in the journal. It is also worth noting that the JKM's most cited article, entitled "Motivation and barriers to participation in virtual knowledge-sharing communities of practice", was authored by Ardichvili, Page and Wentling. Finally, although this work highlights the authors of the most cited documents and the most productive authors who of JKM, many other authors from different parts of the world have published in the journal. Therefore, this work is also an acknowledgment to all the researchers who have collaborated in these 20 years of JKM.

To conduct the task of the science mapping analysis, this work uses VOSviewer software. This technique is more advanced than data counting techniques since it allows more sophisticated interpretation. This paper shows the publication structure of authors, universities and countries by using co-citation, bibliographic coupling, citation, co-authorship and co-occurrence of keywords. The results are consistent with performance analysis. In general, this analysis confirms that documents from the USA and UK are followed and cited by authors from countries, such as Australia, Spain, Italy, among other. This has made them the most influential countries in the JKM literature. It is also worth noting that JKM presents a high level of self-citation, although this practice is normal in most journals. Even so, some explanations for this phenomenon are, for example, the influence exerted by some leads researchers who have published in the journal (Riege, Serenko, Bontis, among others) and the leadership exercised by JKM in the KM field. Another issue, not less important, is to highlight the influence in JKM of some authors such as Nonaka, Takeuchi, von Krogh, Davenport,

among others. Many of the works of these authors (see, Davenport and Prusak, 1998; Nonaka and Takeuchi, 1995; Polanyi, 1966) are considered fundamental for the KM field. Finally, the mapping of science ends with a mapping of the most frequent keywords in JKM and the co-ocurrence between them. Although a temporary analysis by decade of the most used keywords in JKM is also presented. This analysis shows that the authors of the JKM publish on various topics related mainly to the general concept of "Knowledge Management". However, from a longitudinal science mapping perspective, this study shows that the authors have recently become interested in new topics, such as Knowldge Sharing, Knowledge Transfer, Innovation, Knowledge creation, among several others.

Finally, as in other studies, this paper has some limitations. First, the data are obtained from the Scopus database, whose limitations are transferred to this study. One of these limitations is, for example, 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. The science mapping made with the VOSviewer is 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 the science mapping allow us to conclude that there is no significant deviation between the two methods of counting. Still, it would be interesting to use other software, such as Histcite, Pajek, or SCiMat, which can deliver information complementary to the data delivered by this paper (Zhou et al., 2018). Third, the breadth of topics and disciplines in JKM has been evidenced. In this sense, some topics may receive more attention than others regardless of their relevance. Fourth, the different analysis about the authors are made based on their signature. However, over the years, some authors can sign their documents in different ways, and may produce important biases in this type of analysis. In practice, we suggest that researchers register on digital platforms, such as ORCID (Open Researcher and Contributor ID). This type of platform provides a unique digital identifier that would solve the aforementioned complications. Fifth, the change of institution of the authors or the double affiliation at the time of publication, could also generate difficulty when analyzing the data. In this study we have been cautious with these limitations. Finally, while the results give a picture of the current situation, the information presented in this study could change over time. In

fact, we have presented evidence that confirms the variation of the topics of interest in the journal's twenty years. Remember that some of the younger documents could include new topics or significantly increase your number of appointments over the years. Therefore, for future research, we recommend a periodic update of this study to improve the understanding of new trends in the JKM.

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Chapter 4

Ranking Web as indicator of knowledge diffusion: an Application for SMEs

4.1. Introduction

The increase in digital content and the improvements in information search tools have led the to the Internet and information being considered equivalent and interdependent concepts. In this sense, the Internet has become a source rich in opportunities and a useful tool for acquiring knowledge (Lankton, Speier, & Wilson, 2012; Willoughby, Anderson, Wood, Mueller, & Ross, 2009). In addition, the Internet strongly influences how its users make their everyday decisions. It is not surprising, therefore, that in the past five years, the total number of websites has increased by 600% (Internetlivestats, 2016). In this sense, the demand for access to information is likely to be influencing the growth of websites. On the other hand, in the past 10 years, Spaniards' demand for Internet connectivity has grown by 50%, and currently, 99.5% of small and medium enterprises (SMEs hereinafter) in Spain have access to the Internet (ONTSI, 2016). This last fact is relevant since it indicates that small Spanish companies have seen the potential benefits of adopting technologies such as the Internet.

In this sense, given the current dynamism of the market and the evolution of technologies, some authors have highlighted the importance of the Internet to SMEs, as it allows them to improve communication with their customers and suppliers, in addition to promoting their goods or services (Celuch, Bourdeau, Saxby, & Ehlen, 2014; Doherty & Ellis-Chadwick, 2003). However, the Internet's potential in companies seems to be more than a simple tool of communication, commercialization and publicity; it can also facilitate the acquisition of external knowledge, thus improving responsiveness and a company's competitive position (Liao, Welsch, & Stoica 2003).

The literature suggests that companies seek external knowledge to complement their own knowledge and increase their productivity and the quality of their innovations (Laursen, 2012; Leiponen & Helfat, 2010). Likewise, the literature recognizes the acquisition of external knowledge as a key resource in the recognition of opportunities and threats as well as in the development of new markets and technological capabilities (Lavie, 2006). However, the acquisition of this knowledge often involves additional investments (Cruz-González, López-Sáez, Emilio Navas-López, & Delgado-

Verde, 2014), which means that not all companies seek this knowledge. In this sense, and faced with the scarcity of resources or the need to access new knowledge, SMEs are being driven to self-acquire knowledge from different sources, among which the Internet plays a key role (Liao & Barnes 2015; Verona et al. 2006).

At present, a large number of both public and private organizations have been encouraged by Internet technologies, providing different types of information and knowledge online (Charband and Jafari Navimipour, 2016; Guodo Liu, 2000; Rufaro Chiware and Dick, 2008). These online information providers (OIPs) adopt diverse resources from the Internet, such as Web 2.0 applications, which allow the interchange of different types of knowledge through diverse formats, thereby offering companies ideal conditions to acquire them it (Patrakosol and Lee, 2013). The literature on knowledge management often makes a fundamental distinction between tacit and explicit knowledge[3], although it also focuses on other dimensions of knowledge, such as complexity, ambiguity, specificity and taxonomy of knowledge (Becerra, Lunnan, & Huemer, 2008; Lech, 2014). In relation to this last aspect, several types of knowledge have been recognized as functional for the organization, such as business-related, technical, company-specific, and institutional knowledge (Lech, 2014).

While the transfer of this knowledge is increasingly taking place through online media (Charband & Jafari Navimipour, 2016), there is evidence that SMEs have difficulty acquiring knowledge from the Internet (Ciborra & Andreu, 2001; Fang & Holsapple, 2007; Soto-Acosta, Perez-Gonzalez, & Popa, 2014). These difficulties are likely related to the characteristics of websites themselves and to the service provided by OIPs. Therefore, a key factor for OIP will be their ability to provide quality knowledge and use better

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[3] Tacit knowledge is defined as knowledge that is intuitive and is neither verbalized nor articulated. Explicit knowledge, on the other hand, can be structured, stored and distributed more easily (Becerra et al., 2008).

tools to enable a better knowledge acquisition experience. This will increase traffic on a company's website, and consequently, its ranking (Gold, Malhotra, & Segars, 2001; Liu, Spector, & Jex, 2005). However, research that examines the performance of OIPs from Web 2.0 applications and the diversity of knowledge deposited on websites is virtually non-existent. Therefore, the objective of this exploratory study is to examine the influence of the diversity of knowledge offered and the quantity of Web 2.0 applications used in the positioning of OIPs. In addition, the positioning can be used as an indicator of the behavior of entrepreneurs when it is involved in online activities (Benbunan-Fich & Fich, 2004; Yang, Pan, & Song, 2014). Thus, this study could shed light on some factors that facilitate the acquisition of knowledge of SMEs from the Internet. To carry out our research, we have identified diverse types of knowledge in each of the OIPs. Some studies have shown a significant influence on the growth of new and small enterprises (Burgers, Van Den Bosch, & Volberda, 2008b). Hence, the most relevant types of knowledge in SMEs are market knowledge, technology and internationalization (Musteen, Datta, & Butts, 2014). In addition, at each of these sites we have identified several AW (Social Networks, YouTube, Blogs, Forums, RSS, among others) that are used to promote the dissemination of this knowledge (Chua, Goh, & Ang, 2012).

Using the methodology of Binary Logistic Regression, we evaluate two models that estimate the probability that OIPs have a better Web positioning. The first model generally examines the effect of OIPs providing a greater diversity of knowledge through a considerable amount of AW. The results are in line with what we expected and indicate that a greater diversity of knowledge (AK) and Web 2.0 applications (AW) influences the positioning of the OIPs. On the other hand, the second model assesses the influence of each type of knowledge and Web 2.0 applications in the Web positioning of the OIPs specifically. The results indicate that technological knowledge and applications such as blogs, YouTube and forums are the most influential in the positioning of OIPs.

The remainder of this article is structured as follows. In the second section, we elaborate on the theoretical framework, based on the perspective of the knowledge and the Internet technologies; we also establish the theoretical relations, after which the hypotheses are formulated. In the third section, we

present this study's methodology, describe the data and the sample used for the analysis. In the fourth section, we present a discussion of the results. Finally, the last section presents the conclusions, implications and future lines of research.

4.2. Theoretical Framework and Hypothesis

The previous literature indicates that scarce resources have driven new, small and medium-sized enterprises to acquire knowledge from external sources (Lavie 2006; Soto-Acosta &Perez-Gonzalez, Daniel Popa 2014; Liao & Barnes 2015). According López et al. (2010), some external sources of knowledge may be customers, suppliers, partners, competitors, etc. However, other authors, such as Lankton et al. (2012) and Reychav and Aguirre-Urreta (2013), have also considered the Internet to be an important external source of knowledge, since a significant number of organizations use it to provide a wide variety of information, which we identified as OIPs in our investigation.

Business information has traditionally been produced and controlled by authorized institutions and persons, such as government agencies, publishing companies, and academic organizations (Guodo Liu, 2000). However, the development of the Internet has allowed access of new actors who are willing to invest time and money to provide information of the highest possible quality (Okello-Obura, 2015). The Internet has pushed many of these OIPs to play a more proactive role in the production and provision of information (Mole, Hart, & Roper, 2014), using a variety of formats and Web 2.0 applications that aim to improve their competitiveness (Alijani, Mancuso, Kwun, & Topcuoglu, 2014; Guodo Liu, 2000). This has generated interesting competition among OIPs that seek to benefit from the creation of business links (Geigenmuller, 2010), support industrial sectors (European Commission, 2015) and influence user behavior (Mangold and Faulds, 2009). Like any organization, OIPs aim to build and sustain competitive advantage over time. According Porter (2001), companies can achieve sustainable competitive advantage by focusing on "operational efficiency" and "distinctive strategic positioning". In this sense, operational efficiency is "doing the same things as your competitors, but making them better". On the other hand, strategic positioning not only involves doing things differently

than competitors, but also developing and offering a unique value to the target market.

Although Web positioning depends on various factors, such as design, functioning, clarity, theme, number of links, among several others (Morato, Sánchez-Cuadrado, Moreno, & Moreiro, 2013; Perez Rodríguez & Cutín Domínguez, 2005), in this study we suggest that OIPs use Web 2.0 applications as tools to achieve operational efficiency and that the distinctive positioning would be given by the diversity of knowledge offered through of the Web and the number of Web 2.0 applications used to disseminate this knowledge.

In the next section, we will refer to the literature that links Internet technologies and knowledge management and then focus on the types of knowledge that the literature identifies as relevant for SMEs and for new companies.

4.2.1. Internet and Web 2.0 Applications

The use and exploitation of the Internet initially focused on providing information and facilitating online communications. However, as companies gained experience with the new medium, they realized that the interactive nature of the Internet offered a more important attribute for distributing knowledge to users (Seybold & Marshak, 1998). Wulf and Zarnekow (2010) note that the rapid growth of the Internet has not only changed the way business is done but has had a major impact on how business knowledge is provided and used.

On the other hand, in recent years, the development of Web technologies has led to the increased development of certain applications that are based on interaction among users, thus changing the traditional ways of using the Web (Chua et al., 2012; Shang, Li, Wu, & Hou, 2011; Zeng, Gonzalez, & Lobato, 2015). Platforms that facilitate interactivity among Internet users have been called "Web 2.0 Applications" (O'Reilly, 2007). These applications are not a technology as such, but they are services made with open Internet-based technologies and standards (Paily, 2013). They also allow users to exchange information, express thoughts and reconfigure existing knowledge, which

enhance acquisition of new and improved knowledge (Colomo-Palacios, Casado-Lumbreras, Soto-Acosta, & Misra, 2012; Yan Xin, Ramayah, Soto-Acosta, Popa, & Ai Ping, 2014).

In this sense, Sun and Yang (2015) note that knowledge can be acquired in a new way through these applications, since they facilitate the interaction among a greater number of users, changing the way they communicate, learn and share their knowledge.

These applications include blogs, wikis, forums, RSS, YouTube, and social networks (Razmerita, Kirchner, & Sudzina, 2009). According to some authors, the adoption of these applications brings significant benefits to companies (Soto-Acosta, Popa, & Palacios-Marqués, 2017; Zeng et al., 2015), such as a better relationship with users (Andriole, 2010), customer satisfaction (Sharma & Baoku, 2013), better understanding of the market (Barua, Konana, Whinston, & Yin, 2004), and better knowledge management and organizational learning (Argote, 2011). The next section presents the Web 2.0 applications that have been selected for this research.

4.2.1.1. Web 2.0 Applications

<u>*Online Social Networks (OSNs):*</u>

Online social networks (OSNs hereinafter) are an important part of the paradigm shift in communication over the Internet. Their use has exploded and continues to grow at an exponential rate (Cheung, Chiu, & Lee, 2011). OSNs are virtual communities that allow people to connect and interact with each other on a particular topic, but they also allow users to actively create knowledge and exchange it, instead of passively consuming it through more traditional media (Arnaboldi, Conti, La Gala, Passarella, & Pezzoni, 2016). On the other hand, OSNs are generating "collective knowledge" by becoming a source of knowledge diffusion (Bilgihan, Barreda, Okumus, & Nusair, 2016).

YouTube:

YouTube is an application that allows the publication and exchange of videos generated by users, providing a large multimedia library for learning (Godwin-Jones, 2007). This tool has been recognized especially among academic and governmental organizations for its potential for learning by users (Chiang & Hsiao, 2015).

Blogs:

Blogs have been increasingly recognized as one of the most popular Internet technologies for education (Chu, Chan, & Tiwari, 2012), as well as one of the main methods for the exchange of knowledge (Hsu & Lin, 2008). Blogs have facilitated the production and distribution of content online, especially through connectivity between users who share a common interest (Witteman & Zikmund-Fisher, 2012). Although it is considered a tool that helps to improve a company's relationships and reputation, an organization's dynamics are considered a determining factor in the adoption of this application (Wu, Kao, & Lin, 2013).

Forums:

Research conducted on online forums has focused mainly on people's motivations to share and seek information, and in the exchange and management of knowledge (Phang, Kankanhalli, & Sabherwal, 2009; Wasco ã Faraj, 2005). In this sense, we can highlight the business field, where forums have provided platforms for the exchange of information between different groups of people with common interests on different aspects of a company, such as innovation in products and services, public and labor policies, integration within the community, etc. (Zimbra, Chen, & Lusch, 2015).

Really Simple Syndication (RSS):

This is a free software license application (Pandya & Poluru, 2012) that allows its users to subscribe and automatically access new Web content without the need to visit the original site. To access the content, however, the

consumer must follow a hyperlink that will derive to the information updated (Barsky, 2006).

The literature tends to study web positioning from different perspectives. First, there are studies that analyze the influence of web positioning on the success of (.com) dot-com companies. In this line, studies such as Trueman et al. (2001) analyze the relationship between web positioning and company revenues, or Serrano-Cinca et al. (2005), who analyze the influence of web traffic on financial results. Other studies such as Yang et al. (2014) use web positioning data to predict the demand for hotel companies that use the Internet to advertise. Second, other studies analyze the influence of the characteristics of dot-com companies in their web positioning. For example, Morato et al. (2013) analyze the influence of both the internal and external factors of web organization on web positioning. Despite these previous studies, there is still a shortage of research examining the efficiency of OIPs' websites from the use of the Web 2.0 applications. In this sense, these organizations have the common objective of building and sustaining competitive advantage through their Web positioning. Thus, our research suggests that the adoption of Web 2.0 applications is one of the ways in which OIPs achieve "*distinctive strategic positioning*". Hence, we propose the following hypotheses:

> **Hypothesis 1.** *OIPs that use a large number of Web 2.0 applications are more likely to obtain a better Web positioning.*

4.2.1.2. Knowledge perspective

The literature based on knowledge has been showing interest in the sources of new knowledge for companies. Knowledge is a critical resource that gives companies a competitive edge (Gorman, 2002; Grant, 1996) in an increasingly competitive and dynamic economy. The importance of knowledge acquisition lies in the fact that this asset can be the most important resource in obtaining organizational performance. Companies use two main sources of knowledge. First, we find internal knowledge, which is the knowledge existing in the company that includes knowledge of employees, company values, databases, procedures, organizational routines and technological development efforts, the latter of which materialize in the form

of patents and trademarks (Marco-Lajara, Zaragoza-Sáez, Claver-Cortés, & Úbeda-García, 2016). Secondly, we find external knowledge, which lies beyond the boundaries of the company. The acquisition of knowledge from external sources has been recognized a fundamental means for reconfiguring the knowledge and internal capacities of the company; therefore, it is a relevant tool to achieve a strategic renewal of the company (Gray & Meister, 2006; Lavie, 2006). Companies use different sources to acquire and integrate external knowledge to the company; among these, customers, suppliers, competitors and universities stand out (Hussinger & Wastyn, 2016). However, as a result of technological advances, the Internet is currently considered a promoter of relations between companies and an enabler of the acquisition of external knowledge (Eng, 2004; Lankton et al., 2012; Panahi, Watson, & Partridge, 2013).

Some studies recognize that a company's performance can be explained from the acquisition of various types of knowledge. Although there are various classifications of knowledge in the literature (Sudhindra, Ganesh & Arshinder, 2014), our study focuses specifically on technological knowledge, market knowledge and internationalization knowledge (Sullivan & Marvel, 2011; Voudouris, Dimitratos & Salavou, 2011), since they exert a significant influence on the growth of new and small enterprises (Sullivan & Marvel, 2011; Voudouris et al., 2011). Some studies have emphasized that these types of knowledge allow companies to identify and exploit new product or market opportunities (Burgers et al., 2008b). However, studies examining the different sources used by companies to acquire this knowledge are rather scarce. We suggest that these types of knowledge can be acquired through external sources, such as the Internet. Each of them is detailed below.

Technological Knowledge

Technological knowledge refers to the degree of knowledge an entrepreneur possesses about products, technologies and organizational processes, and which are relevant to his business (Burgers et al., 2008b). The acquisition of this type of knowledge will enable the development of skills and competencies that will help companies achieve competitive advantages. In this sense, the acquisition of technological knowledge is considered a critical factor for growth, because it will allow companies to respond to the actions

of competitors and the rapid evolution of market needs, even in international markets (Clarysse, Wright & Van de Velde, 2011; Sullivan & Marvel, 2011). In addition, technological knowledge can serve as a basis for the development of new products, materializing in technologically new or improved products in existing markets (Marvel & Lumpkin, 2007). Finally, the acquisition of this knowledge lies in the ability of the entrepreneur to use it properly. According to Nonaka and Takeuchi (Nonaka & Takeuchi, 1995), this capability can be the difference between success and failure for a company.

Market Knowledge

Market knowledge provides entrepreneurs with the ability to adequately service customers, since they provide detailed information on preferences, distribution channels and most efficient manufacturing procedures (Danneels, 2002). In addition, this type of knowledge is necessary for selecting and responding to the needs of a specific market, which can positively influence the exploration of opportunities and the marketing of new products (Burgers, Van Den Bosch & Volberda, 2008a; Shane, 2000). Other authors note that market knowledge is associated with the understanding of the internal culture, institutional frameworks of government, norms and internal market regulations. (Eriksson, Johanson, Majkgård & Sharma, 1997; Fletcher & Harris, 2012). Therefore, this knowledge can help small businesses counter their own complexities, which are being affected by disruptive and dynamic environments (Wiklund & Shepherd 2003; Marvel & Sullivan 2011a).

International Knowledge

The knowledge necessary to carry out cross-border operations has been identified as knowledge of internationalization (Sandberg, 2014). Some researchers believe that international knowledge refers to knowledge as it relates to customers, competitors and conditions in foreign markets, well as technical knowledge in adapting their resources and capabilities for participating in international operations (Musteen et al., 2014; Zhou, 2007). In addition, this type of knowledge is related to the understanding of the norms, regulations and culture of foreign markets. According to Sandberg

142

(Sandberg, 2014), companies that have this knowledge will have an advantage compared to those that do not, as it will allow them to explore and exploit opportunities in new international markets allowing them to improve their competitive position (Voudouris et al. 2011).

In general, the acquisition of this knowledge is relevant for the performance and competitiveness of new and small enterprises. When companies do not have this knowledge, they can access it from the resources available in the OIPs (Khedhaouria & Jamal, 2015). However, the availability of this knowledge differs between OIPs, and it is likely that users (companies) require a service that provides a greater variety of knowledge. We suggest, therefore, that the Web positioning of OIPs will depend on the quantity and variety of knowledge offered. Therefore, we propose the following hypothesis.

> **Hypothesis 2.** *OIPs that offer a greater amount of knowledge are more likely to obtain a better Web positioning.*

4.3. Research Methodology

4.3.1. Sample Collection

In this study, the sample was obtained between June and November 2015. We focus on both public and private Spanish organizations that offer information and knowledge focused on SMEs and new companies through of Internet. Based on the above, the selection of websites was made based on the following steps. First, we have used three specific search engines (Google, Yahoo and Bing) during four weeks of manual search. These search engines are considered the main ones in Spain and Europe (Ángel, 2012; Zhao & Tse, 2011). For this, the following keywords were used: "Information for SMEs and Entrepreneurs", "Knowledge for SMEs and Entrepreneurs", "Support for Entrepreneurs", "ICT for Entrepreneurs", "Free Consulting for Entrepreneurs", "Forum for Entrepreneurs", "Help to Entrepreneurs" and "Online Tools for Entrepreneurs". Second, search was automated to complement the manual search procedure and to capture new cases. For this task, an alert system provided by the search engines was used. This sends email notifications, with web links related to the entered keywords.

Subsequently, each of the notifications and its respective links were evaluated to determine whether they corresponded to the purpose of the investigation. At the end of both search processes, we obtained 267 OIPs that fit our search criteria.

Subsequently, the OIPs were analyzed over the next four months - July to October 2015. For this, a three-step content analysis was used (Krippendorff, 2013). First, specific information was sought from each OIP. To that end, the whois.com portal provided detailed information on the year of registration of the website and the expiration date. All websites that had an expiration date in the first three months of 2016 were excluded. Second, the next objective was to assess the content and knowledge, excluding all websites that involved paying a cost to access them. Third, we analyzed the types of knowledge and Web 2.0 applications available. For this, two researchers checked each of the hypertexts to analyze and classify the types of knowledge contained in websites. In addition, this determined the presence of various Web 2.0 applications. Specifically, we focused on verifying whether the websites had blogs, Really Simple Syndication (RSS), forums, YouTube, or some social networking service (e.g., Facebook, Twitter, LinkedIn, etc.). When the search function was available on the website, keywords such as "blogs", "RSS" and "forums" were entered to finish checking for Web 2.0 applications. Finally, after the analysis of content, the final sample was established in 203 cases.

4.3.2. Description of Variables

Dependent variable

The dependent variable in our research is the probability that the OIPs have a good position in the web ranking. To estimate the positioning of each OIP in the network, the Alexa.com portal was used. This is a web traffic crawler that uses traffic and reach to provide objective data on the reputation and ranking of each site according to three categories: global, country and other. This crawler has been used in previous studies to evaluate how effective companies have been in attracting customers to their sites (Callaway, 2011; Onaifo & Rasmussen, 2013). The values of the ranking are listed in ascending order, where the lowest values show the best positions. Although there is no consensus on which values indicate the best positions in the Alexa ranking,

144

some websites give information about it. For example, "centroseo.com/lexa" (Altec Line S.L.U, 2015), indicates that websites ranking in the range of 1 - 100,000 presume good positioning. In the same way, the blog "socialmediacm" (Vela, 2013), notes that values below 500,000 indicate a good web position. Based on this information, we assume that the best positioned sites are those that achieve values below 350,000 in the Alexa global ranking.

Based on these affirmations, a dependent variable (GR) was created, in which the value 1 was assigned to those websites that were better positioned, i.e., those that were below the 350,000 Alexa ranking, and 0 was selected for information about websites that are higher than 350,001 in the Alexa ranking.

Independent variables

Web 2.0 Applications

The Web 2.0 applications that were considered in this study were YouTube (YT), blogs (BG), forums (FR), Really Simple Syndication (RSS) and social networks (OSNs). Each of these variables is dichotomous, distinguishing between OIPs that use these applications and those that do not. On the other hand, to evaluate the first model, a variable (AW) was constructed through the arithmetic sum of the amount of AW used in OIPs. That is, AW = RS + YT + BG + FR + RSS (See Table 4.1). The second model evaluates the influence of each of the AW in the Web positioning of the OIPs.

Types of Knowledge

The types of knowledge considered in this study are technological knowledge (KT), market knowledge (KM) and internationalization knowledge (KI). Like AWs, each of these variables is dichotomous, distinguishing between those OIPs that have such knowledge and those who not. Additionally, to evaluate the first model, a continuous variable (AK) was constructed, which is the result of the arithmetic sum of the types of knowledge available in the OIPs. That is, AK = KT + KM + KI. The second model evaluates the specific influence of each type of knowledge on the Web positioning of OIPs.

Control Variables

Both models also included a series of variables to control their possible effect on the Web positioning of OIPs. The EX variable is a continuous variable that represents the domain age of OIPs on the Internet. These data were obtained from the difference between the current operating year (2015) and the creation date indicated in the host record. This variable has been suggested as an important factor in the ranking or Web positioning of a site, since it transmits more confidence than the new domains (Evans, 2007). On the other hand, the square of these values was included to capture possible nonlinear relationships (Harrell, 2001). Another dichotomous variable - UF - has been included, which determines whether the OIPs have a "physical location" for public attention. To do so, the researchers checked whether there was a geographical location in the hypertext contact or information on the website. Finally, the EP variable is another dichotomous variable that differentiates between those OIPs belonging to private companies (1) and those that have a direct link with the government (0). To obtain this information, each OIP was reviewed as it relates to the different Web sections that provided information about the organization, such as "who we are", "our company", etc. In this sense, logos were also key promoters of each OIP.

Econometric Model

To identify the influence of the independent variables on our dependent variable, we will use a logistic regression methodology estimated by maximum likelihood (Greene, 2003). In this study, we analyze two Logit models. The first evaluates the influence of the amount of knowledge (AK) and Web 2.0 applications (AW) in the Web positioning of the OIPs. The second one aims to analyze the specific influence of each type of knowledge and each of the AW in the Web positioning of OIPs. Accordingly, the empirical models of our study are as follows.

146

Likelihood of GR=

$$\beta_0 + \beta_1 AW + \beta_2 AK + \beta_3 UF + \beta_4 EXP + \beta_5 EP + e;$$

Model 1

Note:

AW = OSNs + YT + BG + FR + RSS;
AK = KM + KT + KI

Likelihood of GR=

Model 2

$$\beta_0 + \beta_1 OSNs + \beta_2 YT + \beta_3 BG + \beta_4 FR + \beta_5 RSS + \beta_6 KM + \beta_7 KT + \beta_8 KI + \beta_9 EXP + \beta_{10} UF + \beta_{11} EP + e$$

4.4. Results

Table 4.1 shows the descriptive statistics and correlations corresponding to variables used in Models 1 and 2. One limitation that could occur is multicollinearity, which according to our correlation matrix does not seem to be a problem (see Table 4.1), since none of the correlations appears to be high (Rajalahti &Kvalheim, 2011). In addition, we have obtained the values corresponding to the inflation factor of the variance of the variables (VIF); in all cases, they were less than 10. Therefore, in both correlations it was confirmed that there is no collinearity between the variables (Kleinbaum, Kupper, & Muller, 1988).

The results of both models are presented in Table 4.2. The chi-square test of the models is significant (p <0.01). On the other hand, the Hosmer and Lemenshov test, which measures the correspondence between the actual value and the predicted value of the dependent variable, is not significant in any of the models, indicating a good adjustment of these (Amorós & Basco, 2016). Other statistics indicating a good fit of the models are Nagelkerke and Pseudo-R2 with values of 0.387 and 0.464 in models 1 and 2, respectively. On the other hand, the percentage of selected cases is 86.2% in model 1 and 86.7% in model 2. Therefore, the indicators showed support for the ability of both models to predict the influence of knowledge variables and Web 2.0 applications on the Web positioning of OIPs.

Table 4.1. Descriptive statistics and correlation matrix

	Mean	SD	GR	AW	AK	RS	YT	BG	FR	RSS	KM	KT	KI	EX	UF	EP
1. GR	0.275	.448	1													
2. AW	2.29	1.277	.594***	1												
3. AK	1.45	.653	.247***	.167**	1											
4. OSN	0.812	.391	.154**	.535***	.159**	1										
5. YT	0.463	.499	.377***	.648***	.127*	.293***	1									
6. BG	0.408	.492	.450***	.620***	.036	.142**	.192***	1								
7. FR	0.128	.335	.324***	.040***	-.062	.032	.087	.161**	1							
8. RSS	0.477	.500	.358***	.602***	.182***	.130*	.179**	.187***	.105	.1						
9. KM	0.866	.340	-.082	.021	.227***	.035	.101	-.028	.063	-.090	1					
10. KT	0.418	.494	.369***	.229***	.650***	.125*	.052	.147**	-.026	.307***	-.373***	1				
11. KI	0.167	.374	.0183*	-.029	.679***	.080	.059	-.104	-.132*	-.006	-.018	.154**	1			
12. EX	6.172	4.650	.088	.038	.060	-.036	.040	.027	.084	.002	.061	.045	-.011	1		
13. UF	0.576	.495	-.028	.054	.014	.125*	.176**	-.057	-.059	-.038	-.100	.020	.090	.132*	1	
14. EP	0.738	.440	.115*	.135*	-.016	.031	-.010	.197***	.093	-.074	-.034	.049	-.063	.002	-.146**	1
VIF			1.88	1.58	1.07	1.14	1.34	1.32	1.18	1.22	1.23	1.49	1.08	1.05	1.13	1.07

*** Significant at .01 level; ** Significant at .05 level; * Significant at .1

Table 4.2. Results of Logistic Regression Analysis Models 1 and 2

Independent variables	MODEL 1					MODEL 2				
	Dependent variable: 1 = Good positioning of the OIP; 0 = Poor Web positioning of the OIP									
	β	S.E	Wald	Sig.	Exp (β)	β	S.E	Wald	Sig.	Exp (β)
Number of Web 2.0 Applications *(AW)* – **H1**	1.463	.218	6.70	.000***	4.321					
Web 2.0 Applications										
OSNs						-.037	.692	-0.05	.957	.963
YT						1.820	.511	3.56	.000***	6.175
BG						1.924	.493	3.90	.000***	6.854
FR						2.621	.698	3.76	.000***	13.762
RSS						.872	.486	1.79	.073*	2.393
Number of Knowledge *(AK)* – **H2**	.737	.299	2.46	.014**	2.090					
Knowledge Types										
KM						-.313	.677	-0.46	.643	0.730
KT						1.928	.553	3.48	.000***	6.881
KI						.657	.644	1.02	.307	1.930
Control Variables										
EX	.166	.153	1.09	.278	1.181	.213	.176	1.21	.225	1.238
UF	-.316	.436	-.73	.468	.728	-.339	.514	-.66	.509	.712
EP	.438	.515	.85	.395	1.550	.305	.568	0.54	.591	1.357
EX^2	.-005	.007	-.73	.467	.994	-.008	.009	-0.96	.337	.991
Con	-6.87	1.175	-5.85	.000***	.001	-5.527	1.283	-4.31	.000***	.003
Statistical Information										
-2 log likelihood			-73.514					-64.008		
χ^2			92.59***					111.12***		
(df)			(6)					(12)		
Nagelkerke Pseudo-R^2			.387					.464		
Overall predicted accuracy %			86.21					86,70		
Nº Obervations			203					203		

*****Significant at the 0.01 level; ****Significant at the 0.05 level; *Significant at the 0.10 level.*
AW (Web 2.0 Applications): OSNs = Social Networks; YT = YouTube; BG = Blog; FR = Forum; RSS = Really Simple Syndication
Knowledge Types: KM = Market Knowledge; KT = Technological Knowledge; KI = Internationalization Knowledge;
Control Variables: EX = Experience; UF = Physical Location; EP = Private Web Portal.

According to Model 1, the results indicate that the Web 2.0 application variable (AW) is positive and significant (β = 1.463; Sig. <0.000). This suggests that OIPs that use a greater number of Web 2.0 (AW) applications are more likely to have a good Web positioning. Therefore, these results support Hypothesis 1 of our research. In the same way, the variable AK, which indicates the amount of knowledge deposited in websites, is positive and significant (β=0.737; Sig. <0.05). This indicates that OIPs offering a wide range of content are more likely to be well positioned on the Web. Therefore, our results support Hypothesis 2.

On the other hand, we wanted to analyze the specific influence of each of Web 2.0 application (AW) and the types of knowledge (AK) in the positioning of OIPs in greater detail. The results of Model 1 generally

indicate that Web 2.0 applications are important for the positioning of OIPs. However, Model 2 indicates that not all Web 2.0 applications influence our dependent variable in the same way. Social networks (OSN), for example, do not seem to be relevant in the web positioning of OIPs (β = -. 037; Sig.> 0.1). Other variables tested in Model 2 that were positive and significant were YouTube (YT) (β = 1,820, Sig. <0.000), blogs (BG) (β = 1.924; Sig. <0.000) and forums (β = 2.621; Sig. <0.000). In addition, it was found that the RSS (Really Simple Syndication) variable has a positive and significant relationship at 10% (β = .872; Sig. <0.1). Thus, we could indicate that it also moderately influences the positioning of the OIPs.

Finally, our results related to the types of knowledge indicate that the technological knowledge variable (KT) has a positive and significant relationship (β = 1,928; Sig. <0.000). However, the variables market knowledge (KM) (β -.313; Sig.> 0.1) and knowledge of internationalization (KI) (β = .657; Sig.> 0.1) do not influence the positioning of OIPs.

Table 4.3 summarizes and shows the main empirical results derived from this study.

Table 4.3. Summary of Results on Hypothesis

Model		Hypothesis	Variable	Impact
MODEL 1	Number of Web 2.0 Applications	**Hypothesis 1.** OIPs that use a large number of Web 2.0 applications are more likely to obtain a better Web positioning.	AW	Significant
	Number of Knowledge	**Hypothesis 2.** OIPs that offer a greater amount of knowledge are more likely to obtain a better Web positioning.	AK	Significant
MODEL 2	Social networks	OIPs that use OSNs as a means of transfer information, they are more likely to obtain better Web positioning.	OSN	Not significant
	YouTube	OIPs that use YouTube as a means of transfer information, they are more likely to obtain better Web positioning.	YT	Significant
	Blogs	OIPs that use Blogs as a means of transfer information, they are more likely to obtain better Web positioning.	BG	Significant
	Forum	OIPs that use Forums as a means of transfer information, they are more likely to obtain better Web positioning.	FR	Significant
	RSS	OIPs that use RSS as a means of transfer information, they are more likely to obtain better Web positioning.	RSS	Partially Significant
	Market Knowledge	OIPs that transfer market knowledge, these have more likely to get a better Web position.	KM	Not significant
	Technological Knowledge	OIPs that transfer technological knowledge, they are more likely to obtain better Web positioning.	KT	Significant
	Internationalization Knowledge	OIPs that transfer knowledge of internationalization, they are more likely to obtain a better Web positioning.	KI	No Significant

Source: Own elaboration

4.5. Discussion, Conclusions and Limitations

Organizational learning and, by extension, knowledge acquisition are relevant factors for the growth and success of companies. A key aspect of the literature on the acquisition of knowledge has been the identification of the different sources of knowledge used by SMEs (Cooper, Folta, & Woo, 1995). In this sense, Fuellhart and Glasmeier (2003) note that most SMEs or start-ups are opportunistic in their information search behavior, leaning heavily towards those sources that can be accessed with few resources or additional effort apart from normal business activities (Kim, Lee, & Lee, 2013).

OIPs are both public and private organizations that offer information and knowledge to smaller companies, which have increased considerably with the emergence of the Internet and the development of Internet technologies (Rufaro Chiware & Dick, 2008). These companies have benefited from the characteristics of the Internet, because they allow a more appropriate exchange of information, which in turn allows for collaboration and knowledge sharing, even between organizations (Lopez-Nicolas & Soto-Acosta, 2010). Today, OIPs have a large number of resources on their sites, which can be obtained in simply, quickly and free of charge, thus meeting the needs of smaller companies. In this sense, the adoption of the Internet and its technologies is further closing the resource gap between large and small enterprises (Kim et al., 2013).

Our study has sought to analyze the types of knowledge and Web 2.0 applications that influence the positioning of the websites of information and knowledge services companies that focus on SMEs and new companies. Some of the main results are analyzed below.

4.5.1 Discussion about Web 2.0 Applications

Firms in general are adopting more current technologies such as Web 2.0, which incorporate social networks, wikis, forums and blogs, among others. Although they have clear potential for improving customer interaction (Sherwood & Nicholson, 2013), there is a clear tendency among companies to use these applications for the exchange of knowledge (Lim, Trimi, & Lee, 2010). Our results indicate that the web positioning of the OIPs is related to

the number of applications used on their sites (Hypothesis 1). This result may be supported by previous studies. For example, Soto-Acosta et al. (2014) note that companies are increasingly adopting Web 2.0 technologies, since they facilitate the production, incorporation and distribution of different online content. In this sense, Web 2.0 has changed the nature of the Internet, bringing with it a variety of initiatives based on the interaction of users who generate and transfer different content that can be useful for SMEs (Kim et al., 2013). Our results indicate that OIPs using more Web 2.0 applications are more frequently visited. It is likely in this sense that entrepreneurs prefer to use OIPs that allow them to acquire knowledge interactively through different Web 2.0 applications. However, we agree that these discussions are based on assumptions that should be clarified in future empirical studies capable of corroborating the characteristics of the OIPs that SMEs take into account to acquire the knowledge.

Model 2 aimed to detail the specific influence of each of the applications on the probability that OIPs have a good positioning on the web. In this sense, the results of Model 2 do not seem strange to us. In relation to the variable YouTube (YT), there are diverse opinions. For example, Hendrik and Ingenhoff (2015) note that this application does not seem to play an important role in communication management. However, Payne et al. (2011) note that YouTube is an appropriate application for acquiring knowledge. Despite these contradictions in the literature, our results indicate that the variable YT influences the positioning of websites, so we believe it has the potential to be considered a source of important business knowledge. On the other hand, the variable corresponding to blogs (BG) was positive and significant in Model 2. This indicates that the OIPs that incorporate blogs between their applications obtain a better web positioning. This result is supported in several studies that recognize blogs as useful tools, not only for the exchange of knowledge within companies (Baxter & Connolly, 2014), but between different organizations. In this sense, Yates (2016) notes that blogs have allowed organizations to be lightly connected, allowing them to find the knowledge needed to implement it quickly in their decision-making. Therefore, this application has the potential to improve firms' competitiveness.

Our variable corresponding to the use of online forums (FR) also proved to be significant in Model 2. Online forums, such as blogs, are websites that can be useful for sharing diverse knowledge interactively (Barker, 2015). This result can be supported by recent studies such as Kuhn et al. (Kuhn, Galloway, & Collins-Williams, 2016), who found that 71% of entrepreneurs surveyed had received some kind of help through online forums. However, the empirical evidence on the acquisition of external knowledge from online forums is astonishingly scarce, making it a subject that should be explored in the future.

The RSS variable is also partially significant in our model. The RSS application can be used to keep users informed of changes that are made to the content of websites without having to re-visit them. RSS sources are also used to meet the information needs of users. Although there is evidence that applications such as RSS are important for facilitating access to knowledge (He and Zha, 2014), we suggest that the result in our model is a consequence of the fact that this application is in an early stage of diffusion (Corrocher, 2011).

On the other hand, the OSN variable related to social networks does not influence our dependent variable. It is likely that this result is a consequence of the organizations' attitudes toward the use of social networks. In this sense, there are some studies that could support these results. For example, Skeels and Grudin (2009) examine the behavior and attitudes of staff toward the use of social networks. Their results revealed that some directors considered social networks to be an inadequate communication tool in their companies. Other studies have indicated that social networks are applications of a personal nature, making it difficult to transfer information at the enterprise level (DeNardis & Hackl, 2015). However, it is likely that the result obtained in our model is due to the fact that the variable does not adequately represent the social networks most used by OIPs. In fact, this variable was constructed by determining whether OIPs used at least one type of social network. Therefore, future studies should take these considerations into account and corroborate whether small firms actually acquire knowledge from social networks is an area that requires further research.

4.5.2 Discussion on Types of Knowledge

Model 1 sought to examine the influence of the amount of content or knowledge on the web positioning of OIPs. In this sense, our results seem to support our forecasts about the strategic positioning of these companies. That is, as OIPs offer a greater diversity of knowledge, they are likely to obtain a good Web positioning (Hypothesis 2). The lack of resources of small and new companies continually drive them to acquire new and diverse external knowledge (López-Sáez et al., 2010), and Internet technologies seem to be a good way to do this. However, the identification of high quality knowledge will be a challenge for companies due to the abundant and variable nature of knowledge and to the open and collaborative philosophy of the Internet (Yoo, 2014). In this sense, it is advisable that the OIPs focus equally on providing quality knowledge that is truly useful for entrepreneurs. This activity will be fundamental for offering a greater value to the client and obtaining a better Web positioning.

On the other hand, Model 2 sought to examine the specific influence of each type of knowledge on the Web positioning of OIPs. Our results indicate that the variable related to technological knowledge (KT) was the only significant one. This knowledge is related to the development of products, application of new technologies and organizational processes (Burgers et al., 2008b), and is particularly important in business innovation (Clarysse et al., 2011). Governments have fomented innovation among small enterprises, as the adoption of these strategies contributes to economic development and wealth creation (Guijarro, Garcia, & Auken, 2009). It this sense, is likely in that entrepreneurs seek to acquire technological know-how through OIPs that will allow them to continue to innovate through the development of new products and thus be more competitive (Deligianni, Voudouris, & Lioukas, 2015). This could be an important explanation of our results. The variables related to market knowledge and internationalization (KM, KI) do not influence our model. In this regard, we suggest that entrepreneurs can use other external sources, such as academic institutions, industry associations and consultants, as well as government agencies, clients and suppliers to acquire this knowledge (Kong, 2015).

Regarding the control variables, none of them influences the model. However, from the descriptive statistics of our sample, we found it interesting to note that public and private OIPs increased by 72% and 64%, respectively, since the beginning of the crisis in 2008. This is likely to be a response from both the government and private companies facing the reduction of innovation activities of Spanish SMEs as a result of the crisis (Madrid-Guijarro, García-Pérez-de-Lema, & Van Auken, 2013). Following these results, we suggest that the flow of information and knowledge in times of crisis could be an interesting topic to investigate.

4.5.3 Limitations

Like all investigations, our study presents some limitations. First, our sample focuses on OIPs in the Spanish context. Therefore, our results cannot be taken as a reflection of what happens in other countries for several reasons. For instance, the processes of knowledge acquisition of Spanish entrepreneurs may be different from the processes carried out by entrepreneurs from other countries (Magnier-Watanabe & Senoo, 2010). Additionally, the usability rates of ICTs and Internet technologies vary considerably among countries (Chinn &Fairlie, 2010; Lee, Nam, Lee, & Son, 2016). Therefore, the factors influencing the Web positioning of Spanish OIP may be quite different in other less developed countries. Second, our study has focused on the diffusion of three specific types of knowledge that exert a significant influence on the growth of smaller firms (Deligianni et al., 2015). It would be desirable for future studies to empirically examine the role of Internet tools in acquiring these and other types of knowledge. Finally, in this study, we have analyzed both public and private OIP in the same sample. Therefore, a comparative study between these two types of organizations could be interesting to realize.

Some of the implications of this research are mainly aimed at those in charge of managing public and private OIP to generate contents of greater utility and quality (Ho, Kuo, & Lin, 2012; Panahi et al., 2013). It is also likely that this research will help focus efforts of the OIPs on the use of Web 2.0 applications that are actually used by Spanish SMEs.

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157

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Chapter 5

The effect of ICTs on the results of Ibero-American SMEs: An empirical case of the mediating role of knowledge management, external flexibility and innovation

5.1. Introduction

Small and medium-sized enterprises (SMEs) are increasingly operating in a turbulent and dynamic environment characterized by the changing needs of the customer and increased competition (Parida et al., 2016; van de Vrande et al., 2009). In parallel, the evolution of information and communication technologies (ICTs) has greatly influenced members of the business community, who have drastically increased the adoption of ICTs in recent times. There is empirical evidence that the adoption of ICTs contributes to the performance of firms in terms of labor productivity and production growth (Arvanitis, 2005; Brynjolfsson and Hitt, 2003). Giotopoulos et al. (2017) suggest, for example, that the benefits of adopting ICT cover various aspects of the intra and interfirm business operations and transactions, which in turn impacts the firm's performance. Other authors indicate that ICTs can provide benefits derived from the improvement of services to customers and suppliers, the ease of internal communication, access to market information, the facility to internationalize the firm, etc. (Ghobakhloo et al., 2011). As a result, a substantial number of researchers have focused on studying the adoption and subsequent development of ICTs capabilities in firms.

Despite generalized evidence of the impact of ICTs capabilities on the performance of firms (Patrakosol and Lee, 2009), there is also evidence that ICTs capabilities alone are not enough, but require the support of a broad set of other capabilities (Buhalis and Zoge, 2007; Díaz Rodríguez, 2017; Kim et al., 2016). In this sense, some studies have indicated that ICT capabilities can have an important effect by facilitating improvements in the other capabilities of a firm (Mithas et al., 2011; Morabito et al., 2010), allowing them to be managed successfully and perform well (Gray, 2013; Kim et al., 2016). Therefore, the above suggests that the causal link between ICTs capabilities and the performance of firms is mediated by important organizational capacities. However, quantitative empirical studies that study the relationship between ICTs and business performance are rare (Gálvez Albarracín et al., 2014).

Based on the above, in this study, we focus particularly on two capabilities that may be important in SMEs, namely, knowledge management (KM hereinafter) and external flexibility (EF hereinafter). KM is related to a set of

processes through which organizations add and generate value from knowledge (Goh, 2005), while EF refers to the capacity of the firm to adapt its processes quickly and economically to better meet the needs of customers (Genus, 1995). Researchers affirm that the enabling properties of ICTs help improve KM and EF capabilities, providing competitive advantages and thereby improving the performance of the firm (Overby et al., 2006; Parida et al., 2016; Tanriverdi, 2005). Therefore, based on the above, this study addresses the following research question: are the KM and EF capacities factors that mediate the connect between ICTs and the performance of SMEs?.

The objective of this study is, therefore, to advance in the understanding of the indirect effects of certain business capacities between ICTs and the performance of the firm. For this purpose, we focus on the context of Ibero-American SMEs (Spain, Chile and Colombia). Although these countries have marked differences, this work allows us to validate and generalize a theoretical model not used until now.

Our work makes several contributions. First, we provide and test a new relational model between ICTs, some capabilities, such as KM and EF, and some performance results of SMEs. In effect, our model allows us to verify the mediation effects of KM and EF between ICTs and some performance variables of SMEs. The originality of our work lies in the fact that the systematic empirical investigations that assume these relationships are scarce, and those that exist do so by addressing some of the capacities individually. Second, we contribute to the ICTs literature, proving that one of its main benefits is improving certain capacities of SMEs, such as KM and EF, which in turn, improves the performance of firms. This also allows us to understand the importance of ICTs capabilities in firms that usually have limited resources. Therefore, we believe that our findings are valid both academically and professionally.

The document is structured as follows. The following section provides a theoretical framework that presents an overview of the main concepts involved in our theoretical model and the approach to the research hypotheses. In the methodology section, the procedures used for the data collection are presented and then the hypotheses are tested by means of an

analysis of second-order structural equations. The findings are presented and discussed in the results section. Finally, in the last section, the main discussions, conclusions and limitations are presented.

5.2. Theoretical framework and hypotheses development

The relationship between the resources, capacities and results of organizations have increasingly become a topic of interest among managers and researchers. This theoretical framework is supported by several theories that allow us to test a theoretical model that seeks to explain the performance of SMEs (see Figure 2.1). Following this line, the vision based on resources (RBV) establishes that organizations have different resources and capacities that are fundamental in the variations of performance, given that they are valuable, rare, inimitable and difficult to substitute (Amit and Schoemaker, 1993; Barney, 1991; Wernerfelt, 1984). In this respect, knowledge is considered as a valuable resource (Wang, 2007). Likewise, the literature on the dynamic capabilities of the firm suggests that the integration, construction, and reconfiguration of internal and external competences allow firms to confront the variable environments (Teece et al., 1997) and configure new and innovative forms of organization (Leonard-barton, 1992). Finally, the literature on knowledge management is also included (Chou, 2011; Davenport and Prusak, 1998; Drucker, 1993; Von Krogh, 1998; Nonaka and Takeuchi, 1996), which has been developed in large part for the progress of ICTs.

In considering the theories that support our model, we cannot ignore that the context of the specific market (De Carolis, 2003) and the strategic actions of the managers (Combs et al., 2011) influence the resources and organizational capacities. In addition, in practice, KM investigations are not popular in the case of SMEs (Durst and Runar Edvardsson, 2012). Therefore, to provide a solid base of competitive business advantages, the appropriate use of resources, skills and competencies becomes necessary (Hitt et al., 2016).

In consideration of the above, Figure 2.1 shows the development of the conceptual model, which is detailed in the following sections. This study posits a direct positive effect of the ICTs on the capabilities of the firms and a direct effect of the capabilities on the results of the firm. In turn, the model

173

proposes a mediating effect of knowledge management, external flexibility, and innovation in performance results.

Figure 5.1. Proposal for the articulation model
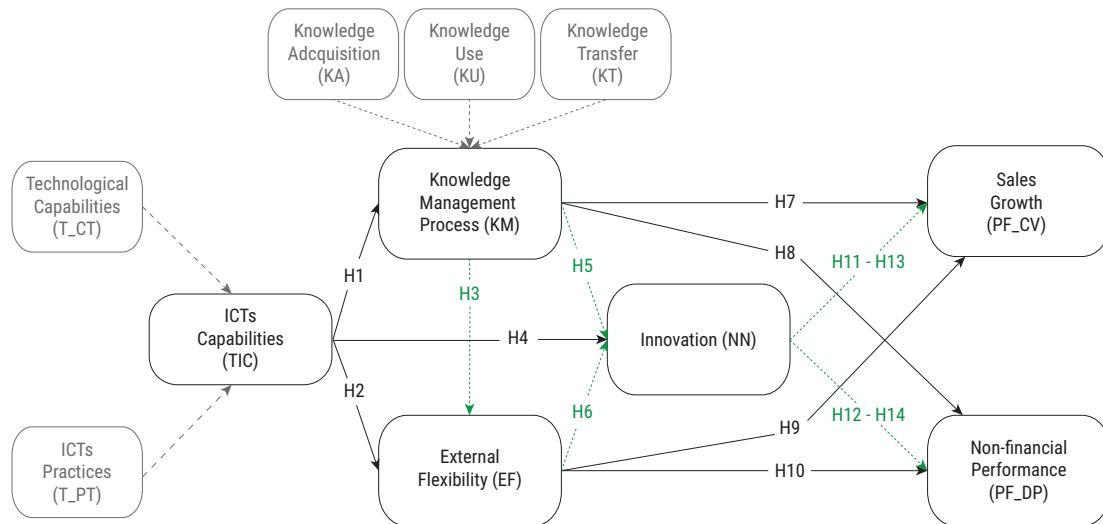
With this approach, this study is intended to provide empirical evidence and new knowledge in these fields of research and a theoretical model that covers a greater number of business effects.

5.2.1. The influence ICTs on business

The literature on resources and capabilities (Barney, 1991; Mithas et al., 2011) and intellectual capital (Bontis, 1999) highlights the importance of ICTs in the organization (Knight, 2000). The dynamics of the environment and the abundance of information demarcates a business reality different from that of past years. At present, organizations have to be renewed or generate changes, to acquire and manage knowledge and respond in this way to the dynamics of the industry and the environment (Carayannis et al., 2015; Chesbrough, 2010). In this sense, the role of ICTs has been strengthened and had acquired increased importance.

Previous research has shown that SMEs do not take advantage of ICT solutions as much as big firms do. However, technological progress is motivating small businesses to venture into the adoption and use of ICTs. Among these motivations, we can highlight the interest to: a) enter into domains rich in technological opportunities (Leten. Belderbos and Looy. 2016), b) strengthen the capabilities, attitudes, resources, context, and online operations (Jones et al., 2014), c) incentivize the growth and profitability of the firm (Bulchand-Gidumal and Melián-González, 2011; Hao and Song, 2016; Pearlson and Saunders, 2013), d) and efficiently manage knowledge flows (Gressgård et al., 2014). In this sense, Sher and Lee (2004) point out that although technology is not the main component of KM, it would be naive to implement KM without considering any technological support. In fact, ICTs are considered a key factor in the KM of firms.

On the other hand, the turbulence and dynamics of the environment force firms to find more flexible ways of responding to uncertainty. The concept of flexibility has developed from the strategic vision (Genus, 1995), and in this study, it is defined as the ability of the firm to quickly and economically adapt its processes to improve customer needs (Lin et al., 2015). However, SMEs have structures that are flatter and less bureaucratic than large firms. This dynamic of flexibility that is characteristic of SMEs allows them to take advantage of and adopt the use of ICTs (Lopez-Nicolas and Meroño-Cerdán, 2009). Some authors have highlighted that the ICTs capabilities of SMEs facilitate the creativity of the staff, improve the exchange of internal information and even information with clients, allowing flexibility in their innovation processes to adapt to their needs. Therefore, considering the above, the following hypotheses are suggested:

> ***H₁:*** *ICTs capabilities have a positive effect on the knowledge management capacity.*

> ***H₂:*** *ICTs capabilities have a positive effect on the external flexibilization capacity.*

In addition, in an environment of rapid changes, it is expected that the ICTs capabilities of small and medium enterprises will allow them to carry out a KM process so that they effectively make good decisions to reallocate and

reconfigure the resources destined to replace the specific needs of the customer (Lesser and Prusak, 2001). Therefore, considering the above, the following hypothesis is presented:

> ***H₃:*** *Knowledge management mediates the relationship between ICTs capabilities and external flexibility*

On the other hand, the literature has suggested that innovation is an important factor to improve the productivity and success of firms (Gërguri-Rashiti et al., 2017). In fact, it is believed that firm that do not innovate face low performance or even dissolution (Wilkinson and Thomas, 2014). As a consequence of the above, policy makers from different countries have committed to supporting the innovation of SMEs, and in this sense, it is necessary to understand the factors that promote innovation (Añón Higón, 2012). From this point of view, it has been recognized that ICTs drive innovation within the firm. In fact, the spectacular advance of ICTs has allowed the improvement of business practices and processes. In fact, they have allowed the way in which work practices are elaborated, controlled and coordinated to change. Some researchers suggest that the successful implementation of ICTs not only improves the efficiency of business processes of firm, but also enables the development of different innovations within the firm (Arvanitis et al., 2011; Koellinger, 2008). In this same line, Añón Higón (2012) points out that ICTs allow the costs to be reduced and improvements in efficiency, and allow advantages and good innovation results to be generated. Therefore, considering the above, the following hypothesis is presented:

> ***H₄:*** *ICTs capabilities have a positive effect on innovation.*

5.2.2. The mediating effect of organizational capacities in the relationship between ICTs and Innovation

Significant advances in ICTs have allowed them to be considered as a key resource that firms are increasingly using. In this sense, Bhatt et al. (2005) suggests that advances in computers and communication technologies have allowed firms to improve their internal processes and make better use of knowledge. In fact, ICTs allow firms to obtain, process, store and share

information and knowledge (Lopez-Nicolas and Meroño-Cerdán, 2009). At present, it is becoming impossible -*given the dynamic business environment*- to manage knowledge without any technological support (Yousef Obeidat et al., 2016). In this sense, KM based on ICTs allows participation, the exchange of information and knowledge among employees, favoring the generation of a more participatory and innovative culture. Evidently, this would have an impact on the innovation results of the small firms. Our study provides evidence of these interactions in SMEs, given the need for a better understanding of them.

On the other hand, and following this reasoning, it cannot be ignored that modern organizations require an interdisciplinary approach that allows them to structure and/or codify knowledge based on information/knowledge systems. In this sense, and although it seems otherwise, the participation of employees from ICTs would allow flexibilization in certain procedures to meet the needs of users (Rivero Amador and Días Pérez, 2008). According to Zhou and Wu (2010), ICTs have a great influence on strategic flexibility. Similarly, Zhang et al. (2016), points out that organizations that have flexibility at different strategic and operational levels generally obtain good results from business innovation. While many of the previous studies show the relationship, for example, between KM processes and innovation (Gloet, 2007; Subramaniam and Venkatraman, 2001; Yousef Obeidat et al., 2016), in this study we expect the effects of ICTs on the results of SME innovation to be reflected through KM mediation and external flexibility. Therefore, considering the above, the following hypotheses are suggested:

> **H_5:** *Knowledge management mediates the relationship between ICTs and innovation.*

> **H_6:** *External flexibility mediates the relationship between ICTs and innovation.*

5.2.3. The influence of organizational capabilities on business performance

The literature indicates that firms in general strive to improve their performance. However, there are no universally accepted criteria for "good performance". Some indicators mentioned in the literature are, for example, the market share, the volume of sales, the reputation of the business, the return on investment, profitability, among others. Given the difficulties entailed measuring of each of the variables mentioned, in this study, we focused on the growth in sales and the nonfinancial performance of SMEs. According to Dzenopoljac et al. (2018), the growth of sales is considered an accurate indicator of the performance of firms, while nonfinancial performance is also considered a good indicator (Darroch, 2005). The performance of the business has been explained from different points of view. For example, Tang et al. (2007) explains the commercial performance of small businesses as a consequence of the implementation of a long-term differentiation strategy. Lonial and Carter find that the strategic orientation of SMEs, composed by entrepreneurial orientation, market orientation and orientation to learning, can improve the performance of these firms. Likewise, Yunis et al. (2018) provide clear evidence that the adoption and use of ICTs are essential to achieve better performance. Finally, Rungi (2014) observes that different types of capacities positively influence the performance of a business.

In our model, we examine certain capacities that allow firms to obtain better returns. In this sense, several studies indicate that the capacity to manage knowledge affects business performance (Bontis and Fitz-enz, 2002; Nonaka and Takeuchi, 1996; Zack et al., 2009), given that it allows firms to use resources more efficiently and, therefore, obtain better results (Darroch, 2005). However, several researchers acknowledge that the findings of these studies have been obtained from large firms, often forgetting the smaller firms. It is likely, then, that the scarcity of resources of SMEs influences knowledge management in a different way, unexpectedly impacting business results. Even so, in this study, we assume that KM will positively influence business performance indicators. Therefore, taking into account the above, the following hypotheses are suggested:

H₇: *Knowledge management is positively related to sales growth.*

H₈: *Knowledge management is positively related to nonfinancial performance.*

On the other hand, as a consequence to the demands of the environment, the firms are forced to find more flexible ways of responding to uncertainty. The capacity to respond to change is a critical capacity for survival that fits the structures of the SMEs (Xie, 2012). In this sense, flexibility strategies can be a good way for small businesses to face the difficulties of the environment. Some studies, such as that of Ebben and Johnson (2005), associated the concept of flexibility with products made against customer orders, which is the source of variability to which a business must respond. This type of flexibility has received various names, such as product flexibility (Ebben and Johnson, 2005), flexibility of product innovation (Liao and Barnes, 2015), or external flexibility (Upton, 1994).

This will allow the firm to respond to the customer's demand effectively and efficiently. Finally, this study refers to external flexibility, such as the ability of a firm to make changes in the product innovation process and launch new products efficiently and effectively in response to changes in the environment. This study proposes that the efforts made by the SMEs in terms of flexibility will allow them to better respond to the needs of the client, providing products and services upon request, and therefore positively influencing their business performance. Therefore, based on the above, the following hypotheses are presented:

H₉: *External flexibility is positively related to sales growth.*

H₁₀: *External flexibility is positively related to nonfinancial performance.*

5.2.4. The mediating role of innovation in the influence of capabilities on organizational performance

The innovation capacity of firms is presented as one of the most important capacities to develop a sustainable competitive advantage and, therefore, has

become a subject of great interest among policy makers and researchers. Innovation arises from the exploitation of the knowledge that is marketed, for example, in the form of new products, services, processes or business models (Gronum et al., 2012). Although the evidence is ambiguous, the literature often assumes that both the innovation process and the resulting innovation results can improve business performance.

According to the vision based on the resources of firms, the innovation capability depends on the resources and underlying capabilities of the business. In the case of SMEs, which tend to face considerable resource limitations, they also have certain capacities that facilitate innovation results. For example, the literature often mentions that the innovative activities of firms are developed in function according to the knowledge management capacity (Nonaka, 1991). Knowledge management, is a capacity in itself, plays an important role in providing a mechanism for the efficient coordination and use of resources (Darroch, 2005). This will obviously influence the innovation results and the performance of the business. Therefore, the following hypotheses are suggested.

> H_{11}: *Innovation mediates the relationship between knowledge management and the business's sales growth.*

> H_{12}: *Innovation mediates the relationship between knowledge management and nonfinancial performance of the business.*

On the other hand, the literature on small businesses frequently refers to the flexibility and agility of SMEs (Edwards, 2007). SMEs, which have smaller structures and are more agile than their larger counterparts, can react more quickly to the individual needs of customers, providing products and services on demand (Rosenbusch et al., 2011). The introduction of innovative products and/or services adapted to attractive niches is an additional opportunity for SMEs to stand out from the competition (Porter, 1980). External flexibility, as defined above, can represent an important competitive advantage that influences the performance of the business. Therefore, the following hypotheses are suggested.

H_{13}: *Innovation mediates the relationship between external flexibility and the business's sales growth.*

H_{14}: *Innovation mediates the relationship between external flexibility and the nonfinancial performance of the business.*

5.3. Methodology

5.3.1. Design of the investigation

The previously presented hypotheses were tested with cross-section data from a sample of Ibero-America SMEs. For the purpose of this study, the selected SMEs are defined according to the description used by the European Union, that is, those that have less than 250 employees (see Raymond and St-Pierre, 2010, p. 51). The value of this study is that it focuses on the capabilities and technological practices of SMEs, which differ when compared with larger firms (Haug et al., 2013). In addition, although studies evaluating the use of technologies in SMEs have increased in recent times, there is a tendency for researchers to focus on larger firms (Bayo-Moriones et al., 2013). To obtain the necessary information, a structured questionnaire was designed using the Qualtrics platform. The questionnaire is aimed at managers and executives of SMEs, since they have an adequate provision of participation and sufficient knowledge to respond to each of the mentioned items. In addition, with the purpose of guaranteeing and improving the quality and rate of responses, the questionnaire was tested twice. The first test was applied to four doctoral students and four researchers. The questionnaire was revised according to the comments, which allowed it to be restructured and some of the questions to be adapted. Subsequently, the questionnaire was sent again to thirteen entrepreneurs. Two of them have doctoral degrees and participate in different business activities in these countries. Their contribution allowed minor modifications to be made and finalization of the draft.

The population object of study was obtained from several *online* directories of Ibero-American businesses (Colombia, Chile, Spain). From the contact address included in the directories, a personalized invitation was sent with

the final questionnaire between November 2016 and February 2017. Since these firms are present in an online environment, it was considered that they fulfilled the criterion of having technological capabilities. A total of 1,450 questionnaires were sent, and to encourage the participation of the firms, they were offered a report containing the results of the survey. In addition, three referrals were made with reminders that sought collaboration with the study. Finally, 137 questionnaires were received, of which 130 were valid, producing a response rate of 9%. Table 3.1 presents the basic information corresponding to the respondents.

It was observed that the majority of those who responded occupy managerial positions (60%). The other respondents are responsible for ICTs (15%), are responsible for the area of communication and marketing (14%), are responsible for the area of human resources (3%) or have other charges (7%).

5.3.2. Measurement of variables

The measure of growth in sales was adapted from the scales previously validated by Mansuri (2008). In this case, respondents were asked about the growth of sales in 2015 compared to the 2014 period. The same was requested for the 2016 period compared to 2015. To measure nonfinancial performance, these measure the nonfinancial performance during the last twelve months and the last five years and management's satisfaction with the performance. These items were evaluated through a Likert scale of 8 points (1 = less sales than the previous year, 2 = 0%, 3 = <2%, 4 = 2-5%, 5 = 6-10%, 6 = 10-20%; 7 = 20-30; 8 => 31%).

Innovation was measured by four items, which were previously validated in the study by Inkinen et al. (2015). These items are valued through a Likert scale of 7 points (1 = very limited, 7 = Very extensive); these evaluate the degree of success obtained in the last three years regarding the creation or improvement of products and / or services for customers, the production methods and processes, the implementation of management or administrative practices, and finally, the practices of marketing.

External flexibility (EF) was measured with 5 items, taking as a reference the study by Liao and Barnes (2015). We used Likert scales of 7 points (1 = very

182

disagreement, 7 = Strongly agree). The following items were rated: 1) the ability to introduce new products in a year, 2) the ability to design a wide variety of products, 3) the ability to develop and introduce products in the short term, 4) the ability to produce new products at a low cost and, 5) the ability to modify the production system to produce new products without affecting efficiency.

The knowledge management process (KM) was measured as a multidimensional variable, composed of three dimensions that measure knowledge acquisition (KA), knowledge use (KU) and knowledge transfer (KT). In the first-order model, a total of 4 items were used in the KA dimension and in the KU dimension; these were adapted from the measurement scales used by Pérez-López and Alegre (2012). For the KT dimension, the measurement scales were adapted from the study of Andreeva and Kianto (2011). The dimensions were measured with 7-point Likert-type scales (1 = totally disagree; 7 = totally agree)

In this sense, the KA evaluated the perception of the respondents about, 1) regular meetings with clients to determine future needs, 2) the internal management processes to acquire knowledge from suppliers, 3) the generation of new knowledge from existing ones and 4) the continuous creation of new ideas and proposals to improve business performance. In the same way, KU values the perception of the respondents in relation to 1) the processes to apply the knowledge learned from past experiences, 2) the facilities for access to knowledge, 3) the processes established by the firm to use the knowledge acquired in the development of new products and services, and finally, 4) the capabilities of the firm to locate and apply knowledge.

In the case of the KT dimension, their measurement scales were adapted from the study by Andreeva and Kianto (2011). This dimension is composed of five items related to: 1) the active sharing of information and knowledge within the departments, 2) actively sharing information and knowledge among the different departments, 3) the exchange of information and knowledge among employees, 4) sharing knowledge and information with strategic partners and 5) regularly informing employees about changes in procedures, instructions and norms. Finally, in the theoretical model, the KM variable was operationalized as a second-order composite variable.

The dimension of ICTs is composed of two constructs that were instrumentalized as a second-order variable. The first of these is a five-item indicator used in the study by Zhou and Wu (2010), which refers to technological capabilities (T_CT). In the construct, 7-point Likert-type scales were used (1 = very low position, 7 = very high position); the items assess the business's situation with respect to competition in 1) the ability to acquire technologies, 2) the ability to identify technological opportunities, 3) the capacity to respond to technological changes, 4) the dominance of cutting-edge technologies and, finally, 5) the ability to constantly develop innovations. The second construct was used in the study by Inkinen (2015) and is composed of 6 items with Likert scales of 7 points (1 = totally disagree; 7 = totally agree).

In this construct, ICTs practices (T_PT) measure the relation to the capacity of the firm in the use of technologies to 1) allow the search and efficient discovery of information, 2) allow internal communication in the firm, 3) allow communication with external agents, 4) collect related business knowledge from competitors, customers and the operating environment, 5) analyze knowledge to make better decisions and 6) develop new products and services with external collaborators.

This study includes two control variables that could influence the business results. These include the size of the firm (Liu and Deng, 2015) and the age of the firm, understood as the difference between the first year of constitution of the firm and the year of obtaining the data.

5.4. Results

5.4.1. Validation of the instrument

The technique of structural equations has been increasingly used in business sciences (Rajalahti and Kvalheim, 2011), especially the partial least squares-based equations (PLS). Previous studies consider that this methodology is a useful tool for management theories in general (Hair et al., 2017). According to Hair et al. (2012), PLS is especially attractive when the objective of the research focuses on predicting and explaining the variance of a construct (for example, the strategic success of the firms) by the different explanatory

constructs (for example, sources of competitive advantage) or when the sample size is relatively small and / or the available data are not normal. According to this, the methodology used through PLS seems to be particularly useful for our theoretical model. Therefore, the estimation of the model is carried out in two stages: analysis of the measurement model, and analysis of the structural model.

Analysis of the measurement model

Prior to the implementation of the PLS technique, a factorial analysis of the dimensions of the model was carried out. This step allowed the indicators that did not correlate with the scales to be discarded. The exploratory analysis revealed the unidimensionality of all the constructs used. After exploring the factorial structure of the information, we proceeded to estimate the measurement model with PLS. It should be noted that, following the approaches of other authors (López et al., 2009; Sharma et al., 2007), ICT practices and the knowledge management process are conceived as second-order constructs. Because PLS does not allow second-order factors to be directly represented, we proceeded to create them with a step approach method.

Thus, in the first stage, the first-order factors that constitute ICTs and KM are presented in the model separately with their respective indicators. In the second step, we estimated a model that used the factor scores (latent variables scores) calculated in the first step for each of the first-order components. Once the second-order variables were established, the measurement model was estimated. This process essentially requires 3 stages. First, the individual reliability of each item must be analyzed through the value of its charges (λ). In this sense, the individual reliability of all the factor loadings of the indicators should exceed 0.65 (Soto-Acosta et al., 2017). It is observed that all loads exceeded the recommended value in the literature. Second, the reliability of the construct scales was examined through the following indices: Cronbach's alpha, the composite reliability index (IFC) and, the convergent validity by means of the analysis of the extracted mean variance (AVE) (See Table 5.1.). It is observed that all the Cronbach's alpha values are higher than the 0.6 value recommended by Nunnally (1978). The convergent validity evaluated from the average variance extracted (AVE)

confirms that it is above 0.5, confirming the adequate validity of the indicators (Fornell and Larcker, 1981). On the other hand, the relative weights to the dimensions that make up each factor of second-order (KM and TIC) have a positive value. This means that both KM and the ICTs are formed by a linear combination that adds three and two dimensions respectively.

Table 5.1. Internal consistency of the scales

Construct		IFC	AVE
ICTs capabilities	(TIC)	0.734	0.581
Knowledge Management process	(KM)	0.798	0.570
External Flexibility	(EF)	0.930	0.727
Innovation	(NN)	0.890	0.669
Sales Growth	(PF_CV)	0.862	0.758
Non-financial performance	(PF_DP)	0.933	0.823

Third, the analysis of the measurement model requires the verification of the existence of discriminant validity. In this sense, the most accepted method in PLS is the comparison between the AVE value of each of the constructs, with the correlation square of that same construct with each of the other variables (Fornell and Larcker, 1981). Thus, if the AVE is greater than the squared correlation, it can be accepted that each construct is more strongly related to its own measures than those of the other variables (Barclay et al., 1995). As shown in Table 5.2., the discriminant validity is adequate for the model. In the diagonal, the AVE value is observed and, in the elements outside the diagonal, the square of the estimated correlations for the constructs are observed, since the AVE value of each construct is greater than the squared correlations of the constructs. This information confirms the existence of discriminant validity between the constructs.

Table 5.2. Discriminant validity / correlation matrix of the shared variance

Construct	TIC	KM	FE	NN	PF_CV	PF_DP
ICT	**0.762**					
KM	0.239	**0.755**				
EF	0.468	0.270	**0.853**			
NN	0.478	0.337	0.589	**0.818**		
PF_CV	0.141	0.070	0.435	0.399	**0.871**	
PF_DP	0.262	0.233	0.446	0.558	0.511	**0.907**

Finally, following these analyses, it can be seen that the model has adequate convergent validity and discriminant validity.

Analysis of the structural model

To test the hypothesis, this study values the effect of ICTs capabilities on some business capabilities. Likewise, the direct and mediating effect of the capabilities on business performance is contrasted. In both cases, the control variables are the total number of employees, which represents the size of the firm, and the experience in the firm's market, which represents the age.

To recognize the statistical significance of the coefficients, the bootstrapping resampling procedure was used with 6000 subsamples (Nevitt and Hancock, 2001). The structural model is examined through the significance of the coefficients λ, the dependency coefficients of the model (β), and by observing the values of the variance explained (R2) of the dependent variables. According to Chin (1998), the variance of each of the constructs (R2) must exhibit a high value. Finally, the Stone-Geisser test (Q2) is used, which evaluates the predictive relevance of the dependent constructs. According to Henseler et al. (2009), this last measure evaluates the predictive capacity of a research model. It is generally considered that if the Q2 value is positive, the constructs have a predictive relevance. Figure 1 shows the coefficients' trajectory and their values of statistical significance to test the hypotheses of the model. In general, the values of R2 are positive; therefore, the model satisfies the predictive relevance. In this sense, all the manifested charges in the variables are presented in appendix 1.

Second, in Table 5.3, the direct relationships of the structural model are presented, the results show support for hypotheses H1, H2 and H3, when finding that the ICT capabilities have a direct and significant effect on *KM (β=0.239, P<0.007*); on external flexibility *(EF) (β=0.428, P<0.000); and on innovation (β=0.230, P<0.002)*. On the other hand, it is observed that KM has no significant influence on sales growth *(PF_CV) (β=-0.077, P>0.372)* or on nonfinancial performance *(PF_DP) (β=0.070, P>0.393)*. Therefore, hypotheses H7 and H8 are rejected. On the other hand, it has also been found that external flexibility (*EF*) exerts a significant influence on sales growth *(PF_CV) (β=0.260, P<0.007),* and consequently, hypothesis H9 is accepted. However, the same does not occur between external flexibility (*EF*) and nonfinancial performance *(PF_DP) (β=0.095, P>0.365),* and therefore, hypothesis H10 is rejected.

Table 5.3. Evaluation of the structural model: Direct effect of the dimensions

Nº	Hypothesis	Coefficient (β)	T-statistics (*t*)	*p*-value	Results
H1	**ICT** => KM	0.239	2.682	0.007***	*Aceptada*
H2	**ICT** => EF	0.428	5.791	0.000***	*Aceptada*
H4	**ICT** *=> NN*	*0.230*	*3.156*	*0.002****	*Aceptada*
H7	**KM** => PF_CV	-0.077	0.892	0.372	Rechazada
H8	**KM** => PF_DP	0.070	0.855	0.393	Rechazada
H9	*EF => PF_CV*	*0.260*	*2.701*	*0.007****	*Aceptada*
H10	**EF** => PF_DP	0.095	0.096	0.365	Rechazada
Other relationships					
	PF_CV => PF_DP	*0.352*	*3.324*	*0.001****	
	VC_TE => NN	*0.194*	*2.620*	*0.009****	
	VC_TE => PF_CV	*0.159*	*2.151*	*0.032***	
	VC_TE => PF_DP	*0.015*	*0.222*	*0.824*	
	VC_EXP => NN	*0.065*	*0.778*	*0.437*	
	VC_EXP => PF_CV	*0.280*	*3.496*	*0.000****	
	VC_EXP => PF_DP	*-0.085*	*0.953*	*0.341*	

***p<0.001; **p<0.01; *p<0.05

Third, the results of the indirect relationships are shown in Table 5.4. According to Bontis et al. (2007), the indirect / mediation effects tests work quite well with PLS. For this, a bootstrapping method was applied to find the degree of significance of the indirect effects (Preacher and Preacher, 2004). The percentiles method was used to calculate the bootstrapping process of 6,000 subsamples, delimited by a confidence margin of 5%.

Table 5.4 Evaluation of the model: Mediation effects of the dimensions

Nº	Hipothesis	Coefficient (β)	T-statistics (*t*)	*p-values*	*Results*
H3	ICT => KM=> EF	0.040	1.724	0.085*	*Aceptada*
H5	ICT => KM=> NN	0.042	1.894	0.058*	*Aceptada*
H6	ICT => EF=> NN	0.183	4.081	0.000***	*Aceptada*
H11	KM => NN=> PF_CV	0.097	2.610	0.009***	*Aceptada*
H12	KM => NN=> PF_DP	0.109	2.205	0.027**	*Aceptada*
H13	EF => NN=> PF_CV	0.092	2.183	0.029**	*Aceptada*
H14	EF=> NN=> PF_DP	0.272	4.772	0.000***	*Aceptada*

***p<0.001; **p<0.01; *p<0.05

It is observed that the analyzed paths are between ICTs resources, business capacities and the results of the firms. The results shown in Table 5.4 show that the zero value is nonexistent in all indirect effects raised in our model, namely, TIC => KM=> EF *(β=0.040; P>0.085)*; TIC => KM=> NN *(β=0.042; P>0.058)*; TIC=> EF=> NN *(β=0.183; P>0.000)*; KM=> NN=> PF_CV *(β=0.097; P>0.009)*; KM => NN=> PF_DP *(β=0.109; P>0.027)*; EF => NN=> PF_CV *(β=0.092; P>0.029)*; EF => NN=> PF_DP *(β=0.272; P>0.000)*. The above indicates that all the indirect effects raised and

calculated are statistically significant; therefore, hypotheses H3, H5, H6, H11, H12, H13, H14 are accepted (See Table 5.4).

Next, Figure 5.2 shows that the estimated final model includes direct and indirect effects. It shows that the ICTs resource has a direct influence on certain capacities of firms, such as KM and EF. However, it is should be noted that the only direct positive relationship between the capabilities of the firm and the performance of the firm is through external flexibility. The final results of the model show a partial participation of the capacities on the results of the SMEs but without a total effect. In fact, KM could have a neutral role in sales growth.

Figure 5.2. Results of the structural model

Indirect Effects

		H12 = KM→NN→PF_DP: (0.109; 0.027)
H3 = TIC→KM→EF: (0.040; 0.085)	H6 = TIC→EF→NN: (0.183; 0.000)	H13 = EF→NN→PF_CV: (0.092; 0.029)
H5 = TIC→KM→NN: (0.042; 0.058)	H11 = KM→NN→PF_CV: (0.097; 0.009)	H14 = EF→NN→PF_DP: (0.272; 0.000)
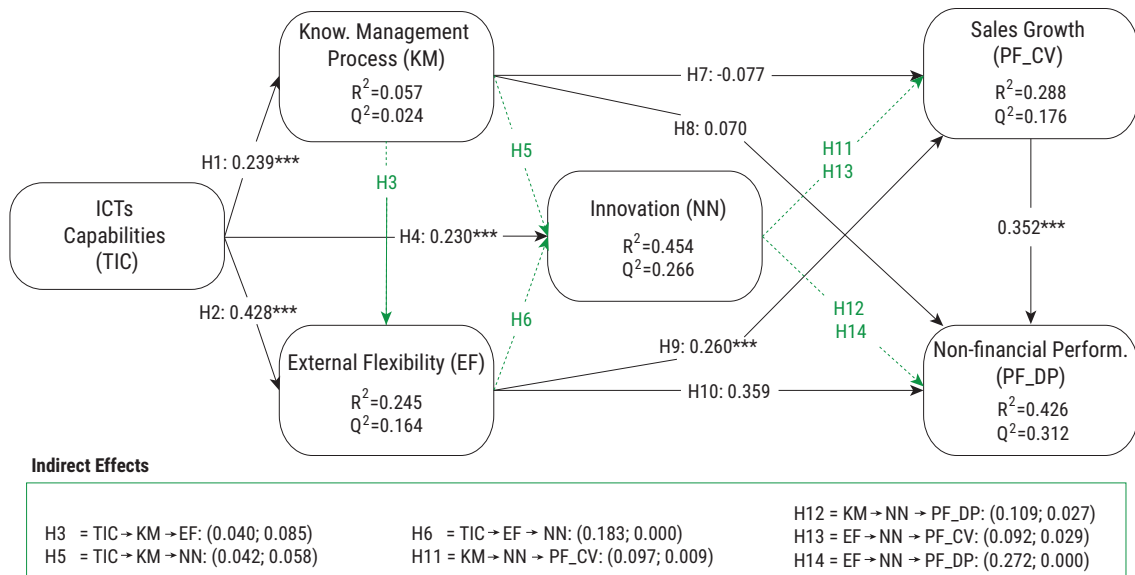
5.5. Conclusions

Several authors have argued that the appropriate use of ICTs may be essential for improving the performance of small and medium enterprises (Dibrell et al., 2008). However, few studies have analyzed the relationship between ICTs and knowledge management capabilities and external flexibility. Therefore, the main contribution of this work has been to extend the literature of SMEs and help to better understand the importance of ICTs in these capacities, allowing better business results. However, we also provide a new theoretical model, which assesses an integrating vision of the links between ICTs, knowledge management, external flexibility and the performance of firms.

From the results, multiple observations can be made. Among them, it is observed that the ICTs act as a factor that drives improvements in the innovation results of the firm, but through certain capabilities of the firm. In this sense, although several direct relationships could be evaluated from ICTs, we consider it important to propose mediating relationships between the variables. Therefore, one of the relationships evaluated was the mediation of knowledge management (KM) and external flexibility (FE) between ICTs and innovation results. In this sense, it is observed that ICTs have a positive relationship with knowledge management and with external flexibility. This makes sense, since ICTs have taken SMEs to advantageous positions in terms of these capabilities (see for example, Dibrell et al., 2008; Pérez-López and Alegre, 2012). It is also found that the impact of ICTs on innovation is mainly indirect, through knowledge management and external flexibility. Although the evidence on the benefits of ICTs was inconclusive, we believe that the spectacular advancement of ICTs provides valuable opportunities for innovation, particularly in small businesses. Our results are coherent because it is frequently mentioned that ICTs enable other capacities that will influence innovative practices.

In addition, the results show a nonsignificant relationship between knowledge management and both measures of business performance. The literature often points to a positive relationship between these variables. However, there are some works with similar results that could support our findings (see, for example, Zack et al., 2009). In addition, some authors

emphasize that the direct relationship between knowledge management and business performance has some weaknesses (Dzenopoljac et al., 2018), among which is the existence of variables that function as mediators between knowledge management and business performance (Omerzel, 2010). In this same line, authors such as Kalling (2003) point out that knowledge management practices in organizations do not necessarily imply better performance, but rather, it is knowledge management that affects a set of intermediate capacities and that in turn should affect the performance of the firm (Lee and Choi, 2003). Some of the relationships in our model confirm this. In fact, a significant positive relationship was found between knowledge management and performance variables through innovation. This shows that when a firm has a better capacity to manage knowledge, it is enabled to generate innovations that will allow it to cope with changes in the environment, as well as improve its performance.

In addition, although there is a significant and positive relationship between external flexibility and sales growth, it is also observed that external flexibility and nonfinancial performance were not found to be related. An explanation to the above is that the link between flexibility and performance is situational. In other words, external flexibility will not necessarily increase the firm's performance, but it will depend on the degree to which flexibility complements the firm's strategy (Vokurka and O 'leary-Kelly, 2000). In addition, just as with knowledge management, it is observed that external flexibility has a significant relationship with both performance variables, but through innovation. This makes sense, since some authors indicate that flexibility is a complementary capability of the organization that can improve the value of resources when combined with other capabilities, such as innovation (Zhou and Wu, 2010). In fact, Bolwijn and Kumpe (1990) suggest that one cannot be innovative without being flexible. Therefore, although a directly relationship with performance is not observed, SMEs should strive to improve their capacity to make their production more flexible, allowing the development of innovation capacities and obtaining good results.

Another result that is derived and confirmed from this study is the direct relationship between innovation and business performance variables. Although SMEs often face considerable resource limitations, these types of firms are more agile and flexible than their larger counterparts and, therefore,

often implement successful innovations. This relationship, therefore, has been well studied and is often well accepted in the context of SMEs (e.g., Gunday et al., 2011; Roxas et al., 2014). However, SMEs must adopt certain capacities that allow them to innovate successfully and face the changing market opportunities.

Like any other study, this research presents some inherent limitations. First, the sample used was 130 respondents. Although it meets the minimum criteria of 10X suggested for the PLS-SEM tests, it is expected that the sample size of future studies can be extended. Second, although the informants of our sample mostly occupied positions of responsibility, only one was surveyed per firm. The design of future studies should consider the collection of multiple responses from firms. This measure would guarantee reliability, particularly regarding the performance questions. Third, the sample data were taken from three countries with different levels of development and in different participation percentages. Therefore, the next studies should take a representative sample of each economy to strengthen the generalization of the model (Zhu et al., 2004). However, it is valid to ask the following question: Is the model of this study adjusted to the reality of firms in all countries? This work allows us to confirm the importance of ICTs in SMEs. However, we have omitted the specific institutional characteristics of each country. The policies of each country could help or prejudice the adoption of ICTs in SMEs. Therefore, we suggest that future studies conduct comparative studies to encourage the formulation of policies that lead to better business performance. In this same line, and as might be expected, studies focusing on SMEs in emerging economies are scarce; therefore, future studies should focus on the context of one of these economies and observe if this model shows a better performance of the SMEs.

Our study also presents some implications for managers of SMEs. First, we evidenced the role played by ICTs on certain capacities and results of firms. We agree with Pérez-López and Alegre (2012) regarding the support for certain capacities, i.e., not only is it necessary for firms to assign resources to implement ICTs, but they must also do so in such a way that ICTs are an effective support for achieving correct knowledge management. It is also likely that the implementation of ICTs will strengthen other capacities, such as flexibility. Second, firms must create clear processes to acquire and

process the knowledge that is actually important for the organization. According to our results, firms that achieve these competencies will be able to innovate more easily, obtaining better performance. Finally, an important implication for policy makers is that they should continue to incentivize the invention and adoption of ICTs among SMEs. However, while it is true that the adoption of ICTs promotes certain capacities in firms, incentive policies should not be restrictive. In contrast, the governments must consider the development and training of the firms' human capital so that they can carry out effective knowledge management practices.

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Chapter 6

Conclusions

In the current economy knowledge-based, all countries in the world are struggling to build, manage and use the knowledge necessary to participate successfully in the global economy (Wiig, 2007). In an organizational context it is their human capital - the people - who have assumed key and leading role by displacing the traditional factors of production, such as factories, machinery, land and work, considered until a few years ago as the main sources of competitive advantages (Prusak, 2001). Consequently, at present is considered that these tangible assets alone do not ensure the sustainability of a competitive advantage, but that it is increasingly dependent on "know-how incorporated in individuals" (Grant, 1996; Kogut and Zander, 1992; Prahalad, 1983). In other words, the knowledge that employees possess is key to achieving a competitive advantage.

For several years, the research has highlights the importance of knowledge within the organization. For example, Santoro and Usai (2018) point out that knowledge is a fundamental resource, and as such, firms strive to explore new knowledge given that increases an simulates the business innovation. Similarly, Del Giudice et al., (2017) points that the use, manage and share knowledge is an important task in organizations and, therefore, for good management of this resource can affect the performance and growth of firms. As a consequence, knowledge has become one of the most important resources that an organization can take advantage, and therefore, the new challenge for managers is to know how to manage this resource, which has undoubtedly become more important than ever before. This important challenge caused a few years ago the appearance of a remarkable field of research, namely, knowledge management.

Therefore, trying to continue contributing to the Knowledge Management field, both from the theoretical and empirical point of view, the main objective of this doctoral thesis is to examine the impact generated by Knowledge Management in academic research, as well as helping to understand its relationship and impact on the performance of SMEs.

As indicated in this doctoral thesis, knowledge management (KM) is a young research field that began in the nineties (Hislop, 2010), and that it has built its theoretical core on the knowledge of several disciplines, including information technology, organizational science and cognitive science, among

others (Dalkir, 2005). Since its inception, the KM literature has made remarkable progress, motivating the development of a solid scientific structure that has been supporting the development of the field. In this sense, we can mention, for example, the emergence of an important network of academic journals exclusive of the field (Serenko and Bontis, 2017), the emergence of different cooperation networks in research (Ma and Yu, 2010) and an important network of conferences (Serenko and Bontis, 2009). According to Serenko and Dumay (2015), these are attributes that give evidence of a healthy research field.

According Soto-Acosta and Cegarra-Navarro (2016), there is consensus in the literature about KM, as a set of practices related to the use of knowledge and that is a crucial factor to add and generate value. In effect, KM emerged as an applied discipline, and at present, its practical impact on the organization is anchored to different strategic processes in the management of corporations, governments and institutions (Beesley and Cooper, 2008). In light of this, much of KM's empirical literature has emerged at the intersection with other disciplines trying to provide policy makers and entrepreneurs with relevant knowledge that may impact both public policy as in the management of the organization.

An interesting line of research developed in the KM field arises at the intersection with the field that studies information and communication technologies (ICTs). The use and effect of ICTs in the organization is a well-established field of research, and in practice, these play an important role in supporting KM processes (Al-Kurdi et al., 2018; Alavi and Leidner, 2001; Riege, 2005). In fact, the first investigations in the KM field focused on ICTs as main facilitators in the transfer of information (Pandey and Dutta, 2013). Bolisani and Scarso (1999) mentioned that ICTs are a great contribution to the ability of the firm to transfer and share knowledge without geographical limits. Tanriverdi (2005) for his part, concludes that ICTs improve the KM capabilities of organizations and that these increase the performance of the firm.

The literature also points out that access to knowledge facilitated by ICTs structures strengthens the capacities and innovation results of firms (Gressgård et al., 2014). It is not surprising, therefore, that organizations

carry out a large investment in ICTs and in the internal strengthening of the technological competencies of their workers. Depending on the type of technology used and its degree of adoption (Bayo-Moriones et al., 2013), ICTs will allow firms, for example, to create collaboration spaces, facilitate communication channels or implement the storage of documents, that support and allow to perform the KM processes with greater consistency (García-Álvarez, 2015).

In summary, KM researchers have favored the progress of this field of knowledge in recent decades. During this time, an important body of theoretical and empirical literature has been generated, in which it is possible to find multiple KM definitions and a wide network of links between different scientific actors that have generated interaction with different disciplines. In addition, KM's research has been approached with a wide variety of methodologies and currently, with the advancement of ICTs, new research techniques are beginning to be implemented to continue development the KM field, which still presents several theoretical and empirical challenges.

At a theoretical level, for example, Binney (2001) points out that KM is a ill-defined field, in which different theories that seek to be developed at the intersection with KM coexist. Thirteen years later, Tzortzaki and Mihiotis (2014) point out that there is still a need to reach a consensus on the definition of KM and to achieve greater conceptual robustness. In fact, Serenko and Dumay (2015) state that KM is an research field that is still in an embryonic phase of development, and that it lacks consensus on their future lines of research.

At the empirical level, Andreeva and Kianto (2012) point out that the field presents a lack of empirical studies that demonstrate a real connection between KM and organizational performance. Massingham (2013), for his part, points out that empirical evidence is needed on which KM tools work, how to implement KM and how to measure their value. Durst and Edvardsson (2012) also point out that, despite the importance of SMEs in economies, the field has tended to focus on large firms and, therefore, needs to be developed empirically in SMEs.

Through our objectives, our thesis intends to continue contributing from a theoretical, but also empirical point of view.

To this end, a first section was developed, two relevant bibliometric studies that examine and organize part of the KM literature. These studies respond to the importance of classifying and organizing the literature of a specific field of research, since it allows to follow the advances and tendencies of the field, serving as a point of reference for those who want to introduce in scientific research (Gaviria-Marin et al., 2018; Merigó and Yang, 2017). Specifically, the first of these studies classifies the literature focused on the different stages of the KM process and that has been published in the Business and Management journals. This classification is made according to the influence and productivity of all the scientific actors involved in this field.

To develop this analysis the first study answered the following questions: 1) What are the main journals that publish KM literature?, 2) What are the most influential articles in KM literature?, 3) Who are the most productive and influential authors, universities and countries in KM literature?, 4) How are the networks structured among the different KM research actors?, 5) What are the main thematic areas addressed by KM research? and, 6) How have these topics evolved over time?. As a consequence of this research, It was carried out a second theoretical study, that organizes as of bibliometric techniques, all the literature published in the main journal of the KM field (Serenko and Bontis, 2017), namely, *Journal of Knowledge Management (JKM)*. To carry out this analysis, a series of questions similar to the first study were answered, but focused on JKM. For example, (1), What is the total number of publications in JKM?, (2). What are the core JKM articles?, (3) Who are the main researchers, universities, and countries in JKM?, (4) What is the affiliation of the researchers?, (5) What are the topics main in articles of JKM?, (6) What are the structural networks among the actors who publish in JKM?. The answers to the previously mentioned questions, allowed us to obtain two scientific contributions, which aim to provide valuable information to those interested in the development of the JKM field, as well as, being an important point of reference for those who want to start in this interesting field of study.

Subsequently, a second empirical section was developed, in which two research problems were identified, focused particularly on SMEs, a type of firm that is relevant in current economy, and that KM literature has neglected remarkably (Centobelli et al., 2017; Cerchione et al., 2016; Massaro et al., 2016). In each of these studies, a particular research methodology was selected. For the implementation, we proceeded to extract secondary data and a survey was applied, which led to the development of different frameworks based on the vision of knowledge management. In this way, the third contribution is an exploratory study in which a particular type of online organizations is identified, providing through the internet and different web 2.0 tools various types of information to entrepreneurs (OIPs). This contribution responds, therefore, to the following questions: (1) What are the types of knowledge that improve the OIPs web positioning?, (2) What are the web 2.0 tools that allow OIPs to obtain a good performance in terms of web positioning?. Finally, the fourth and last contribution answers the following question: ¿Are ICT capabilities adequate resources to generate positive effects on the capabilities and performance of SMEs?

The answers to the research questions and, therefore, the main findings and implications of this thesis are summarized below. Subsequently, the limitations of the thesis are discussed, together with the suggestions for future directions of research in this field.

6.1. Main conclusions

Chapter 2 aimed to complement previous studies and provide a broad quantitative and qualitative view of KM research focused on the organization. The previous literature has made several similar studies (Akhavan et al., 2016; Gu, 2004; Nonaka and Peltokorpi, 2006; Qiu and Lv, 2014; Serenko and Dumay, 2015), however these have overlooked the literature published in journals focused on the organization. In addition, these studies almost completely avoid the complementarity of bibliometric tools, such as performance analysis and science mapping. In this way, the results of this study confirm the significant growth of KM's research in the field of *Business and Management*.

As expected, the USA is the country that leads KM research since it has the best indicators of influence and productivity. This situation occurs in most scientific fields. An explanation that derives from this chapter is that both universities and North American researchers mark a strong presence in the field. Although it should be noted that, in general terms, universities and European researchers also have considerable influence in the field. The mapping of the science presented in this chapter confirms and strengthens these results. However, it is observed that other countries such as Canada and China have achieved significant growth in recent years.

On the other hand, when analyzing the dimension of the journals, it is observed that some of the exclusive journals in the field, such as JKM and KMRP, present high productivity and several of their articles are quite influential. However, there are other journals in the Business and Management area, such as OSC and SMJ stand out for having more influence in the KM field. An explanation to this last, is that in these journals have been several of the most cited articles in the field have been published, with recognized researchers such as Nonaka, Kogut, Grant, among others. It is worth mentioning that Nonaka is the most influential author of KM field with a great number of citations. Finally, the analysis of performance and mapping of the science carried out in this chapter, provides relevant information on the progress of KM research in the areas of business and management.

Chapter 3, on the other hand, had the objective of carrying out a bibliometric analysis of all the documents published by JKM during its twenty years of existence. This chapter responds to a JKM gap, since this did not have a complete analysis of its own literature. In this sense, this chapter provides a fairly broad and solid base informative on based on the main references published during the 20 years of JKM. As in the previous chapter, the results were obtained from two methodological procedures, namely, a performance analysis and a mapping science analysis.

These methodologies are easy to interpret. In addition, these can be replicated in new future studies. Therefore, from this, the results show that JKM has a high level of self-citations, although this seems to be a usual practice in most journals. In addition, the leadership and positioning of the USA in the journal is confirmed again, although it is followed closely by the UK. However, other

European and Asian countries have begun to appear strongly in JKM. This has reduced productivity in recent years in the USA and the UK. At a continental level, European countries are broad dominant of JKM, since its has more than 50% of the most influential and productive universities and ressearchers. Even so, and according to the number of citations, the Griffith University, of Australian origin, has become a very influential university within the journal.

It is also concluded that Serenko and Bontis are the most productive and influential authors of JKM. It is important to highlight that the results obtained from the scientific mapping made with the *VoS Viewer Software*, are consistent with the previously mentioned. In fact, Nonaka stands out again as one of the most cited authors in JKM. Using this technique, a mapping of the most frequently used keywords during the 20 years was also carried out. Their results logically show that the *Knowledge Mangement* concept is most used. Although from a longitudinal perspective, other concepts related mainly to the dimensions of the KM process are observed, such as *Knowledge Sharing*, *Knowledge Transfer*, *Knowledge Creation*, among others.

Chapter 4 is the first of the two empirical chapters of this doctoral thesis. The objective of this study was to examine the influence of the factors that influence the web positioning of the Online Information Providers (OIPs), which we consider as a measure of performance of these organizations. This chapter is based on the premise that the Internet is used by SMEs as an important source of external knowledge. According to the literature, the acquisition of knowledge should encourage innovation and increase the productivity of these firms (Laursen, 2012). On the other hand, the Internet has become an important source for acquiring new knowledge (Lankton et al., 2012; Willoughby et al., 2009). Through them, a large amount of content suitable for entrepreneurs and people in general are offered. In fact, some authors such as Kim et al. (2013), point out that the resources available on the Internet are closing the gap between large and small businesses.

Therefore, in this exploratory study we focus on public and private organizations that offer a great diversity of information and knowledge to small businesses through the Internet (Charband and Jafari Navimipour,

2016). These types of organizations were denominated Online Information Providers (OIPs). The OIPs will have a better web positioning if increase the number of visitors on their websites. Therefore, web positioning is assumed as an indicator of the online behavior of entrepreneurs when these engage in activities that could facilitate the acquisition of different types of knowledge.

To carry out this study, we focus on Web 2.0 applications, since there is a clear tendency among firms to use these applications for the exchange of knowledge (Lim et al., 2010), but we also focus on the different types of knowledge available in the OIPs. Specifically, in technological knowledge (KT), market knowledge (KM) and knowledge of internationalization (KI). In this way, using a logistic regression analysis was evaluated in a first model, the influence of the number of Web 2.0 applications and the types of knowledge about good web positioning, and subsequently, in a second model, the specific influence of each of the Web 2.0 applications, and the particular types of knowledge on good web positioning were evaluated.

Therefore, the results show that the OIPs have a better web positioning depending on the number of Web 2.0 applications used. In other words, the OIPs that use more Web 2.0 applications will be more visited, particularly those that use Youtube, Online Forums, Blogs and Really Simple Syndication (RSS). The results also show that the OIPs that offer a greater amount of knowledge probably will have a good web positioning.

It is specifically evidenced that the contents related to market knowledge (MK) and knowledge of internationalization (IK) do not seem to have an impact on web positioning, while the knowledge related to technological aspects (KT), turns out to be significant. In other words, the OIPs that offer this type of knowledge are more visited and therefore have a better web positioning. Even so, for the OIPs the challenge will be which can offer quality knowledge, that are really useful for small entrepreneurs.

Finally, chapter 5 had the objective of advancing in the understanding of the indirect effects between ICTs and the performance of the SMEs through some capacities of firms such as knowledge management (KM) and external flexibility (EF). For this we focus on Ibero-American firms, such as Spain, Chile and Colombia. The main contribution of this chapter was, in the first

place, to extend the literature focused on SMEs, particularly in the relationship between ICTs, capabilities and the performance of firms. But in addition, a new theoretical model is provided that integrates and analyzes various links between the aforementioned variables. In this way, the results allow us to conclude that ICTs act as a factor that drives and improves the innovation results of SMEs through KM and EF capacities. These results are consistent since the literature frequently mentions that ICTs are enablers of certain capacities that influence the innovation of firms (Dibrell et al., 2008).

The results also show a non-significant relationship between KM and the performance measures of the SMEs. Other studies present different results, and therefore, the relationship between these variables are not conclusive. Something that can be observed is that KM is positively related to performance measures, but through innovation. This is consistent with other studies that point out that KM does not necessarily imply better performance, but rather, it improves other capabilities of the firm, which in turn has an impact on its performance (Lee and Choi, 2003).

It is also possible to observe that the external flexibility of the SMEs show a significant relationship with the growth in sales, but the same does not happen with non-financial performance. However, these relationships become positive through innovation. This makes sense, since flexibility is a complementary capacity that adds value to the firm when combined with other capabilities such as innovation (Zhou and Wu, 2009). Finally, the chapter concludes by demonstrating the direct relationship that exists between innovation and performance measures of SMEs. This relationship is well studied and is often accepted in the literature (Roxas et al., 2014).

6.2. Implications

6.2.1 Implications to academy

The first section of this thesis is composed of two works that have a marked line of theoretical development. In both studies, bibliometric methodologies were used that involve a performance analysis and a mapping of science. This allows to raise some interesting implications especially in the academic field.

As previously mentioned, chapter 2 of this thesis develops a bibliometric study which aims to provide relevant information about KM research applied to the areas of business and management. Therefore, according to the methodology used, the performance analysis provides information in terms of, for example, the main authors, institutions and countries that have contributed to the development of this field. Likewise, the mapping of science provides relevant information about the network structure of the different academic actors that interact in the KM field. Keep in mind that the quality of the information obtained is based on the complementarity of both analyzes - performance analysis and mapping of science - allows to provide a objective view of the development of KM research at the intersection with business and management areas. Therefore, this information is relevant for young or consolidated researchers who wish to begin or deepen in the intersection of these academic disciplines.

The chapter 3 develops a broad bibliometric study of all the literature published during the 20 years of existence of which has become the main journal of the KM field, namely, *Journal of Knowledge Management* (Serenko and Bontis, 2017). Like the previous chapter, this study is carried out through bibliometric methodologies that involve a performance analysis and a scientific mapping analysis. Therefore, the information in this paper is useful for any reader of this journal to understands the evolution that JKM has had in the last 20 years in terms of the actors who have contributed to its story. In this sense, the usefulness of this study is based on determining and recognizing the main scientific actors that have intervene in JKM in terms of productivity and influence.

Finally, the scientific mapping analysis was used to complement and reinforce the performance analysis data. Through these results we observed for example, the main concepts historically addressed by the journal.

6.2.2 Implications to practitioners

As mentioned earlier, the second section of this thesis is composed of two empirical studies that have been developed with different quantitative methodologies. Moreover, both studies extend literature centered on SMEs, but focusing on different perspectives that are at the intersection of the field

KM with other disciplines such as ICTs or Innovation. This allows to suggest some implications especially for practitioners.

The chapter 4 focuses on the web positioning of some organizations that use the Internet to offer information and knowledge to firms (OIPs). The results showed that the OIPs will have a better web positioning depending on the amount of knowledge and Web 2.0 applications available. Furthermore, with respect to model 2, it evidenced that the OIPs that offer technological knowledge, and that also use YouTube, online forums, Blogs and RSS get a better web positioning. The value of these results lies in giving to evidence of an interaction between the OIPs and diverse users who look for business information.

Some of the implications derived from this study, are oriented in the first place to the administrators of the OIPs, since it allows them to recognize the importance of reinforcing their abilities and efficiently use the different tools available on the web. This should also encourage the OIPs to manage and deliver quality information and knowledge through these tools. Likewise, entrepreneurs must strengthen or develop the skills that allow them to acquire and use new knowledge of online environments. However, the Internet should be one of several sources of knowledge that will allow you to improve your processes and performances.

Finally, chapter 5 proposes a structural model that evaluates the mediation of some capacities, such as knowledge management and external flexibility, in the relationship between ICTs and the business performance of SMEs. As already mentioned, one of the main contributions of this study was to extend the literature focused on SMEs and to help understand the links between ICTs, the capabilities and the firms results.

After analyzing the results of this work, it is necessary to recommend to firms that must allocate resources for the acquisition and modernization of ICT systems, and that allow adequate knowledge management. In addition, and according to our results, investment and the implementation of ICTs could strengthen other capacities of the organization. It is also necessary for firms to implement processes to acquire and manage the knowledge that are

important for the organization. According to our results, the firms that achieve a correct management of knowledge will obtain better results.

This chapter also has some implications for lawmakers. In effect, they should continue to promote and encourage SMEs to invest in effective ICT systems to adequately process knowledge.

6.3. Limitations

Like any research work, this doctoral thesis and its contributions, presents a series of limitations that are described below.

Chapter 2 classifies and organizes scientific investigations of the KM field carried out in journals oriented to organizational issues. In the same way, chapter 3 seeks to organize the literature published in the main journal of the KM field, previously identified as the *Journal of Knowledge Management*. In both chapters, bibliometric methodologies are used that include an analysis of performance and a mapping of science, whose results complement and provide enough information. However, some general limitations that derive from the methodologies used must be taken into account in both chapters.

It is necessary to consider that the information presented in both chapters is purely informative and its objective is to guide researchers with respect to the dimensions analyzed in each one of them. In this regard, should take account that the continuous scientific activity and its subsequent publication and updating in the different databases can generate changes with respect to the results obtained in these chapters.

In both chapters, 2 and 3 only publications made in English were taken into account. This procedure makes sense since most of the documents in a language other than English are not included in the *Web of Science* (Merigó et al., 2016). In fact, *Journal of Knowledge Management* is a journal written entirely in English. In a coherent line with this, both studies gave an account of the scarce KM literature of emerging countries.

The incorporation of some indicators such as the h-index may imply some limitations. For example, this indicator does not benefit researchers who have a large number of appointments and moderate productivity. Given this limitation, readers of both chapters, already published, must take into account other indicators incorporated in their analyzes, such as the number of appointments and productivity.

Some limitations is related to the databases used to collect the references. For example, the WoS and Scopus database use a complete recounting system of all the research participants, in which the papers with several authors and / or affiliations tend to take greater relevance in comparison with the papers made by a single author. Since the VOS viewer software uses a fractional count (Merigó et al., 2018), the mapping of the science developed in the two chapters of this thesis, tries to mitigate the limitations described about. In this sense, the coherence of the results obtained in both studies, allow to conclude that there are no significant deviations between the two methods of counting.

In this sinse, the analysis on publications indexed exclusively in the WoS, may have excluded publications from other journals that have not yet been indexed in this database. It is likely that other databases such as Scopus, Scielo, Google Schoolar, among others, have manuscripts that are equally important for the development of the KM field.

The use of a certain group of keywords directly influences the registries of the databases. Therefore, the exclusive use of 11 keywords determined the quantity documents analyzed in the chapter 2. In this way, articles, reviews, notes and letters that included other keywords were excluded.

The following two chapters of this thesis are empirical in nature and also have various limitations. As mentioned above, chapter 4 evaluates some factors that influence the web positioning of online information providers (OIPs).

The sample of OIPs considered in this study is limited to the Spanish context, and therefore, the results should not be generalized to the realities of other countries. In the first place, because the knowledge acquisition processes of individuals may vary between countries depending of the conditions of

development of their economies (Magnier-Watanabe and Senoo, 2010). Secondly, It should be considered that the usability rates of ICTs and Internet technologies vary considerably among countries (Chinn and Fairlie, 2010; Lee et al., 2016).

The sample includes OIPs, both from public and private. It is likely that the type of information, the deposited knowledge and Web 2.0 tools used vary according to the interests and capabilities of these types of organizations.

Finally, some limitations in chapter 5 relate particularly, to the sample size, the number of surveys per firm, multisector participation and sampling of firms from different types of economies. In this sense, 130 Ibero-American firms have been surveyed, which meet the minimum criteria suggested for carrying out PLS-SEM tests. However, all these countries have different levels of development. According Yang et al. (2016) indicate in this sense, that each economy has particular environments in which interact factors specific of these.

6.4 Future Research Lines

Promote the study of knowledge management in emerging countries, thus, It would be advisable that the main researchers of these countries make a diagnosis that allows the detection and development of really interesting and applicable lines in these countries. Likewise, emerging countries should create clear strategies to promote and strengthen international research networks.

This study used some keywords representative of the different stages of the knowledge management process. Other studies could consider other *keywords*, such as "*knowledge Identification*", "*knowledge retention*", "*knowledge capture*", "*knowledge disposition*", "*knowledge organization*", "*knowledge structures*". Finally, it must be taken into account that classifying the literature of a field such as KM is not simple. This is a field that intersects with many other disciplines, and therefore, some future studies could carry out specific bibliometric studies of these research subfields.

Future studies should focus and analyze online information providers (OIPs). It would be desirable to develop comparative studies studies among the groups public and private of OIPs. It is likely that the type of information, the deposited knowledge and Web 2.0 tools used vary according to the interests and capabilities of these types of organizations. In addition, other study variables could be added that can also influence the web positioning of the OIP's both governmental and private. Some of these variables include, for example, the design, the use of advertisements or advertising, functionality, among others (Bringula, 2013; McDowell et al., 2016).

Similarly, as is analyzed the diffusion of three specific types of knowledge, such as technological, market and internationalization. Due to these types of knowledge exert a significant influence on the growth of smaller firms (Deligianni et al., 2015). It would be desirable, therefore, that future studies examine the role of other more specific types of knowledge deposited in the OIPs, and that can be highly demanded by small entrepreneurs.

It would be interesting to develop complementary studies that help determine the importance of OIPs in the routines of small businesses. Likewise, it would be important to know if entrepreneurs consider important other types of knowledge that were not contemplated in the study.

We suggest that the following research questions could be useful for the KM field: What are the knowledge distributed on the Internet and that in our study are not analyzed? Is there interest from management teams to identify which are the OIPs that cover the knowledge needs of the firms? ¿The functioning and information offered by the government OIPs meet the expectations of the entrepreneurs? Should governments unify in a single portal all the knowledge and help directed to entrepreneurs?

Future studies can replicate this model and apply it to a specific economic environment, as for example in some emerging economy. Moreover, It would be interesting to consider the particular institutional factors to each country. For example, include indicators related to digital gaps, ICT investment, policies to support SMEs, entrepreneurship, or ICTs, among others.

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