Full Length Research Paper

Mapping knowledge management authoring patterns and practices

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This paper examines the literature on knowledge management (KM) in order to identify the typical authoring patterns and the focus of the content of published research. The study explores the argument that the inter-organizational level of analysis is explored less frequently than the intra-organizational level. The article reports on KM researchers and practices based on evidence from six journals ranked in the journal citation report covering several decades of publications. Based on this review, articles can generally be seen to have two co-authors from two different universities within the same country. The study confirms that published research is mainly empirical; largely adopting the intra-organizational level of analysis, with the people element being the least explored comparing to technology and process elements. This research gap represents an opportunity for authors to contribute with studies focusing on the inter-organizational level.

Key words: Knowledge management, research mapping, inter-organizational, intra-organizational, processes, technology, people.

INTRODUCTION

Managing the stock of knowledge in the firm is the domain of the knowledge management (KM) (Choo and Bontis, 2002). Interest in KM has increased among academics and practitioners (Serenko and Bontis, 2004). The term "knowledge management" became popular in the 1990s, though its origin is older (Edwards, 2008). Achieving sustainable competitive advantage is one of the motivations for organizations to adopt KM (Gray and Meister, 2006; Hoof and Huysman, 2009; Jasimuddin, 2007; Lee and Kim, 2001). There is no consensus on the concept of KM (Chen and Chen, 2006). This research regards KM to be "the collection of processes that govern the creation, dissemination and leveraging of knowledge

to fulfill organizational objectives" (Lee and Yang, 2000), considering both the existing knowledge and the creation of new knowledge, while it also focuses on the alignment with business goals. Several authors have identified alignment with organizational objectives as an important factor for achieving results with KM (Jarrar, 2002; Wong and Aspinwall, 2004).

The number of articles published on KM in academic journals has increased annually (Serenko and Bontis, 2004). Most articles that analyze the publications on KM investigate specific areas of interest. Chauvel and Despres (2002) analyzed surveys on KM in the period 1997 to 2001, Serenko and Bontis (2004) investigated research productivity and citations analysis of individuals, institutions and countries, Eunni et al. (2006) examined research on KM processes in international business alliances in the period 1990 to 2003, Edwards (2008) "reviewed both the literature on KM and the practice of

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KM in the energy sector". More recently, Serenko et al. (2010) conducted a "scientometric analysis of the body of literature contained in eleven major knowledge management and intellectual capital (KM/IC) peer-reviewed journals". All of these mentioned articles do not show the exact content of what is being researched in terms of KM, regardless of the context (intra-organizational or interorganizational) or research method adopted, and what gaps need to be investigated. According to Serenko et al. (2008), "by understanding the past and present state of a scientific area, it is possible to identify influential academics, observe research gaps, discover understudied topics and explore methodological issues. It is realized with scientometrics studies".

As our research addresses KM, we have analyzed six journals ranked in the journal citation report (JCR) that have the words information and management in the title. The six selected journals were: information and management, information processing and management, international journal of information management, journal of global information management, journal of management information systems and management information systems quarterly. This article examines publications trends about knowledge management and has a few objectives: 1) to identify authoring patterns; 2) to identify the most applied research methodologies; 3) to determine the most often investigated elements of KM (process, technology and people) and context (intra-organizational and inter-organizational). The paper addresses the following research questions:

i. How are the authoring patterns?
ii. What research methods have been most used?
iii. What KM elements have been most investigated?
iv. What contexts (intra-organizational and inter-organizational) have been most investigated?

The article is a useful guide for future research.

KNOWLEDGE MANAGEMENT

For several authors, KM is composed of three elements: process, technology and people (Carrión et al., 2004; Edwards, 2008; Tirpak, 2005). The process element is characterized by stages, which according to Carrión et al. (2004), are: creation and acquisition, storage and retrieval, transfer, application and protection. This element considers the requirements and conditions necessary to stimulate the creation, dissemination and use of knowledge in the organization. The technology element refers to the hardware and software adopted to support the processes (Carrión et al., 2004). Information and communication technology (ICT) reduces barriers to knowledge sharing, and has a key role in supporting KM practices (Fehér, 2006). The technology to be adopted will depend on the needs of users and the type of

knowledge, among other things. With regard the people element, the main aspects to be considered are the organizational culture and the establishment of roles and attitudes (Carrión et al., 2004). The organizational culture includes collaboration among employees, encouraging teamwork, knowledge sharing between different teams within the organization and a positive attitude to organizational change, etc.

The KM process is addressed by several authors, Demarest (1997), Bose (2004), Chen and Chen (2005), Lee et al. (2005), Goldoni and Oliveira (2010), among others. Depending on the authors, the names used to describe each stage of the process may vary, for example, dissemination (Bose, 2004) and sharing (Lee et al., 2005), in relation to the contents, occur in the management stage, suggested by Bose (2004). According to Edwards (2008), the elements of KM relate as follows: people design and use the technology; technology supports the people; people aid in the design and operation of the processes; processes define the role of the people and the knowledge they are required to have; technology makes some processes possible; processes determine the technological needs.

Following the stages of the KM process, the first stage concerns the creation, combination, acquisition, construction and selection of the knowledge, which will be part of KM. This phase, which Carrión et al. (2004) refers to as creation and acquisition, includes both the existing knowledge and the creation of new knowledge. The knowledge identified in the initial phase needs to be stored and retrieved when needed. At this stage, it is important to consider the validation and updating of the knowledge. The form of storing the knowledge implies that it can be retrieved, disseminated and applied by people. The third stage of the process relates to the dissemination of knowledge, also known as transfer, sharing and circulation. This means bringing knowledge to people who need it to develop their activities in the organization. Knowledge sharing is related to the culture of the organization (Chen and Chen, 2005). Application of knowledge is the stage in which knowledge is used by people in order to obtain a result for the organization. According to Chen and Chen (2005), the biggest challenge of this stage is how to integrate the external and internal knowledge within the organization. The protection stage, mentioned by Carrión et al. (2004), considers the existence of legal rights over knowledge and security policies concerning access to knowledge. Security issues and rights are related to storage and retrieval of knowledge, so it is considered part of storage.

Measurement, feedback or evaluation is considered one stage within KM by authors such as Demarest (1999), Goldoni and Oliveira (2010), among others. For other authors, measurement is associated with other phases, such as, the implementation phase as in the case of Carrion et al. (2004). Measurement, whether it is considered a stage in itself or part of the others, is

important for the continuity of KM, as it stimulates new investment and facilitates corrections to the course adopted initially. However, it is difficult to measure the results of KM initiatives because it is not possible to isolate their effects on the results of the organization. In fact, only the process can be easily evaluated. For example, Minguela-Rata et al. (2010) analyze "the influence of the mechanism used to transfer knowledge on the performance of franchise systems", and Kamya et al. (2010) "examines the relationship between knowledge management and competitive advantage".

Technology supports all stages of KM, for example, bringing together geographically distant people, allowing fast storage and retrieval of a body of knowledge that inevitable would not be possible manually. Currently, technology is not an option for organizations, but a necessity, due to the large volume of information and knowledge available, the geographical dispersion and the relationship between organizations (Lindvall et al., 2003). Several authors (Alavi and Leidner, 2001; Binney, 2001; Lindvall et al., 2003; Saito et al., 2007) have approached technology as a support for KM and discuss technology considering the process of KM, the products available, their application to the business, or the support strategy, among others. According to Saito et al. (2007), technologies that support KM are usually introduced by associating them with the stages of the process. Illustrative examples are the studies by Alavi and Leidner (2001) and Marwick (2001).

Technologies related to the different stages of the KM process by Alavi and Leidner (2001) are: creation - data mining and learning tools; storage - electronic bulletin boards, knowledge repositories; transfer - electronic bulletin boards, discussion forums, knowledge directories, application - expert systems, workflow systems. IT presents three applications in organizational KM: "The coding and sharing of best practices, the creation of corporate knowledge directories, and the creation of knowledge networks" (Alavi and Leidner, 2001). Saito et al. (2007) classify IT according to the support it provides for the KM strategy into: communication and collaboration – instant messaging, e-mail, forums, etc.; search – search engine, etc.; distribution – intranet, etc.; storage and retrieval – repositories, workflow, internet, etc. (Saito et al., 2007). According to Turban et al. (2002), "knowledge management systems are developed using three types of technology: communication, collaboration and storage." The technology for communication, as the name implies, focuses on communication between individuals, for example, e-mail, internet, intranet, among others. The technology for collaboration facilitates group work, and may be synchronous or asynchronous. The storage technology includes database systems, which keep mainly explicit knowledge.

There are different technologies that can be used for KM. The adoption of a particular technology to support the KM is associated with a number of factors, such as the approach and style of KM chosen by the organization, the type knowledge, and the stages of the KM process, among others. Moreover, there are aspects of the environment in which the organization is inserted that can impact the adoption of certain KM support technology (Ryan and Prybutok, 2001). Luan and Serban (2002) and Lindvall et al. (2003) present a list of products available on the market, with their descriptions and sellers. The products were classified into the following categories by Luan and Serban (2002): business intelligence, knowledge base, collaboration, content and document management, portals, customer relationship management, data mining, workflow, search, and e-learning. The authors emphasize that there is some degree of overlap between categories, as well as some products that can be included in more than one of the categories. Technology, though essential in the current context, is not enough for KM, because knowledge depends on people. One of the aspects associated with the people element is the organizational culture (Carrión et al., 2004). Culture is defined as shared values, beliefs and practices of the people in the organization (McDermott and O'Dell, 2001).

Culture can be seen as one of the main barriers to knowledge sharing (McDermott and O'Dell, 2001). According to the authors, alignment of knowledge sharing with the organizational culture requires: relating knowledge sharing with business objectives, problems and results; identifying practices aligned with the style of the organization, instead of copying other organizations; making suitable tools available to existing human networks; enlisting the support of people who already share knowledge. Authors like Birchall and Tovstiga (1999) stress the importance of organizational culture. Organizational culture can play a very important role in the process of transferring and sharing knowledge. In non-routine work environments, involving situations that require initiative, flexibility and innovation from the individual, formal control is less effective than cultural control. The organizational culture can encourage innovation, and knowledge sharing where the formal methods of control fail. Organizational culture must support a system that rewards the sharing and exchange of knowledge.

Organizational culture plays an important role in knowledge sharing and in the creation of the needed platforms, being able to create insurmountable barriers or, alternatively, facilitate and promote the circulation of knowledge flows between the elements of the organization (Lahti and Moilanen, 2004). Gholipour et al. (2010) confirm that cultural factors are relevant to knowledge management. The individual tacit knowledge that each employee carries is lost when the individual leaves the company. In contrast, "cultural knowledge" (Choo and Bontis, 2002), although not codified, remains in the organization despite changes of personnel and exerts a powerful   effect on the creation and adoption of new
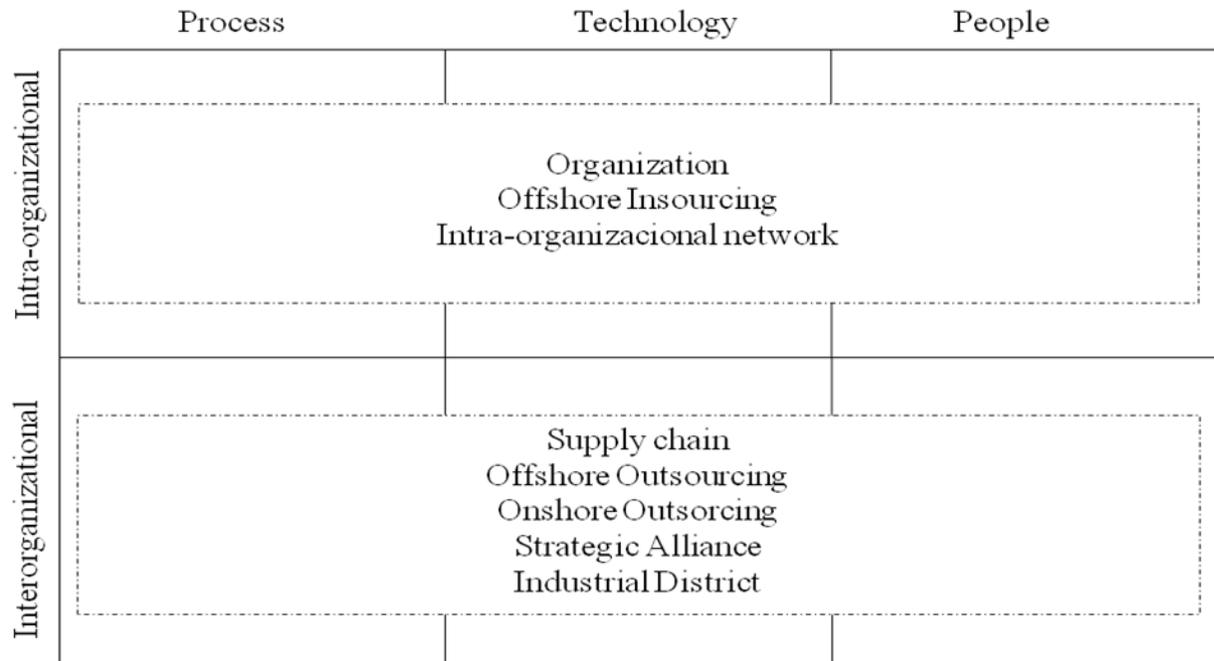
Figure 1. Relationship between the elements of KM and the context in which they are analyzed.

new knowledge. This "cultural knowledge" translates into values and beliefs that persist in the form of shared perceptions, systems of incentives and rewards, and criteria and evaluation methods (Choo and Bontis, 2002).

One of the key features needed for KM is collaboration, within the organization or between organizations (Luan and Serban, 2002). Knowledge can be obtained from different sources, internally (for example, employees) and externally to the organization (for example, suppliers and customers) (Darroch, 2003). Thus, all three elements, technology, process and people may be considered within the organization, that is the intra-organizational KM and between organizations, that is, inter-organizational KM. According to Burstein et al. (2010), the KM team should be defined according to the characteristics of each organization. Some roles are extensions of existing ones, while others are created specifically for KM. Lin (2007) in his stage model of KM, places the construction of a KM team to start the KM in the first stage, and a leader to coordinate the infrastructure and activities of KM in the second stage. The knowledge needed to obtain sustainable competitive advantage is found both within and outside of organizations, consequently, inter-organizational KM initiatives have to be adopted alongside the intra-organizational ones (Ahrmadjian, 2008; Yang and Kim, 2007). An example of research that identified achieving competitive advantage through KM with a focus on inter-organizational relationships was presented by Lakshman and Parente (2008). The authors studied an automotive supply chain in which each

organization was seen as a strategic partner.

Research into KM in an inter-organizational environment is not new. Dyer and Nobeoka (2000) also analyzed the KM in a supply chain, considering that it can be more effective in generating and sharing knowledge than the intra-organizational KM.

The authors concluded that initially, the sharing occurs only between suppliers and the focal firm, and later, knowledge sharing may also occur among suppliers. Ikpen and Tsang (2005) identified a set of conditions that facilitate knowledge sharing in different types of networks (intracorporate network, strategic alliance, industrial district).

Based on the framework proposed by Ikpen and Tsang (2005), knowledge sharing is also discussed in the context of offshore outsourcing (supplier network) (Rottman, 2008), while Lee (2001) investigated the relationship between knowledge sharing and outsourcing success. Figure 1 shows the relationship between the elements of KM and the context in which they are studied. Figure 1 identifies three possibilities for the intra-organizational situation: the organization, offshore in-sourcing and the intra-organizational network. Offshore in-sourcing occurs when a company transfers part of its activities beyond the limits of its country of origin (Olsson et al., 2008). "An intra-corporate network consists of a group of organizations operating under a unified corporate identity, with the headquarters of the network having controlling ownership interest in its subsidiary" (Ikpen and Tsang, 2005).

Five possibilities are presented in Figure 1 in relation to inter-organizational relationships: supply chain, offshore outsourcing, onshore outsourcing, strategic alliance and industrial district.

They respect literature; according to Brown and Hendry (1998), "supply chains involve a vertical relationship between firms engaging in commercial transactions for the exchange of goods and services".

Offshore outsourcing occurs when a company hires another to develop activities and processes, and the two are geographically located in different countries, on the other hand, through onshore outsourcing, the hiring company and the contracted company are geographically located in the same country (Olsson et al., 2008).

A strategic alliance comprises a group of companies that voluntarily organize to share or jointly develop products, technologies or services (Ikpen and Tsang, 2005).

An industrial district is "a network of independent firms operating in the same or related market segment and a shared geographical locality, benefiting from external economies of scale and scope from agglomeration" (Brown and Hendry, 1998).

METHODS

This study follows a descriptive approach, which is suitable for a scientometric analysis of journals articles. Articles published in congresses and books were not analyzed in this research because, according to Gonzalez et al. (2006), people in the academic and business worlds prefer to use journals to obtain and disseminate knowledge. The journals were selected using the journal citation report (JCR) of the social sciences edition of 2008, which was consulted on November 13, 2009. The list of 61 journals was obtained considering the subject category "information science and library science". All the journals presenting the words "information" and "management" in the title were selected for the study. The six selected journals were: information and management (I and M), information processing and management (IP and M), international journal of information management (IJIM), journal of global information management (JGIM), journal of management information systems (JMIS) and management information systems quarterly (MISQ).

The articles reviewed in the journals were selected using proquest as follows:

i. Research on March 13, 2010;
ii. Advanced search considering the journal name and keyword, excluding literary criticism, essays and journals);
iii. The adopted keyword was "knowledge management";
iv. Search made in three locations - a) title, b) abstract and c) citation and abstract. The result obtained by searching "citation and abstract" was adopted because it is the most comprehensive since it considers the title, abstract and keywords.

The articles from from 2009 that were unavailable in Proquest were consulted directly on the site of the journals. However, after examining the list of selected documents, some documents were found not to be articles and were excluded. Thus, the column "article" in Table 1 shows the total number of articles reviewed in each journal and the articles references are in Appendix.

The variables collected in the articles were organized into three dimensions: identification of the article in the journal, article identification and article content. The identification of the article in the journal included the following variables: name of journal, volume, issue and year.

For the identification of the article the variables collected were: title, number of authors, authors' names, affiliation and country. Regarding the article content the variables were: key words, theoretical versus empirical, method and content. Data were organized into a database for later analysis.

The data analysis considered the presence or absence of the variables in the articles (quantity) and content analysis in relation to the contents of the article. If an author presents two or more affiliations, only the first is chosen.

According to Serenko et al. (2008), "people list their more important affiliation first".

The recommendations proposed by Weber (1990) were used for content analysis. The articles were classified according to their content into two dimensions: context (intra-organizational and inter-organizational) and the KM components (process, technology and people). The articles were classified as intra-organizational when they addressed internal issues relating to the organization including offshore insourcing or intra-organizational network; and into inter-organizational when they dealt with the relationship between organizations (supply chain, offshore outsourcing, onshore outsourcing, strategic alliance, industrial district, etc.). The article was classified according to the component of KM (process, technology and people) that received the greatest emphasis. This was identified while reading the articles.

DISCUSSION

The oldest analyzed article was published in 1992 in the journal information and management (Integrating information systems technologies to support consultation in an information center - Sudha Ram, Stephen Hayne and David Carlson), focusing on technology. The distribution of the number of articles per year is shown in Figure 2. There is a trend towards growth in the number of published articles, although it is not possible to say that growth is constant over the years.

This study did not consider specific journals of knowledge management, such as journal of knowledge management, or knowledge and process management, among other journals, but the findings are consistent with Serenko and Bontis (2004) who identified a growth of KM publications from 1993 to 2002, including journals of knowledge management.

Figure 3 shows that International Journal of Information Management and Information and Management, present the largest percentage of articles related to knowledge management topic, although none of them is dedicated only to KM. The numbers of KM articles published by the journals are not directly related with the "aim and scope" declared in the journals website, since:

i. International Journal of Information Management and Journal of Management Information Systems include knowledge management as a topic covered by the journal. Information processing and management did not

Table 1. Number of articles selected in the journals.

Journal	Period (proquest) (March 31, 2010)	Number of the articles with "knowledge management" in			Total number of articles reviewed in each journal
		Title	**Abstract**	**Citation and abstract**	
JGIM	Winter 1993, volume 1, issue 1 to Oct-Dec 2009, volume 17, issue 4	4	7	11	9
IP and M	1976, volume 12, issue 6 to Nov 2009, volume 45, issue 6	1	6	10	10
MISQ	Mar 1985, volume 9, issue 1 to Dec. 2009, volume 33, issue 4	7	12	31	28
JMIS	Winter 1992-1993, volume 9, issue 3 to Fall 2009, volume 26, issue 2	11	13	29	28
I and M	Mar 1981, volume 4, issue 1 to Dec. 2009, volume 46, issue 8	13	23	45	45
IJIM	Mar 1992, volume 12, issue 1 to Dec. 2009, volume 29, issue 6	17	33	56	55
Total		53	94	176	175
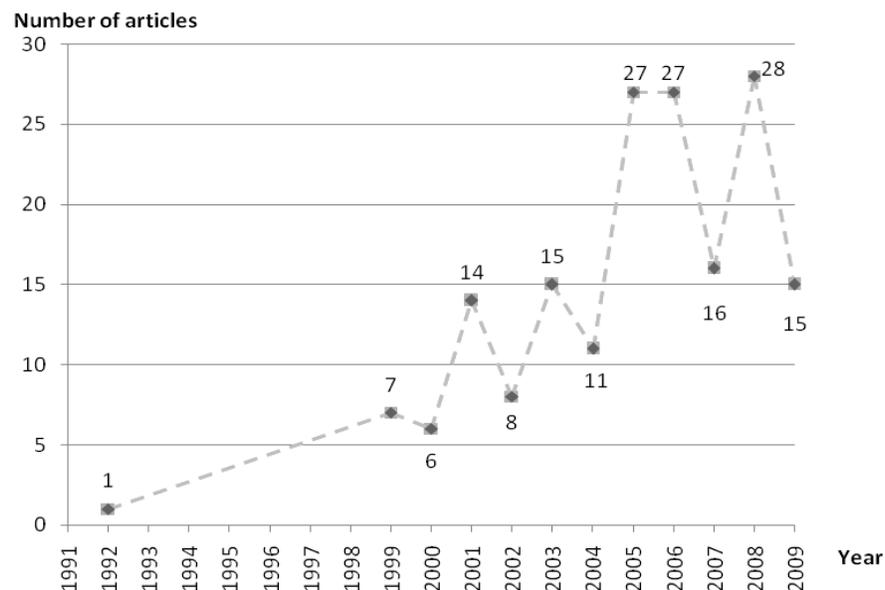
Figure 2. Distribution of articles per year.

"aims and scope". However, aspects related to KM such as dissemination of information and knowledge is

mentioned;

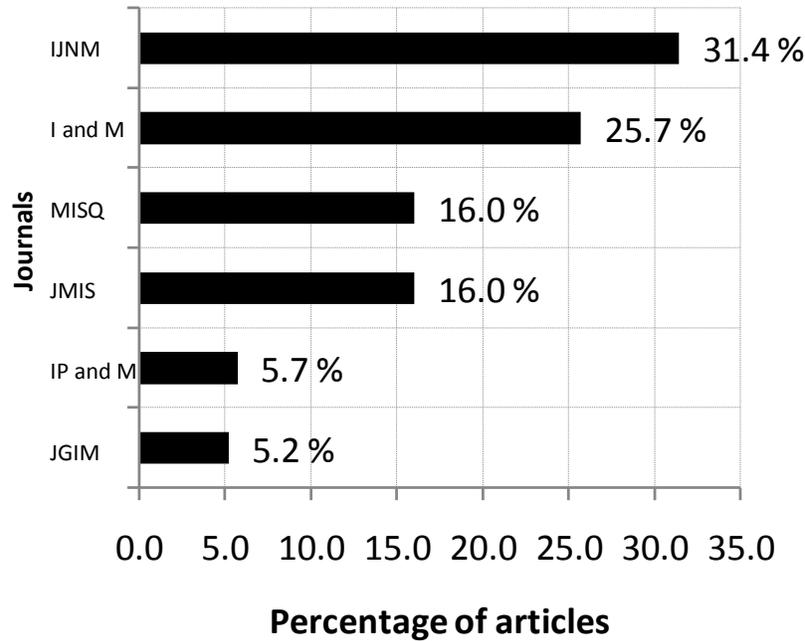ii. Information and management, management

Figure 3. Distributions of articles per journal.

Table 2. Number of articles by number of authors.

Journal	Number of authors in each article					
	1	2	3	4	5	6
IJIM	17	25	7	4	0	2
I and M	9	20	12	3	1	0
MISQ	5	11	10	2	0	0
JMIS	6	11	7	2	1	1
IP and M	3	2	4	1	0	0
JGIM	1	3	2	3	0	0
Total	41	72	42	15	2	3
Percentage	23.4	41.2	24.0	8.6	1.1	1.7

information systems quarterly and journal of global information management did not mention KM in the "aim and scope".

When studying the journal of knowledge management, knowledge and process management and journal of intellectual capital 1993 to 2002, Serenko and Bontis (2004) found that 46% of the articles had been written by one author and 94.9% by one to three authors. Although the journals examined in this study are not the same, there is a change in the pattern of results. The highest percentage (41.2%) in Table 2 is associated with articles presenting two authors. The percentage of items with one to three authors is lower compared to the research carried out by Serenko and Bontis (2004); this is partly due to the large number of articles presenting four authors. This can represent greater maturity in the field of

research with the need for greater interaction among researchers to generate relevant contributions. Table 2 shows the distribution of articles according to the number of authors.

Dattero (2006) analyses networks of relations using Serenko and Bontis (2004) data set.

The author concludes that the reason for the lack of collaboration (46% of the articles had been written by one author) is "the fact that in many universities and organizations there is a single person who leads the KM/IC research efforts". This could also partially explain the results of the present study, since co-authors are affiliated with different institutions in most articles having two or more authors (103 out of 134 articles).

This may also be due to several other reasons such as: partnerships occur due to affinity between researchers

Table 3. Number of articles per number of affiliated institutions.

Number of authors in each article	Number of articles with:				Total	Percentage
	1 Institution	2 Institutions	3 Institutions	4 Institutions		
2 Authors	21	51	0	0	72	53.8
3 Authors	7	15	20	0	42	31.3
4 Authors	1	4	7	3	15	11.2
5 Authors	0	0	2	0	2	1.5
6 Authors	2	1	0	0	3	2.2
Total	31	71	29	3	134	100
Percentage	23.1	53.0	21.7	2.2		
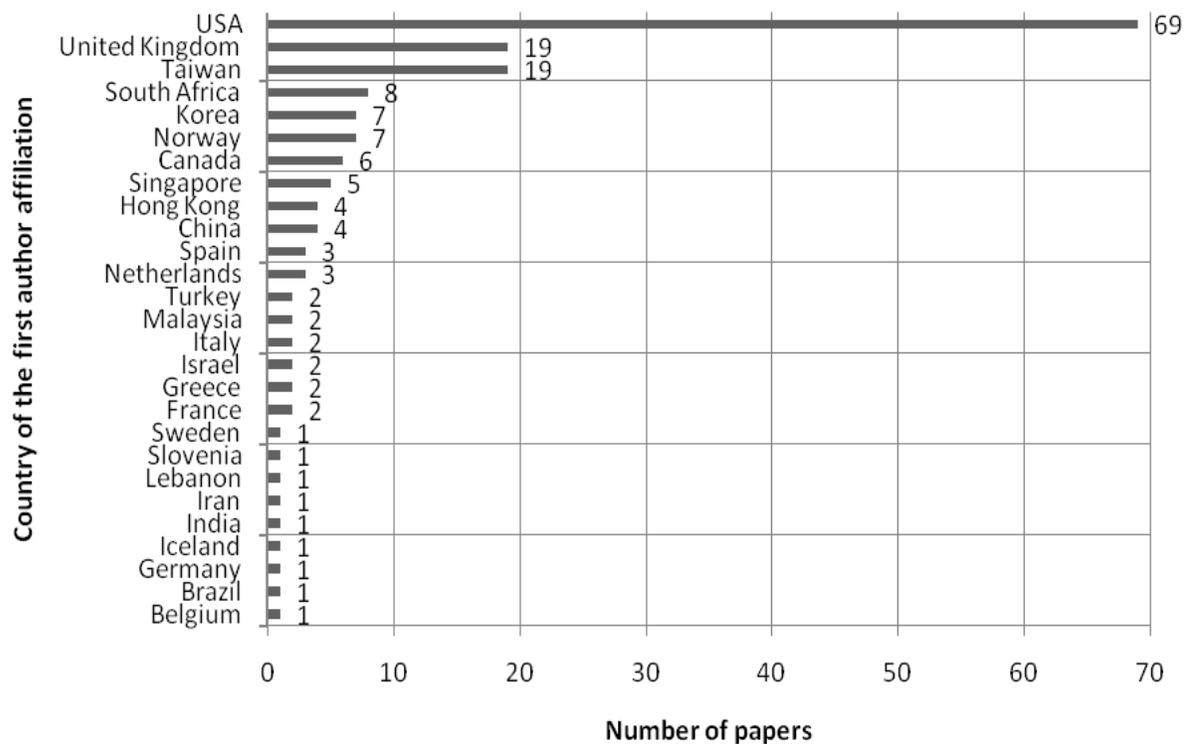
Figure 4. Distribution of articles per country of first author´ affiliation.

regardless of the institution to which they are affiliated; the visit of a researcher on sabbatical to another institution for a period of time, some kind of exchange, etc. Table 3 shows the number of articles according to the number of institutions to which the authors are affiliated.

According to Palvia et al. (2007), most of the papers in "information and management" are published by United States of America (USA) based researchers.

Serenko and Bontis (2004) identify USA and United Kingdom as the most productive countries. In this study, results are consistent with previous research; approxi-

mately 39% of the first authors have their affiliation located in the USA, followed by United Kingdom and Taiwan with 11% respectively. Figure 4 shows the distribution of articles by country of first author´s affiliation.

Considering all authors in each paper, the distribution of articles per country of all author´s affiliation also shows USA, United Kingdom and Taiwan as the most productive countries. This study use direct count technique to rank the countries, since this approach produces comparable results to equal credit scoring approach (Serenko et al., 2008, 2010). This study identifies contributions of relatively smaller countries, such as Sweden and Greece, consistent with previous work (Serenko et al., 2010).
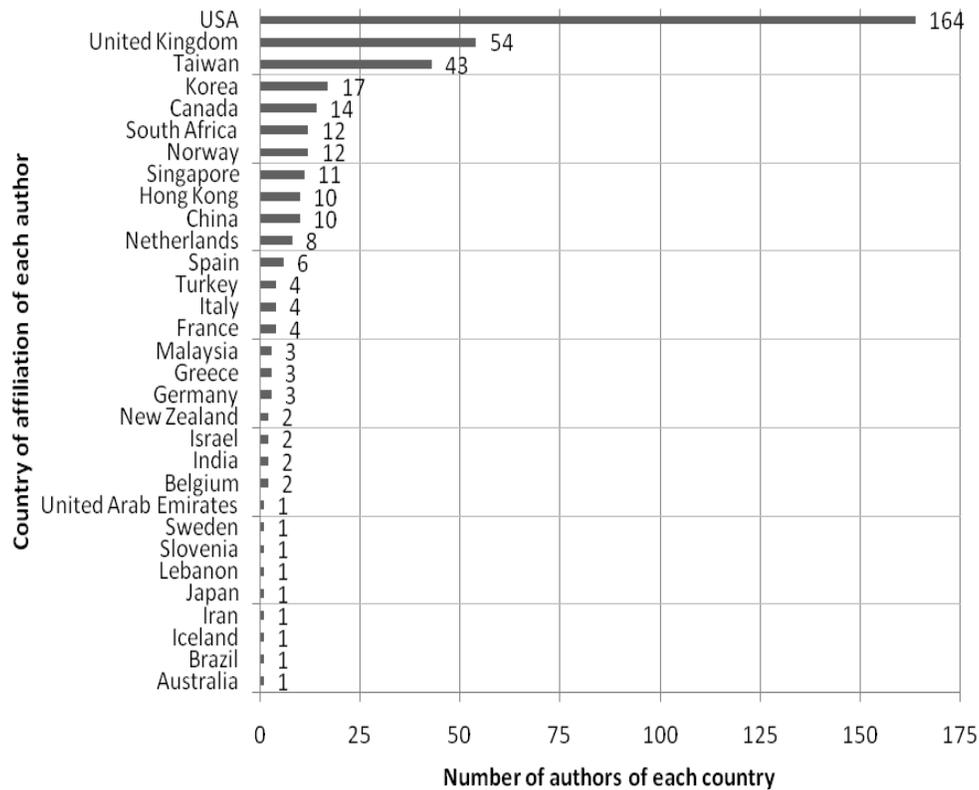
Figure 5. Distribution of articles per country of all authors' affiliation.

Table 4. Number of articles per number of countries of authors.

Journal	Number of countries		
	1	2	3
IJIM	47	8	
I and M	37	7	1
MISQ	23	3	2
JMIS	25	3	
IP and M	9	1	
JGIM	3	4	2
Total (in %)	144 (82.3)	26 (14.9)	5 (2)

Figure 5 shows the distribution of articles per country of all author´s affiliation.

Although two or more institutions may be involved in most co-authored articles, the number of studies involving authors in institutions located in more than one country is still very small, 17.7% involved two or three countries, as shown in Table 4. Partnership between teachers located in different countries can facilitate the comparative study of different cultures. Moreover, geographical distance (time zone, unable to physically attend meetings, etc.) and the teaching environment (which implies different availability of time and resources, different school calendars, etc.,) are barriers that need to

be overcome when working together. The countries where the authors of the 31 articles (17.7%) are located are: Australia, Brazil, Canada, China, Greece, Hong Kong, India, Iran, Israel, Japan, Malaysia, New Zealand, Korea, Singapore, Slovenia, Taiwan, the Netherlands, Turkey, United Arab Emirates, the United Kingdom, and the United States of America.

Partnerships between researchers from different countries are facilitated when a researcher visits another institution for a period of time, either as a student or visiting professor.

Among the total of 175 articles analyzed, 325 writers were identified who participated in one article, 23 authors

Table 5. Number of authors by journal with 1 to 4 articles.

Journal	Number of authors by journal with:			
	1 Article	2 Articles	3 Articles	4 Articles
IJIM	91	4	2	3
I and M	98	2	0	0
MISQ	60	2	0	0
JMIS	66	2	0	0
IP and M	23	0	0	0
JGIM	25	0	0	0

Table 6. Theoretical vs. empirical studies published in the journals.

Journal	Empirical:				Total number of empirical studies	Total number of theoretical studies
	Survey	Case study	Experiment	Other		
MISQ	8	4	3	3	18	10
Percentage	44.4	22.2	16.7	16.7	64.3	35.7
I and M	24	8	3	4	39	6
Percentage	61.5	20.5	7.7	10.3	86.7	13.3
JMIS	9	6	4	3	22	6
Percentage	40.9	27.3	18.2	13.6	78.6	21.4
IP and M	0	1	2	5	8	2
Percentage	0	12.5	25.0	62.5	80.0	20.0
JGIM	3	3	0	1	7	2
Percentage	42.9	42.9	0.0	14.2	77.8	22.2
IJIM	14	18	1	7	40	15
Percentage	35.0	45.0	2.5	17.5	72.7	27.3
Total	58	40	13	23	134	41
Percentage	43.3	29.8	9.7	17.2	76.6	23.4

who participated in two articles, 5 authors who participated in three articles and 4 authors who participated in four articles. The authors who were first author in more than one article are: M du Plessis, Kevin C Desouza, Jon-Arild Johannessen – in 4 articles; Petter Gottschalk, Peter H Gray, Minsoo Shin, Maryam Alavi, M Lynne Markus, Jae-Nam Lee, I-Chieh Hsu, Chinho Lin, Anne P Massey, Alton Chua, Ali E Akgün – in 2 articles.

Results in this study are consistent with previous research, since Petter Gottschalk also appears among top KM/IC researchers ranked by individual productivity that was elaborated by Serenko and Bontis (2004) and Serenko et al. (2010). We believe experienced and productive authors could reveal to be very helpful when integrating junior research teams, sine, authors who participated in two or more papers could serve as models or advisors to junior researchers (Serenko et al., 2008). IJIM, I and M, JMIS and MISQ were the journals where the same author published more than one article. Table 5 shows the number of authors with one or more articles in each journal. The same author having more than one article in the journal may be associated with two reasons; the type of research conducted by the author or some journals publishing a greater number of articles on KM than others.

Most of the examined articles (76.6%) report empirical research. However, some theoretical articles can be found. Table 6 shows the number of theoretical and empirical articles in each of the journals analyzed. The research methods most used were the survey (58 articles) and case study (40 articles). These results are consistent with previous research; Serenko et al. (2010) identify a reduction in non-empirical studies over time, which is also clear in this study. It is a signal of field maturity, since early studies usually adopt theoretical approaches necessary to propose frameworks, and latter ones develop empirical research necessary to validate the previous ones.

In 171 analyzed articles, 595 key words were identified, while four articles had no key words. The objective was to

Table 7. Number of keywords and number of articles in which they were mentioned.

Number of key words	Number of articles
1 (knowledge management)	88
1 (knowledge sharing)	17
1 (knowledge management system)	17
1 (knowledge transfer)	13
1 (knowledge)	11
2 (tacit knowledge, social capital)	6
4 (collaboration, information management, information technology, organizational learning)	5
11 (absorptive capacity, case study, communities of practice, expert systems, information systems, innovation, knowledge acquisition, knowledge creation, new product development, organizational culture, structural equation modeling)	4
17 (coordination, data mining, decision making, e-commerce, ERP, group support systems, Indigenous knowledge, information retrieval, knowledge flow, knowledge integration, knowledge network, knowledge repositories, knowledge sourcing, qualitative approach, software development, technology, user satisfaction)	3
37 key words	2
519 key words	1

identify the most frequently used key words. Table 7 shows the number of key words in relation to the number of articles in which they were mentioned. The number of key words that were mentioned in only one article is large (519). This may indicate that the topics studied in each article are very specific or that the chosen key word is very specific, and not the researched contents. Another interesting finding is that "knowledge management" was chosen as a keyword in only 88 articles, although it is the most cited keyword. The keywords most frequently used are: knowledge management (51.4%), knowledge sharing (9.9%), knowledge management systems (9.9%), knowledge transfer (7.6%), and knowledge (6.4%).

Key words mentioned three or more times were classified in the following dimensions: 12 technology, 16 process and 6 people. According to this classification, key words related to research method were disregarded (qualitative approach, case study, structural equation modeling) as well as the terms knowledge management and knowledge, because they are generic to this research. Key words associated with each dimension are presented in Table 8.

Table 9 shows the number of articles classified according to the content. The articles were classified according to their content considering the KM elements (technology, process and people) and environment (inter organizational or intra-organizational).

The greater concentration of articles focusing on technology and process compared to people may be explained by the choice of journals reviewed which was based on the words information and management being present in the titles. When analyzing the data, it is visible that there are more studies that focus on the intra-organizational environment (144 items - 82.3%). Such numbers seam to indicate that organizations have not yet sufficiently matured their KM projects internally, to the level of introducing them in the external environment.

CONCLUSION, LIMITATIONS AND RESEARCH GAPS

Considering the six top academic-oriented journals, the review of the work published on KM turned out to be very interesting. The first article on the subject was published in the early 1990's by information and management, which had accumulated 45 published articles by the end of 2009, considering the selected journals. The research on KM in the six journals covered reached a total of 175 articles from 1992 till the end of 2009. This evolution is consistent with the increasing relevance of KM research in the general academic-oriented management literature.

The KM has attracted the attention of a large number of individuals (357 writers), considering the analyzed data set. The highest percentage of the papers (76.6% - 134 papers) presents two authors; co-authors are affiliated with different institutions in 76.9% of the cases (103 papers). According to our findings, there is not a single author or an institution publishing the most research. This study identifies a sign of maturity with a increasing in the number of co-authored papers compared to Serenko and Bontis (2004) results. Multi-authors could help to improve the paper quality and to establish networks leading to

Table 8. Classification of the keywords into three dimensions.

Dimension	Technology	Process	People
Key words	data mining, e-commerce, ERP, expert systems, group support systems, information management, information systems, information technology, knowledge management system, knowledge repositories, software development, technology	absorptive capacity, collaboration, communities of practice, coordination, decision making, information retrieval, innovation, knowledge acquisition, knowledge creation, knowledge flow, knowledge integration, knowledge network, knowledge sharing, knowledge sourcing, knowledge transfer, new product development	indigenous knowledge, organizational culture, organizational learning, social capital, tacit knowledge, user satisfaction

Table 9. Classification of articles' content.

Variable		Dimension:			Total
		Technology	Process	People	
Environment	Inter-organizational	6	23	2	31
	Percentage	3.4	13.2	1.1	17.7
	Intra-organizational	64	62	18	144
	Percentage	36.6	35.4	10.3	82.3
	Total	70	85	20	175
	Percentage	40.0	48.6	11.4	100.0

higher cooperation among institutions.

There is a positive relationship between international cooperation and citation impact (Inzelt et al., 2009). The international cooperation was not identified widely in this investigation. The number of papers involving authors affiliated to institutions located in different countries is very small, only 31 papers involve two or three countries. Based upon data regarding first author's affiliation country this study indentifies 27 countries contributing to literature, expanding to 31 when considering all co-authors' affiliation countries. Sixty one percent of all the papers have a first author affiliated to an institution located in USA, United Kingdom or Taiwan. These results are consistent with previous research, similar to Serenko et al. (2010) results; the papers are not distributed equally among countries. A suggestion to equilibrate the number of published articles by author's affiliation countries could be increasing international partnership among researchers. The international partnership could be facilitated with grants to visiting professors and sabbatical year.

The journal that accounts for the largest number of articles on KM (IJIM) mainly offers articles by one or two co-authors, quite the opposite of the journal that published the least number of articles on the subject (JGIM) which more often presents articles involving three co-authors. Based on this review, most articles have two co-authors from two different universities within the same country. By contrast, JGIM appears to favor contributions from multinational affiliated authors. Most journals publish an author's research just once over the years, while IJIM consents to publish up to 4 articles by the same authors, considering the period covered by the study.

According to the present study, published research is mainly empirical; with MISQ publishing the highest ratio of theoretical articles on KM with little over 35%. This result is also consistent with previous research, since Serenko et al. (2010) found a decline in non-empirical methods in literature. Regarding the three key elements considered in the literature on KM, process is the one most often addressed by authors. Technology is another key element often dealt with in articles, while the people element is by far the least explored. This imbalance is coherent within the context of the journals chosen for the purposes of this study, which are mainly dedicated to information systems issues, and consistently present KM research that emphasizes the relevance of processes and technology over people.

Published work largely deals with the intra-organizational level of analysis. Although there are several domains within the literature on inter-organizational studies (supply chain, onshore and offshore outsourcing, strategic alliances and industrial districts), few articles addressing such topics have been published (17.7%). In contrast, over 80% of published work focuses on intra-organizational contexts (organizational level, offshore insourcing and intra-organizational networks). This disparity reveals that authors pay comparatively little attention to the inter-organizational context and invites research on the relational level.

Similar to all researches, limitations should be considered when interpreting the results. First, the journals examined did not represent all available publication about KM, because KM is an interdisciplinary topic. This paper focuses only journals in the category of "information science and library science". Second, research production in terms of quantity may not reflect research quality or impact. The quality or impact of the papers was not assessed in this study.

Future research into KM should attempt to fill the identified gap by focusing more on the inter-organizational studies. The development of such work will allow the detection of relevant variables and dimensions that firms need to consider in order to better interrelate in the globalized world in which they operate. While respecting the essence of information systems journals, authors are also invited to develop the human dimension of their studies, since people are an essential element in every organizational system. People use information systems to management knowledge within the firm. Authors should devote some time to research the overlap between the two areas.

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