
A Bibliometric Study on Authorship Trends and Research Themes in Knowledge Management Literature

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Abstract

The aim of the study is to identify the contribution of authors in the domain of Knowledge Management (KM). The underlying data is from two leading KM journals, namely, the *Journal of Knowledge Management (JKM)* and the *Journal of Intellectual Capital (JIC)*. We downloaded articles from *Thomson Reuters Web of Science (WoS)*, with JKM and JIC-specific searches resulting in 508 and 73 citing articles respectively. The timeframe of analysis was 2009-2016. This dataset was used to create co-citation network visualisations to provide insights into the clusters of authors and research topics.

Measures such as *Betweenness centrality* and *hubs-authorities (HITS)* were used to identify significant authors and their key themes of interest. More specifically, network analysis identified six dominant research themes, it revealed a total of 14,422 authors being cited (depicted as nodes in the visualisation) with a total of 1,023,123 citations (edges). Based on the findings of this study, the paper will explore the specific themes and the intellectual turning points in KM research and its evolution. Our bibliometric analysis has practical significance for researchers since it recognises the dominant research areas, and by extension, it identifies those that are still in their infancy; the latter having the potential of representing an interesting research gap. The limitation of the study is that the underlying data is only from two journals (albeit, from the top two journals in KM), which may lead to partially biased results. In future, the aim is to also leverage the analysis to more KM journals, e.g., the top ten journals within the Serenko & Bontis (2013) most updated list.

Keywords – Knowledge Management, bibliometrics, bibliography, network analysis, scientometrics.

1 Introduction

The aim of the study is to identify authors that have made an important contribution in advancing the discipline of Knowledge Management (KM). Our authors' analyses include both 'cited' and 'citing' authors; we identify the extant research themes and co-authorship networks. The underlying data for the analyses comes from two top-tier KM journals (see Serenko and Bontis 2013): the Journal of Knowledge Management (JKM) and the Journal of Intellectual Capital (JIC). Data was extracted from Thomson Reuters Web of Science (WoS) with the search term "Journal of Knowledge Management" and "Journal of Intellectual Capital" (search type: Publication Name). From the results of the query we gather that JKM and JIC have been archived in WoS beginning from the year 2009 and 2015 respectively (until December 2016, the time of writing the paper). However, it is to be noted that the aforementioned constraint is for the source papers alone (referred to as 'citing articles'); each citing article will have numerous references to 'cited articles', many of them would necessarily have been published prior to 2009, and which will be used in our analyses. Co-citation network visualisations were used to provide insights into the clusters of authors and topic modeling for identifying the key research themes in the domain of KM. Betweenness centrality and hubs-authorities (HITS) were calculated for the nodes to identify significant authors and their key interest themes in KM.

Our analyses provide insights on the leading authors advancing the body of knowledge in KM and the key themes that evolved during the almost twenty year period of KM specific journals under analysis. The Journal of Knowledge Management search resulted in 508 citing articles, and the Journal of Intellectual Capital in 73 articles. The network analysis revealed 14422 nodes (authors being cited), and 1023123 edges (citations). The analysis also revealed, that the six top key research themes in the Journal of Knowledge Management were communities and networks, knowledge sharing, innovation capability, intellectual capital, public sector knowledge management and knowledge management models and frameworks, and in the Journal of Intellectual Capital correspondingly intellectual capital models and frameworks, intangible assets, performance management, knowledge creation and innovation, public sector intellectual capital management, and intellectual capital reporting and disclosure. Based on the analysis, we will explore the identified themes in more detail in the result section of the paper and furthermore, we will also discuss the evolution of the key research themes.

The remainder of the paper is structured as follows. In section 2 we outline the methodology, this is followed by the results and findings in section 3. Discussion and conclusion are presented in section 4.

2 Method

Bibliometric data analysis is conducted as a means to provide quantitative analysis of academic literature (Nicolaisen 2010). Bibliometrics is known as statistical analysis of written publications and citation analysis (Hajikhani 2017). This study employs topic modeling as a method to uncover dominant research themes in the studied journals and bibliographic network analysis as a method to identify authoritative authors. Topic modeling method has been applied to analyze the abstracts contents. The technique is a type of statistical model for discovering the abstract "topics" that occur in a collection of documents in order to explore hidden semantic structures in a text body (Blei 2012). Application of the "Latent Dirichlet allocation" introduced by Sievert and Shirley (2014) was utilized in order to perform the topic generation of the analyzed abstracts.

Data for the study was extracted from *Thomson Reuters Web of Science (WoS)*. Our search string comprised of 'Publication Name' - "**Journal of Knowledge Management**" (Emerald; ISSN: 1367-3270) and the "**Journal of Intellectual Capital**" (Emerald; ISSN: 1469-1930). From the results of the query we gather that JKM and JIC have been

archived in WoS beginning from the year 2009 and 2015 respectively. We therefore, limited the study to cover the years 2009-2016. The JKM search resulted in 508 citing articles, and the JIC in 73 articles.

We used *Network Analysis Interface for Literature Studies* “NAILS” (Knutas et al. 2015) to generate topic models from the extracted data. We then used *Tethne Bibliographic Network Analysis* tool (Peirson et al. 2016), written in Python, to generate a co-citation network of the papers. *ForceAtlas 2* (Jacomy et al. 2014) algorithm was used to layout the networks. *HITS (Hyperlink-Induced Topic Search) algorithm* (Kleinberg 1999) was used to determine the authority of the nodes and to define the node size (the higher the value of authority the higher the size of the node).

In order to overcome some of the main challenges and limitations of data-driven research (see Bruns 2013) this study was carried out using *Ostinato* process model for visual network analysis (Huhtamäki 2016). *Ostinato* process model enables several researchers to participate and collaborate in the data driven network analysis and provides guidelines on conducting the study in a way that make it both easier to follow and for other researchers to replicate.

3 Results and Findings

3.1 The Journal of Knowledge Management

The analysis revealed, that the six top key research themes in the Journal of Knowledge Management were communities and networks, knowledge sharing, innovation capability, intellectual capital, public sector knowledge management and knowledge management models and frameworks (see Table 1 and Graph in Appendix 1.)

Table 1. JKM topics discovered by LDA topic modelling.

	Dominant Themes	LDA Topic Modelling Terms
1	Communities and Knowledge	Case, Communities/Community, Cops/Cop (co-operation), Network/Networks, Social, Transfer, Web,
2	Knowledge Sharing	Culture, Employees, Individual, Knowledge Transfer, KS, Motivation, Share/Sharing, Trust
3	Innovation Capability	Innovation, Performance, Firm/Firms, Organization, External Capabilities, Capital Acquisition, Capacity
4	Intellectual Capital	Capital, Review, Academic, Intellectual, IC, Field, Journals, Research, University, Articles
5	Public Sector Knowledge Management	KM Implementation, Public Leadership, Sector Barriers, Initiatives, Performance, Study Practices

6	Knowledge Management Models and Frameworks	Knowledge Framework, Model, Project Creation, Management Process, Tacit Literature, Organisation
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The most authoritative papers from the JKM co-citation network are illustrated in Table 2. Top 15 papers from the co-citation network of JKM are ranked in the descending order of authority.

Table 2. JKM Top 15 most authoritative papers.

Authors	Authority	PageRank	Modularity
Nonaka (1994)	0.145	0.0098	3
Grant (1996)	0.145	0.0176	3
Alavi & Leidner (2001)	0.139	0.0070	3
Hansen, Nohria, & Tierney (1999)	0.129	0.0064	0
Szulanski (1996)	0.122	0.0035	0
Nonaka (1991)	0.108	0.0024	0
Lee & Choi (2003)	0.107	0.0026	2
March (1991)	0.105	0.0031	0
Grant (1996)	0.102	0.0111	0
Wasko & Faraj (2005)	0.095	0.0057	2
Davenport & Prusak (1998)	0.095	0.0021	0
Ruggles (1998)	0.095	0.0158	3
Inkpen & Tsang (2005)	0.095	0.0044	0
Huber (1991)	0.094	0.0035	0
Nahapiet & Ghoshal (1998)	0.093	0.0015	0

3.2 The Journal of Intellectual Capital

In the Journal of Intellectual Capital correspondingly, the analysis revealed, that the six top key research themes were: intellectual capital models and frameworks, intangible assets, performance management, knowledge creation and innovation, public sector intellectual capital management, and intellectual capital reporting and disclosure (see Table 3 and Graph in Appendix 2).

Table 3. JIC topics discovered by LDA topic modelling.

	Dominant Themes	LDA Topic Modelling Terms
1	Intellectual Capital Models and Frameworks	IC, Model, Framework, Strategic, ICS, Organization, Measurement, University, Management Organizations
2	Intangible Assets	Intangibles, Intangible, Economic Companies, Sectors, Strategic, Policy, Countries, Market, Company

3	Performance Management	Relational Performance Structure, Business, Firms, Efficiency, Manufacturing, IC, Data, RC
4	Knowledge Creation and Innovation	Knowledge Firms, Firm, HC, Innovation, Employee, Relationship, Family, Human Creation
5	Public Sector Intellectual Capital Management	IC, Research, Public Measurement, Concept, Practice, Perspective, Sector, Authors, Case
6	Intellectual Capital Reporting and Disclosure	Disclosure Reporting, ICD, ICD, Content, IC, CA, Information Analysis, Prior, IR.

The most authoritative papers from the co-citation network of the papers of The Journal of Intellectual Capital are illustrated in Table 4. Top 15 papers from the co-citation network of JIC are ranked in the descending order of authority.

Table 4. JIC Top 15 most authoritative papers.

Authors	Authority	PageRank	Modularity
Stewart (1997)	0.200	0.041	0
Edvinsson & Malone (1997)	0.196	0.199	0
Guthrie, Ricceri & Dumay (2012)	0.192	0.028	0
Roos, Edvinsson, & Dragonetti (1997)	0.165	0.013	0
Namvar, Fathian, Akhavan, & Reza Gholamian (2010)	0.165	0.127	1
Cabrita & Bontis (2008)	0.164	0.020	1
Bontis (1998)	0.162	0.008	1
Brooking (1996)	0.159	0.012	2
Petty & Guthrie (2000)	0.156	0.008	1
Edvinsson (1997)	0.155	0.015	2
Keong Choong (2008)	0.155	0.067	1
Riahi-Belkaoui (2013)	0.144	0.043	1
Bontis (2001)	0.142	0.009	2
Dumay & Garanina (2013)	0.140	0.006	0
Bontis, Chua Chong Keow, & Richardson (2000)	0.139	0.009	2

4 Conclusions

The results of the paper highlight central authorities that were discovered from the co-citation networks of top two ranked KM journals. These results also shed light on the development of KM discussion via topic modelling of the top two KM journals ranked A+ in the study of Serenko & Bontis (2013). Contrasting the two highest ranked KM journals the topics are fairly similar. Knowledge sharing and communities and networks were more dominant topics in JKM, whereas intellectual capital, intangible assets and performance management were more dominant topics in JIC. Interesting finding was that although topic wise the journals were fairly similar, the most authoritative papers and

corresponding authors were totally different as observed from the top 15 list (Table 2 and Table 4).

As the study was only limited to two top journals, this may lead to partially biased or rather incomplete results regarding major KM discussions. Further studies would benefit from including a broader range of journals as well as focusing on large set of authoritative papers and authors. Nevertheless, it is proposed that the methodology presented can serve as good introduction to any domain and support in discovering research gaps and less discussed topics in the literature.

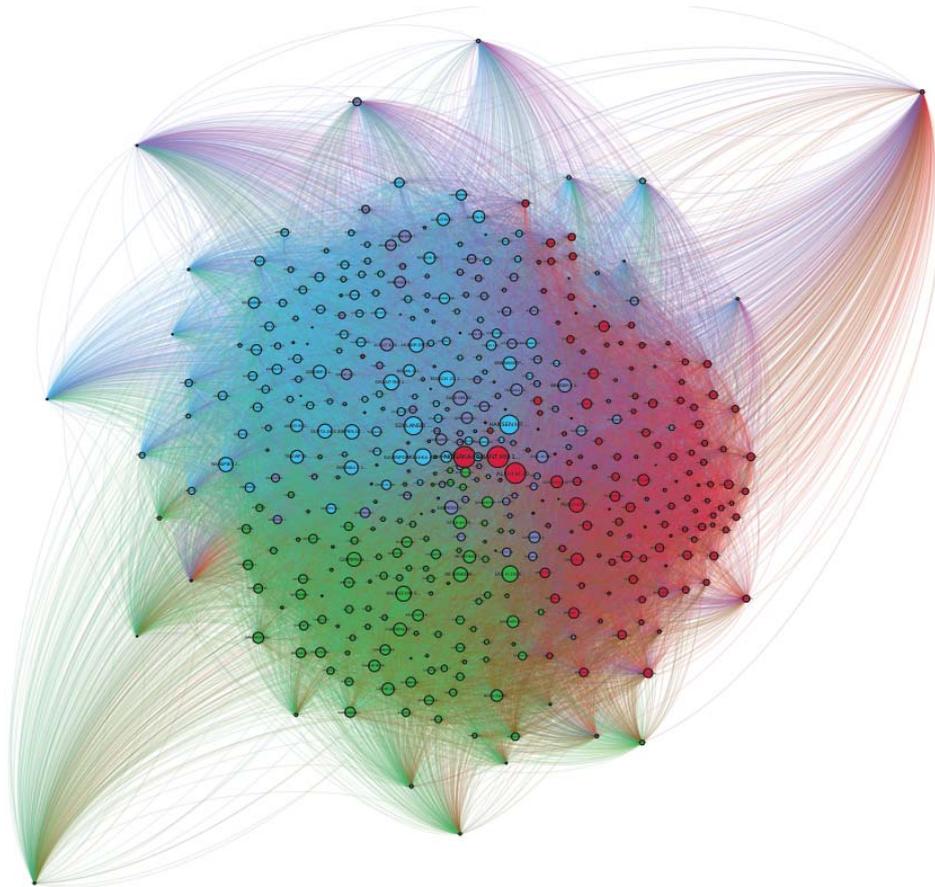
References

- Alavi, M., & Leidner, D. E. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS quarterly*, 107-136.
- Blei, D.M. (2012). Probabilistic topic models. *Communications of the ACM*, 55(4), pp.77-84.
- Bontis, N. (1998). Intellectual capital: an exploratory study that develops measures and models. *Management decision*, 36(2), 63-76.
- Bontis, N., Chua Chong Keow, W., & Richardson, S. (2000). Intellectual capital and business performance in Malaysian industries. *Journal of intellectual capital*, 1(1), 85-100.
- Bontis, N. (2001). Assessing knowledge assets: a review of the models used to measure intellectual capital. *International journal of management reviews*, 3(1), 41-60.
- Brooking, A. (1996). *Intellectual capital*. Cengage Learning EMEA.
- Bruns, A., 2013. Faster than the speed of print: Reconciling 'big data' social media analysis and academic scholarship. *First Monday*, 18(10).
- Cabrita, M. D. R., & Bontis, N. (2008). Intellectual capital and business performance in the Portuguese banking industry. *International Journal of Technology Management*, 43(1-3), 212-237.
- Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know*. Harvard Business Press.
- Dumay, J., & Garanina, T. (2013). Intellectual capital research: a critical examination of the third stage. *Journal of Intellectual Capital*, 14(1), 10-25.
- Edvinsson, L. (1997). Developing intellectual capital at Skandia. *Long range planning*, 30(3), 320-373.
- Edvinsson, L., & Malone, M. S. (1997). *Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower*. HarperBusiness.
- Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic management journal*, 17(S2), 109-122.
- Grant, R. M. (1996). Prospering in dynamically-competitive environments: Organizational capability as knowledge integration. *Organization science*, 7(4), 375-387.
- Guthrie, J., Ricceri, F., & Dumay, J. (2012). Reflections and projections: a decade of intellectual capital accounting research. *The British Accounting Review*, 44(2), 68-82.
- Hajikhani, A. (2017, January). Emergence and dissemination of ecosystem concept in innovation studies: A systematic literature review study. In *Proceedings of the 50th Hawaii International Conference on System Sciences*.

- Hansen, M. T., Nohria, N., & Tierney, T. (1998). What's your strategy for managing knowledge?. *Harvard business review*, 77(2), 106-116.
- Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. *Organization science*, 2(1), 88-115.
- Huhtamäki, J. 2016, *Ostinato Process Model for Visual Network Analytics: Experiments in Innovation Ecosystems*. Tampere University of Technology. Publication, vol. 1425, Tampere University of Technology.
- Inkpen, A. C., & Tsang, E. W. (2005). Social capital, networks, and knowledge transfer. *Academy of management review*, 30(1), 146-165.
- Jacomy, M., Venturini, T., Heymann, S. and Bastian, M., 2014. ForceAtlas2, a continuous graph layout algorithm for handy network visualization designed for the Gephi software. *PloS one*, 9(6), p.e98679.
- Keong Choong, K. (2008). Intellectual capital: definitions, categorization and reporting models. *Journal of intellectual capital*, 9(4), 609-638.
- Kleinberg, J. M. (1999). Authoritative sources in a hyperlinked environment. *Journal of the ACM (JACM)*, 46(5), 604-632.
- Knutas, A., Hajikhani, A., Salminen, J., Ikonen, J., Porras, J., 2015. *Cloud-Based Bibliometric Analysis Service for Systematic Mapping Studies*. CompSysTech 2015.
- Lee, H., & Choi, B. (2003). Knowledge management enablers, processes, and organizational performance: An integrative view and empirical examination. *Journal of management information systems*, 20(1), 179-228.
- Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of management review*, 23(2), 242-266.
- Namvar, M., Fathian, M., Akhavan, P., & Reza Gholamian, M. (2010). Exploring the impacts of intellectual property on intellectual capital and company performance: The case of Iranian computer and electronic organizations. *Management Decision*, 48(5), 676-697.
- Nicolaisen, J., 2010. Bibliometrics and citation analysis: From the science citation index to cybermetrics. *Journal of the American Society for Information Science and Technology* 61(1), pp.205-207.
- Nonaka, I. (1991). The Knowledge-Creating company. *Harvard Business Review*, 69(6), 96-104.
- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization science*, 5(1), 14-37.
- March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization science*, 2(1), 71-87.
- Peirson, B. R. Erick., et al. 2016. Tethne v0.7. <http://diging.github.io/tethne/>
- Petty, R., & Guthrie, J. (2000). Intellectual capital literature review: measurement, reporting and management. *Journal of intellectual capital*, 1(2), 155-176.
- Riahi-Belkaoui, A. (2003). Intellectual capital and firm performance of US multinational firms: a study of the resource-based and stakeholder views. *Journal of Intellectual capital*, 4(2), 215-226.
- Roos, J., Edvinsson, L., & Dragonetti, N. C. (1997). *Intellectual capital: Navigating the new business landscape*. Springer.
- Ruggles, R. (1998). The state of the notion: knowledge management in practice. *California management review*, 40(3), 80-89.
- Serenko, A., & Bontis, N. (2013). Global ranking of knowledge management and intellectual capital academic journals: 2013 update. *Journal of Knowledge Management*, 17(2), 307-32.
- Sievert, C. and Shirley, K.E., 2014, June. LDAvis: A method for visualizing and interpreting topics. In *Proceedings of the workshop on interactive language learning, visualization, and interfaces* (pp. 63-70).

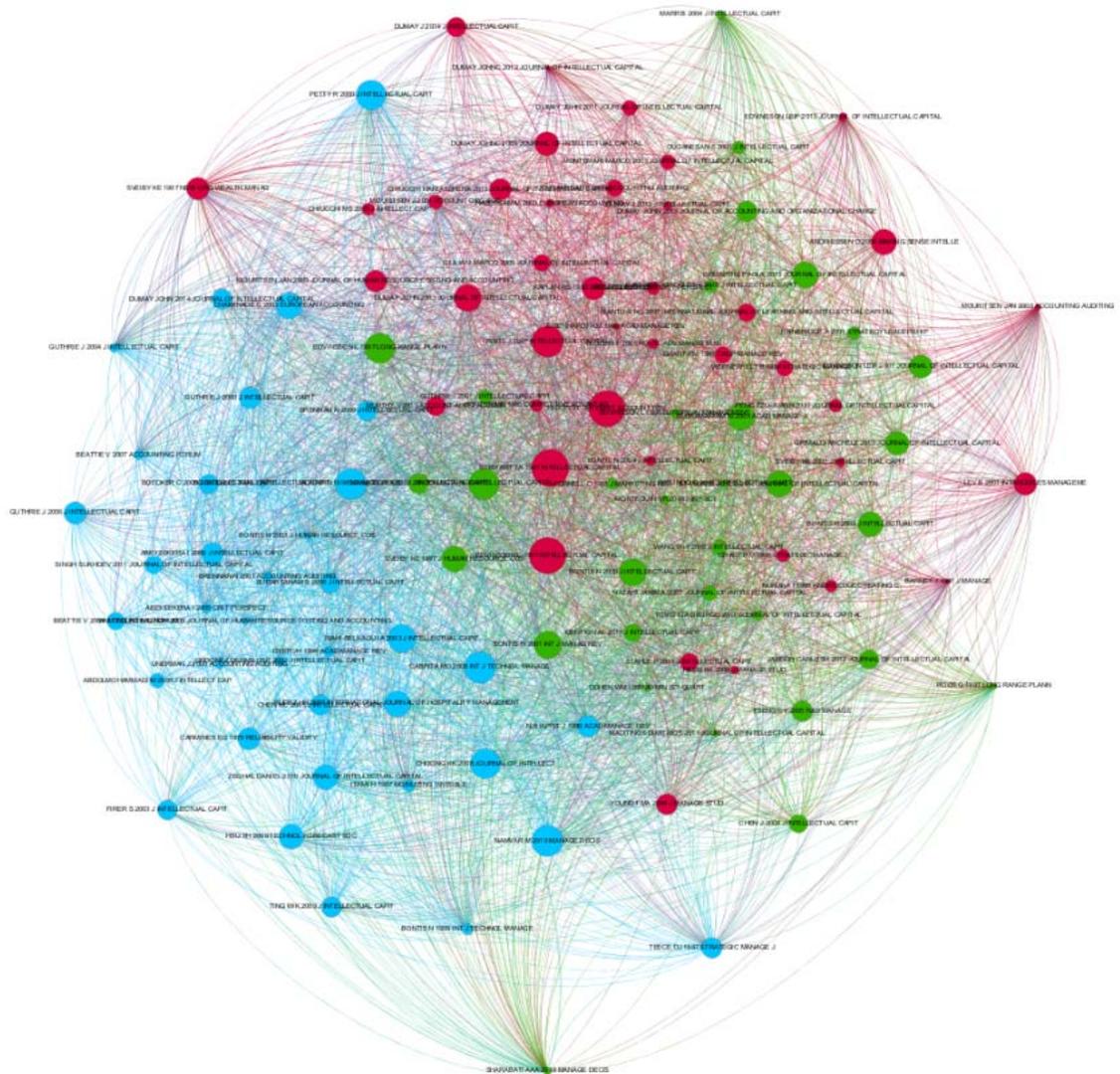
- Stewart, T. (1997). *Intellectual Capital: The New Wealth of Organization*, Currency Doubleday. New York.
- Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic management journal*, 17(S2), 27-43.
- Wasko, M. M., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS quarterly*, 35-57.

APPENDIX 1



Underlying structure of the co-citation network of papers after filtering (3%) 18,985 nodes and 1,146,454 edges from 508 JKM papers.

APPENDIX 2



Underlying structure of the co-citation network of paper after filtering (90%) 3,701 nodes and 216,719 edges from 73 JIC papers.