

Knowledge Management towards a digitalization era: systematic review of past research and future directions

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Abstract: This paper presents a systematic analysis of knowledge management (KM) research spanning the last four decades. The analysis is tracing the research paradigms, the theoretical premises and the objects of study of extant research building on the accomplishments of the past to map the key dimensions of KM as a research domain. Furthermore, a number of directions for future research are identified. The review provides a conceptual basis for synthesizing and extending KM research. During the past four decades, KM matured as a domain and its popularity increased for both academics and practitioners. The interest in KM is fueled by digitalization and the turn to a knowledge economy. The systematic analysis of research output over the years reveals the sociotechnical character of KM as shifts in the study of technology and organizations that are closely related to the domain's evolution. A systematic analysis of overarching review papers was chosen as a method that allows to thoroughly delve in the content without compromising coverage. Specifically, the findings reveal the plurality of research paradigms in extant KM research and the diversity of theoretical conceptualizations. Overall, there is a shift from the individual-knowledge focus towards a group-knowledge focus, which is more compatible with networking rather than repository approaches to KM. The objects of study also vary significantly covering technologies, the interplay between technologies and organizations and knowledge trajectories including creation, elicitation, codification, conversion, accumulation, transfer, application, valorization and obsolescence. Future research can be developed to cover underexplored areas and underrepresented theoretical and methodological approaches in extant research and to respond to needs for research on emerging topics related to digitalization. However, returning to the roots of the KM field when practitioners made substantial contributions to KM research may be useful, especially because of the opportunities that new KM technologies offer.

Keywords: KM trends, future KM research, KM research paradigms, KM theory

1. Introduction and Background

Knowledge management (KM) is a relatively young field of research. The roots of the field date back to around the 1970's, though it is not until the mid-late 1990's that the rate of research and publications within the domain started to truly accelerate. This paper attempts to give a comprehensive overview of the field as a research domain and to identify the key dimensions of extant research that may hint at what the future of knowledge management research may hold. Because of the very large number of published papers in the domain, it is nearly impossible to review all studies in detail to identify their research premises. Thus, a systematic analysis of overarching review papers was chosen as a method that allows condensing the review without compromising in terms of coverage. Specifically, the findings of 19 review papers published in the 2001-2016 period were analyzed.

Research activity on KM has a history of more than forty years. The earliest publications included in our analysis were published back in the 1970's (such early publications are covered by: Alavi and Leidner 2001; Dwivedi et al. 2011; Gu 2004). The emergence of the domain is linked to the gradual transformation of the global economy and the shift towards the "knowledge economy". The term which was introduced by Peter F. Drucker in 1969 (Drucker 1969) but only received widespread attention in the nineties when economy changes became more visible. Overall, KM as a domain did not attract many researchers' attention until the middle of the 1990s (Gu 2004). At that time, the idea that knowledge can be viewed as a "resource" for economic development was established. Drucker wrote: "the productivity of knowledge is increasingly going to be the determining factor in the competitive position of a country, an industry, a company" (Drucker 1993: 176). This perspective on knowledge, stimulated the interest of researchers and practitioners (Serenko et al. 2010), resulting to an exponential growth of the worldwide KM scholarly society from the mid 1990's (Gu 2004), and to the publication of several thousands of KM papers (Lee and Chen 2012; Sedighi and Jalalimanesh 2014). The interest in KM has been further fueled by the shift towards digitalization that revolutionized value creation in the modern economy (Malhotra 2001). The use of information

and communication technology (ICT) is driving knowledge and value creation, transforming most if not all sectors (OECD 2016a). This also means that new types of work are emerging (OECD 2016b) bringing knowledge in focus. Within this realm, there is evidence of significant complementarities between investments in ICT and investments in knowledge based capital (Corrado et al. 2014). Organizations are rushing to catch the knowledge wave and academics are investigating and contributing to the further development of knowledge-intensive organizations.

While the accelerating number of publications indicates the raising interest on knowledge, there are challenges in delineating KM as a research discipline (Nonaka and Peltokorpi 2006). The state and identity of KM was frequently explored from the “management fad” or “management fashion” approach (Serenko 2013). This relates to the fact that KM emerged from the non-academic sector, including consulting companies (Koenig and Neveroski 2008) and research developed from a spectrum of different traditions ranging from philosophy to computer science and economics (Nonaka and Peltokorpi 2006). The conceptual plurality and the strong initial contributions of non-academics shaped the ambiguous profile of KM as a research discipline. Despite a critical mass in KM publications, there has been no comprehensive analysis of the research paradigms, the theoretical premises and the objects of study of extant KM research. Thus, the principle contributions of this study are twofold. First, we provide a foundation for research development by mapping the key dimensions of knowledge management as a research domain and by identifying areas for further research. Second, we systematically synthesize a significant volume of KM research offering a sound basis that can help researchers orient themselves within the domain and position their own work.

The remainder of the paper is organized as follows. Section 2 presents the systematic approach used for selecting articles to review and the specific questions that our review aims to answer. In Section 3, we offer a synthesis of our findings structured around our research questions. Subsequently, in Section 4 we present directions for future research based on our analysis of secondary studies. In Section 5, we conclude by discussing the most interesting observations. Finally, we present a summary of the key elements of all the secondary studies covered in this review (see Appendix 1). This table presents each paper’s objectives and findings, timeframe, and future research directions.

2. Research focus and method

Because of the very large number of research papers in the domain, it is nearly impossible to review all published studies. For instance, Lee and Chen, identified a total of 10,974 publications in the KM field from 1995 to 2010 (Lee and Chen 2012). Thus, a systematic analysis of overarching review papers was chosen as a method of synthesizing a large body of research without compromising in terms of coverage (Kitchenham et al. 2009). The goal of the review is to draw from secondary studies (i.e. literature reviews) to consolidate the key dimensions of KM as a research discipline and its future orientation. We have chosen to employ a systematic approach for identifying, evaluating and interpreting the findings of multiple review papers in our tertiary study. The approach is based on Kitchenham’s three main phases: planning the review, conducting the review and reporting the review (Kitchenham 2004). We used the basic setup of these three phases as a methodological framework that we explain in detail in the following paragraphs.

The interest of our investigation is specifically on KM as a research domain, hence, in our review we explored three key research dimensions: the research paradigms within KM (i.e. the ontological and epistemological underpinnings), the knowledge related conceptualizations that are guiding research (i.e. the theoretical premises for the core concept of knowledge), the objects of study in KM research (i.e. systems, processes, outcomes, or other types of KM objects being studied). Specifically, the research questions addressed are the following:

RQ1: What research paradigms are found in extant KM research? RQ2: What are the theoretical premises? RQ3: What are the objects of study?

By defining criteria early on, both for searching and selecting, we aimed to reduce selection bias, assure the quality of the papers selected and increase the credibility of our review (Kitchenham 2004). Hence, we developed predefined search terms and applied them. The selection of papers was performed in October 2016. Hence, we covered secondary studies on KM published up to that time. Extraction was conducted in two rounds. First,

“knowledge management” was searched as a keyword or word in the title. Further, we filtered the identified articles by selecting only the ones that are secondary studies of prior literature by retaining only the ones that use the terms “literature review”, “trends”, “meta-analysis”, “meta-review”, “bibliometric” or “scientometric” in their titles or as a keyword. We performed the research in Oria, which allows searching simultaneously through the collections of all Norwegian academic libraries (including electronic books and articles) and in Google Scholar. As a result, 79 articles were selected. To aid with the selection and quality assurance process we added some exclusion criteria (Table 1). We applied the inclusion and exclusion criteria to form the corpus of secondary studies for our study by reading the titles and then the abstracts of every article in this initial shortlist.

Table 1: Inclusion and Exclusion Criteria

Inclusion criteria	I1: General, over-arching KM research review. I2: Meta-analysis (bibliometric or scientometric) of KM research publications.
Exclusion criteria	E1: Sole focus on a specific theme within the KM field. E2: Sole focus on a specific practice or application within the KM field (e.g. focus on healthcare KM). E3: Sole focus on a specific country or geographical location.

After applying our inclusion/exclusion criteria and doing a quality assessment on each article based on these criteria, 19 articles were selected (Table 2). Additionally, a detailed table that summarizes the key points of the selected papers is presented in Appendix 1. Our selection of papers offers coverage from the early days of KM in the 1970's, and all the way up to 2016. The middle period of the early 2000's receives the most coverage in our selected studies.

3. Findings

3.1 What research paradigms are found in extant KM research?

Prior KM research is characterized by plurality in the research paradigms employed (Alavi and Leidner 2001). Chauvel and Despres (2002) explored the research underpinnings of KM papers and made a distinction between the classical (positivist) perspective and the interpretive (post-positivist) perspective. Similarly, Nonaka and Peltokorpi (2006) discussed ontological and epistemological differences within KM publications using an objective - subjective continuum. They traced the differences back to the research traditions of the key scientific fields that have influenced KM research. Publications based on economics are largely based on a positivist rationale; furthermore, positivism has long had a dominant position in the social sciences with its objective view of social reality. In contrast, interpretative philosophies, such as phenomenology and pragmatism, place an emphasis on subjectivity and KM scholars drawing from interpretative philosophies tend to provide processual and contextual KM accounts.

Dwivedi et al. (2011) distinguished between four categories of papers: a) the ones that follow a positivist paradigm, b) the ones that do not neatly fit into either positivist or interpretive categories (e.g. personal view points or studies that are highly conceptual in nature) which they labelled “descriptive/conceptual/theoretical”, c) the ones that follow an interpretive paradigm and d) the ones that follow the critical research paradigm. They found that the dominant research paradigm amongst KM researchers is the positivist one, while the second most frequent approach is the descriptive/conceptual/theoretical one. The only found very few KM papers in their secondary study that followed an interpretive or critical paradigm. Similarly, Schultze & Leidner (2002) found that the majority of published KM research belongs to a normative discourse. Furthermore, they classified KM research to three more discourses: interpretive (about understanding broad organizational implications), critical (about political struggles and power), and dialogic (about the complexity and lack of shared meaning).

We found that although positivism seems to be the dominant KM research paradigm, there is also a significant volume of research that follows different paradigms (most notably interpretivism). Using secondary studies to explore research paradigms is challenging, not only because of the plurality in research approaches employed in the KM domain, but also, because there is a variety of schemas employed in secondary studies for the classification of prior research papers. Furthermore, due to the largely practical nature of the discipline, several papers do not exhibit any clear epistemological characteristics (Dwivedi et al. 2011).

Table 2: The corpus of secondary studies for our review

#	Article
1	Akhavan, P., Ebrahim, N. A., Fetrati, M. A., & Pezeshkan, A. (2016). Major trends in knowledge management research: a bibliometric study. <i>Scientometrics</i> , 107(3), 1249-1264.
2	Alavi, M., & Leidner, D. (2001). Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. <i>MIS Quarterly</i> .
3	Chauvel, D., & Despres, C. (2002). A review of survey research in knowledge management: 1997-2001. <i>Journal of knowledge management</i> , 6(3), 207-223.
4	Dwivedi, Y. K., Venkitachalam, K., Sharif, A. M., Al-Karaghoul, W., & Weerakkody, V. (2011). Research trends in knowledge management: Analyzing the past and predicting the future. <i>Information Systems Management</i> , 28(1), 43-56.
5	Gu, Y. (2004). Global knowledge management research: A bibliometric analysis. <i>Scientometrics</i> , 61(2), 171-190.
6	Kakabadse, N. K., Kakabadse, A., & Kouzmin, A. (2003). Reviewing the knowledge management literature: towards a taxonomy. <i>Journal of knowledge management</i> , 7(4), 75-91.
7	Lee, M. R., & Chen, T. T. (2012). Revealing research themes and trends in knowledge management: From 1995 to 2010. <i>Knowledge-Based Systems</i> , 28, 47-58. ISO 690
8	Liao, S. H. (2003). Knowledge management technologies and applications—literature review from 1995 to 2002. <i>Expert systems with applications</i> , 25(2), 155-164.
9	Newell, S. (2015). Managing knowledge and managing knowledge work: what we know and what the future holds. <i>Journal of Information Technology</i> , 30(1), 1-17.
10	Nonaka, I., & Peltokorpi, V. (2006). Objectivity and subjectivity in knowledge management: a review of 20 top articles. <i>Knowledge and process management</i> , 13(2), 73-82.
11	Patil, S. K., & Kant, R. (2014). Methodological literature review of knowledge management research. <i>Tékhné</i> , 12(1), 3-14.
12	Ponzi, L. J. (2002). The intellectual structure and interdisciplinary breadth of knowledge management: A bibliometric study of its early stage of development. <i>Scientometrics</i> , 55(2), 259-272.
13	Schultze, U., & Leidner, D. E. (2002). Studying knowledge management in information systems research: discourses and theoretical assumptions. <i>MIS quarterly</i> , 26(3), 213-242.
14	Sedighi, M., & Jalalimanesh, A. (2014). Mapping research trends in the field of knowledge management. <i>Malaysian Journal of Library & Information Science</i> , 19(1), 71-85.
15	Sensuse, D. I., Sucahyo, Y. G., Rohajawati, S., & Anggia, P. (2014, April). Models and frameworks of knowledge management: A literature review. In <i>Information Science, Electronics and Electrical Engineering (ISEEE), 2014 International Conference on (Vol. 2, pp. 1166-1170)</i> . IEEE.
16	Serenko, A. (2013). Meta-analysis of scientometric research of knowledge management: discovering the identity of the discipline. <i>Journal of Knowledge Management</i> , 17(5), 773-812.
17	Serenko, A., & Bontis, N. (2004). Meta-review of knowledge management and intellectual capital literature: Citation impact and research productivity rankings. <i>Knowledge and process management</i> , 11(3), 185-198.
18	Serenko, A., Bontis, N., Booker, L., Sadeddin, K., & Hardie, T. (2010). A scientometric analysis of knowledge management and intellectual capital academic literature (1994-2008). <i>Journal of Knowledge Management</i> , 14(1), 3-23.
19	Tsai, H. H., & Yang, J. M. (2010). Analysis of knowledge management trend by bibliometric approach. <i>Proceeding (s) of the WASET on knowledge management</i> , 62, 174-178.

3.2 What are the theoretical premises of extant KM research?

Extant KM research adopted different meanings and definitions of knowledge (Kakabadse et al. 2003; Liao 2003) building upon 20th century philosophers (such as Polanyi and Foucault) but also drawing from ancient Greek philosophy and the students of Plato. Beyond the philosophy-based models in KM, prior research has employed cognitive models (drawing from psychology), network models (drawing from innovation studies) and the community of practice model of KM which builds on sociological and historical perspectives. Furthermore, scholars

have theorized based on economics to discuss the role of knowledge in organizations (Nonaka and Peltokorpi 2006).

Different KM scholars have based their research on different theoretical constructs. One of the most used concepts is the distinction between tacit and explicit knowledge (Alavi and Leidner 2001; Nonaka and Peltokorpi 2006) drawing from the philosophical work of Polanyi (1958) and being mostly influenced by the interpretation of tacit knowledge by Nonaka (1991). Another key conceptual distinction is between data, information and knowledge (Alavi and Leidner 2001; Nonaka and Peltokorpi 2006). Unlike information, knowledge is about beliefs, commitment, perspectives, intention and action (Nonaka and Peltokorpi 2006). Knowledge has been conceptualized in prior KM research as an object, a cognitive state or a capability; asset or commodity; culture or symbolic capital; residing in individuals, groups, collectives, and organizations, documents, processes, policies, physical settings, or computer repositories (Alavi and Leidner 2001; Nonaka and Peltokorpi 2006; Schultze and Leidner 2002). Only few scholars have discussed the nature of the knowers; in such research, humans are often conceptualized either as deterministic or voluntaristic. In the former, emphasis is placed on individuals and in the latter, on collectives (Nonaka and Peltokorpi 2006).

Overall, the individual-knowledge focus of the 1970s and 1980s has shifted to a group-knowledge focus in the 1990s and 2000s (Kakabadse et al. 2003). A group-knowledge focus is more compatible with networking rather than repository approaches to KM. Repository and network approaches are based on different research assumptions (Newell 2015). The networking model seeks to support knowledge-sharing and rich communication activities within communities by providing them with interactive communication tools, such as email, videoconference, the intranet, and social software. The KM research which builds upon the networking model often studies tacit knowledge and informal relations in organizations, such as communities of practice. On the other hand, the repository model is adopted by more technologically focused research exploring the codification of knowledge into information systems for reuse. Most recently, the material agency of technology (IT as an active participant in knowledge work) has emerged as a theoretical conceptualization relevant for KM scholars (Newell 2015). Nevertheless, although a significant volume of prior KM research relates to computer systems, the theoretical breadth surrounding KM mainly occurs within management oriented research (including Information Systems) and not KM studies oriented to computer science (Ponzi 2002).

3.3 What are the objects of study in extant KM research?

The objects of study in extant KM research kept shifting from its early days until today. KM research has explored constructs and variables related to information technology systems, to issues related to the social psychology of organizing, and – to a lesser extent – the interaction between these two (Chauvel and Despres 2002). Although there was a dominance of papers focused on technical objects of study related to Computer Science during the 2005–2008 period, since then, we have witnessed the dominance of objects of study related to business and economics (Akhavan et al. 2016).

Our analysis of secondary studies on KM research (mostly the work by: Alavi and Leidner 2001; Chauvel and Despres 2002; Dwivedi et al. 2011; Kakabadse et al. 2003; Lee and Chen 2012; Schultze and Leidner 2002; Sedighi and Jalalimanesh 2014) revealed diverse objects of study including: (1) issues related to software for KM such as the development of expert systems, semantic web technologies, text mining, query processing, collaborative systems, social software (technology focus), (2) issues related to KM in organizations including the interplay of technology and organizational aspects such as research on KM impact, KM performance evaluation, enablers and/or barriers associated with KM, implementation of KM initiatives and governance structures, awareness and legitimization of KM (organizational and business focus), and (3) issues related to knowledge handling including creation, elicitation, codification, conversion, accumulation, transfer, application, valorization and obsolescence (focus on knowledge trajectories).

Surprisingly, limited prior research regardless of its orientation (technology, organizational/business, knowledge trajectories) has explored KM at an inter-organizational level (Patil and Kant 2014). The majority of KM researchers tend to view the subject area as being organizationally-bounded (Dwivedi et al. 2011).

The objects of study in KM research are evolving (Lee and Chen 2012; Serenko 2013) as they are strongly influenced by technological advancements and by new perspectives in the study of organizations and technology. For instance, recent IT developments, especially in relation to social software and the digitization of everything, are presenting new opportunities for KM research (Newell 2015). Furthermore, there is a new trend to research efficient searching, sorting and filtering and new technologies including big data, social software and crowdsourcing. In addition, the advent of new technologies is linked to new objects of study related to privacy, security, ethical issues.

Overall, secondary studies reveal that the first-generation of KM research (prior to the mid-1990s) focused on management-driven, techno-centric processes for KM. A second-generation of KM research (mid-1990s to the early 2000s), recognized the value of human factors, organizational culture, and distributed personal initiative while technology was considered more as an enabler rather than a driving force for KM. A third generation of KM tries to reconcile the differences between the first and second generation bridging plan-driven and emergence/distributed agency perspectives. The fourth, future generation of KM will have to deal with this increasing sociotechnical complexity of the KM domain (Serenko 2013).

4. Implications for future research

Several future research topics were suggested from the authors of the papers in this analysis, and by comparing the papers, we were able to identify both common and different implications and suggested topics for future KM research (see also Appendix 1). Epistemological implications were highlighted in some of the papers (Nonaka and Peltokorpi 2006; Schultze and Leidner 2002), and there is a call for more research built around critical and dialogical discourses (Schultze and Leidner 2002). In addition, Nonaka and Peltokorpi (2006), suggest combining different paradigms in KM research by for instance considering phronetic social research or a pragmatic approach. Implications from different studies demonstrate the persistent need for focusing on the concept of knowledge to improve our theoretical understanding of it, and its role and function in organizations and society (Alavi and Leidner 2001; Serenko 2013). Overall, there is a lack of theoretical advancement in native KM theories, and there is a need for establishing more evidence-based KM theories (Serenko 2013), and models on how essential non-transferable knowledge and knowing can be generated in organizations (Kakabadse et al. 2003).

Furthermore, new research agendas on KM are needed to examine and understand the relationships between technology, organization and society (Alavi and Leidner 2001; Newell 2015). Especially there is a need for more empirical studies such as field studies, case studies, action research and design science studies to counterbalance the significant volume of prior research based on conceptual studies without any empirical investigation (Patil and Kant 2014; Serenko 2013). Such research can contribute to the development of much needed contextual understanding (Chauvel and Despres 2002; Kakabadse et al. 2003), to comparisons of industries in terms of organizational characteristics and culture, and to the determination of cross-national differences in KM approaches (Chauvel and Despres 2002).

Moreover, there is still a need for understanding the negative and unfavorable consequences of KM, and difficult issues such as power and conflict that KM might incite (Schultze and Leidner 2002). Issues of both learning capacity (Kakabadse et al. 2003), and unlearning concepts (Serenko 2013) should be important foci. Furthermore, there is a need for investigating knowledge across organizations developing chain perspectives (Patil and Kant 2014) and building upon conceptualizations that relate to complex adaptive systems.

Some of the future research topics proposed seem to be consistent over time. For example, Alavi and Leidner (2001) propose a set of future research questions that focus on the role of IT in different knowledge processes (creation, storage, retrieval transfer and application). The authors also recommend addressing how individuals can trust knowledge captured through KM systems. In addition, they also emphasize the need for undertaking research to understand the influence of KM systems on organizational performance. Ten years later, Dwivedi et al. (2011) still point to the importance of focusing on knowledge processes, and in particular the urgency to comprehend how organizations can ensure evolution in their knowledge processes and how this evolution will influence KM practice.

5. Discussion and conclusion

The contribution of this study is a novel overview that presents a “review of reviews” on KM. This tertiary review of extant KM research aims to map the fundamental dimensions of KM as a research discipline. Our study offers a comprehensive analysis of the research paradigms, the theoretical premises and the objects of study of extant KM research and future research directions. Our findings provide a foundation for research development and a basis that help researchers orient themselves within the domain and position their own work. The analysis goes beyond a mere focus on metadata indicators (e.g. contribution of different researchers, institutions and countries, citation patterns, variations across publication years and major journal outlets). Table 3 summarizes our key findings.

Table 3: Fundamental dimensions of KM as a research discipline

Research paradigms	<ul style="list-style-type: none"> • Research plurality: positivism is the dominant KM research paradigm, but also a significant volume of research following different paradigms (most notably interpretivism). • Practical orientation of the discipline: several papers do not elaborate on epistemological issues.
Theoretical premises	<ul style="list-style-type: none"> • Philosophy-based models (20th century philosophers and ancient Greek philosophy), cognitive models (drawing from psychology), network models (drawing from innovation studies), community of practice models (building on sociological and historical perspectives). • Distinction between tacit and explicit knowledge; conceptual distinction between data, information and knowledge. Knowledge conceptualized as an object, a cognitive state, a capability; asset, or commodity; culture or symbolic capital (knowing in practice). • The individual-knowledge focus of the 1970s and 1980s shifted to a group-knowledge focus in the 1990s and 2000s. A group-knowledge focus is more compatible with networking rather than repository approaches to KM. Networking approaches seek to support knowledge-sharing and communication activities within communities. Repository approaches are adopted by more technically oriented research exploring knowledge codification and accumulation. • Most recently, the material agency of technology emerged as a theoretical conceptualization relevant for KM scholars.
Objects of study	<ul style="list-style-type: none"> • KM and technology e.g. expert systems, semantic web technologies, text mining, query processing, collaborative systems, social software. • KM and organizations including the interplay of technology and organizational aspects e.g. research on KM impact, KM performance evaluation, enablers and/or barriers, implementation of KM initiatives and governance structures, awareness and legitimization of KM. • Knowledge handling including creation, elicitation, codification, conversion, accumulation, transfer, application, valorization and obsolescence.
Future directions	<ul style="list-style-type: none"> • Research based on critical and dialogical discourses. Research combining different paradigms (e.g. phronetic social research or pragmatic approaches). Research for the development of evidence-based KM theories. • More empirical studies including case studies, action research and design science to counterbalance the significant volume of purely conceptual studies. • Understanding the negative and unfavorable consequences of KM, and difficult issues such as power and conflict that KM might incite and ethical issues. • Investigating knowledge across organizations, developing chain perspectives and building upon conceptualizations that relate to complex adaptive systems.

Traditionally, KM has adopted a dual focus to technologies and organizations. Such a dual focus is especially relevant to the current digitalization era with information and communication technologies driving knowledge and value creation. Finally, the findings of secondary studies on KM research suggest a need for more collaboration between academics and practitioners to mitigate the risk of producing research with little practical relevance. Bridging the communication gap between researchers and practitioners is a key challenge for the domain (Serenko and Bontis 2004; Serenko 2013). Our findings make known that the KM field is evolving and maturing, being far from stagnant. Thus, following the development of KM research in the future will be both an exciting and interesting prospect.

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Appendix 1: Overview of key elements of all secondary studies covered

#	Author(s)	Year	Primary studies	Period	Objectives	Findings	Future research directions
1	Akhavan et al.	2016	500	1980 to 2014	An overview of the knowledge management literature from 1980 through 2014.	Bibliometric study on major keywords. KM scope; disciplines, methods, journals, authors, temporal evolution.	Investigate what characteristics lead authors to cite an article.
2	Alavi & Leidner	2001	99 cited but not all are primary studies (some are background literature).	1971 to 2000	A review and interpretation of KM literature with an aim to identify important research areas.	Detailed process view of organizational knowledge management with a focus on the potential role of information technology in this process.	A set of research questions concerning: Knowledge creation, storage, retrieval, transfer, application and IT.
3	Chauvel & Despres	2002	23 KM surveys	1997 to 2001	Identify surveys in KM between 1997-2001, and find themes that form their conceptual foundations.	A view of KM with six dimensions: Phenomena, action, level, knowledge, technology and outcomes.	The field would benefit from future research that is longitudinal in nature and which assess cross-national differences.
4	Dwivedi et al.	2011	1043 (but analyzed only a subset of the 250 most recently published ones)	1974 to 2008	A literature review investigating KM trends in terms of how the domain is represented along a number of dimensions.	A combination of positivist, empirical, conceptual/descriptive, and multi-method approaches have been predominantly used in the area. Organizational as well as systems and environmental context-based KM research were found to be the most widely published topics.	Suggests future research in the field of KM requires studies related to unifying different KM models in the existing literature and understanding the determinants of the evolution of KM in organizations.
5	Gu	2004	1407	1975 to 2002	The study characterizes the dynamic publication activity of global KM, a bibliometric analysis.	Bibliometric analysis of KM contributions by journals, countries, universities and researchers. Topics include KM processes and explicit– tacit knowledge. Authors' majority published just once.	Further quantitative studies need to be carried out to ascertain the distinctive features and characteristics of KM as an emerging discipline.
6	Kakabadse et al.	2003	113 cited but not all are primary studies (some background literature)	1980's to 1990's	Question whether the focus should be placed on knowledge transfer or knowledge management.	No specific findings presented, just an overall overview and synthesis of knowledge taxonomy.	There is a need for "alignment" between technology requirements and organizational capabilities.
7	Lee & Chen	2012	10974	1995 to 2010	Build an intellectual structure by examining publications in the KM field from 1995 to 2010.	Research themes and trends in knowledge management: from 1995 to 2010.	The research trends raise the question: "Is the KM field likely to focus on a dominant paradigm or to fragment itself into a myriad of subfields in the future?"
8	Liao, S. H.	2003	234	1995 to 2002	Classification of articles from 1995 to 2002 on KM technologies and application.	KM technologies tend to develop towards expert orientation, and KM applications development is a problem-oriented domain.	The ability to evolve and obtain new understanding is the power of KM technologies and will be the application of future work.
9	Newell, S.	2015	169 cited but not all of them are primary studies (some are just background literature)	1998 to 2013	Review the recent IS literature on KM and consider different assumptions that underpin different approaches to this broad research area.	Identifies how recent IT developments, especially in relation to social software and digitization, are presenting new opportunities (and challenges) for how organizations can manage both knowledge and knowledge work.	Suggests crowd and sensor KM models, in addition to the traditional repository and network models.

#	Author(s)	Year	Primary studies	Period	Objectives	Findings	Future research directions
10	Nonaka & Peltokorpi	2006	20	1990 to 2002	Review and position 20 of the most frequently cited KM articles. KM publications are classified on the subjective-objective continuum.	The challenge of conceptual plurality. Few scholars follow interpretive approaches. Strengths and weaknesses of publications drawing from different philosophies. Discusses challenges in KM, and how objectivity and subjectivity can be used to provide both product and process orientation in future research.	Combining subjective and objective views in research. To consider phronetic social research or a pragmatic approach which has been promoted for achieving coexistence between objective and subjective perspectives.
11	Patil, & Kant	2014	344	till 2013	Examine the state of KM research from the standpoint of existing methodologies.	Qualitative research methods such as a case study and conceptual models hold greater credibility. The gaps identified relayed to research at an inter-organizational level, hypothesis testing and use of mathematical models.	Research via case, activity and field studies on KM. Focus on hypothesis testing and mathematical modeling in KM research. More research at the inter-organizational level.
12	Ponzi	2002	405 articles that co-cite Knowledge Management authors	1994-1998	Explore KM's intellectual structure and interdisciplinary breadth.	KMs emergence associated with the literature and constructs of organizational learning, knowledge-based theories, and Polanyi's view on tacit knowledge.	A wider time-period for clearer understanding of the underlying intellectual structure of KM.
13	Schultze & Leider	2002	78	1990 - 2000	Highlight the lack of attention paid to unintended consequences of managing organizational knowledge	Classifies papers into four scientific discourses (the normative, the interpretive, the critical, and the dialogic). Research focus, metaphors of knowledge, theoretical foundations, and implications for each discourse are presented.	More focus on difficult issues such as power and conflict. More critical and dialogic research. A stronger theoretical base that includes both favorable and unfavorable consequences of KM.
14	Sedighi, & Jalalimanesh	2014	50,862	2001 to 2010	Research trends in KM through a systematic analysis of publications.	The structure of fundamental areas within the field of KM has changed and expanded dynamically.	Future studies using other analytical approach to be compared with each other.
15	Sensuse et al.	2014	8	2000 to 2011	An overview of KM models and frameworks (30 different KM models).	Each model and framework has its own emphasis on possible solutions and problems solving.	No specific future research presented.
16	Serenko et al	2010	2,175	1994 to 2008	A scientometric analysis using 11 major journals.	A challenge bridging the gap between theory and practice. Clear trend toward multi-authored publications.	More collaboration with industry practitioners, to ensure that KM does not lose its relevance.
17	Serenko	2013	108 scientometric studies of the KM discipline	up to 2012	Meta-analysis of prior scientometric research of the knowledge management (KM) field.	The overall volume of scientometric KM works has been growing, reaching up to ten publications per year by 2012, but their key findings are somewhat inconsistent.	Future generation of KM will have to deal with an increasing complexity of the knowledge domain by developing new KM metaphors, paradigms, and tools.
18	Serenko, & Bontis.	2004	450	up to 2003	Investigation of research productivity. Citation analysis.	Productivity is exploding and there are several leading authors and foundation publications that are referenced regularly.	Not so much about future research topics.
19	Tsai, & Yang	2010	1393	1989 to 2009	Investigation of KM literature productivity.	Productivity is still increasing demonstrates trends by categories.	No specific future research presented.