# Citation classics published in *Knowledge Management* journals. Part II: studying research trends and discovering the Google Scholar Effect

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**Abstract**

**Purpose** – *The purpose of this study was to discover growing, stable and declining knowledge management (KM) research trends.*

**Design/methodology/approach** – *Citations to 100 KM citation classics as identified by Serenko and Dumay (2015) were collected and analyzed for growing, stable and declining research trends.*

**Findings** – *This research has two findings that were not theoretically expected. First, a majority of KM citation classics exhibit a bimodal citation distribution peak. Second, there are a growing number of citations for all research topics. These unexpected findings warranted further theoretical elaboration and empirical investigation. The analysis of erroneous citations and a five-year citation trend (2009 – 2013) reveals that the continuously growing volume of citations may result from what the authors call the Google Scholar Effect.*

**Research limitations/implications** – *The results from this study open up two significant research opportunities. First, more research is needed to understand the impact Google Scholar is having on domains beyond KM. Second, more comprehensive research on the impact of erroneous citations is required because these have the most potential for damaging academic discourse and reputation.*

**Practical implications** – *Researchers need to be aware of how technology is changing their profession and their citation behavior because of the pressure from the contemporary "publish or perish" environment, which prevents research from being state-of-the-art. Similarly, KM reviewers and editors need to be more aware of the pressure and prevalence of mis-citations and take action to raise awareness and to prevent mis-citations.*

**Originality/value** – *This study is important from a scientometric research perspective as part of a growing research field using Google Scholar to measure the impact and power it has in influencing what gets cited and by whom.*

**Keywords** *Research, Sciences, Knowledge management*

**Paper type** *Research paper*

## Introduction

This study's purpose is to extend Serenko and Dumay's (2015) research into Knowledge Management (KM) citation classics. In their previous study, Serenko and Dumay (2015, p. 401) identify the 100 most cited KM articles "to analyze the key attributes and characteristics of the selected articles to understand the development of the KM discipline". They conclude that "the KM discipline is at the pre-science stage because of the influence of normative studies espousing KM practice" and that "KM is progressing toward normal science and academic maturity". Thus, Serenko and Dumay (2015) argue that KM research is heading toward a "normal science,", but it is still in an "embryonic" stage.

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As KM research is "embryonic", it is essential to understand KM research trends. Those articles considered KM citation classics – defined as works within a discipline that have

high citation counts – inform active scholars by identifying growing, stable and declining research trends. Understanding the trends then informs the direction of KM research toward developing new KM knowledge; otherwise, KM research could stagnate and have declining or little impact (Dumay, 2014a). To recognize the trends, an understanding of how citation classics gather citations is useful, if not essential. This knowledge can help hatch KM from its "embryonic" stage.

Serenko and Dumay (2015) also outline how new KM research needs to be critical and performative. As with intellectual capital (IC) research (Guthrie *et al.*, 2012; Serenko and Bontis, 2013c), the KM literature needs more empirical studies of KM in action because normative rather than empirical ideas and concepts currently dominate KM research. This is dangerous for KM research – if it does not become more scientific, KM might become "merely one more set of very interesting ideas that is continually elusive to grasp and use" (Chatzkel, 2004, p. 337). Therefore, the examination of how the normative research agendas dominating KM are developing informs KM researchers and creates opportunities for empirical scientific research to test the normative arguments. Similarly, identifying which empirical research agendas are having the greatest impact and which are declining helps researchers discover impactful future research opportunities.

The KM field is truly multidisciplinary (Heisig, 2015). To create a body of knowledge, KM scholars reference various disciplines, such as management information systems, strategy, human resources, organizational behavior, marketing, library and information science, and sociology (Holsapple and Wu, 2008; Serenko and Bontis, 2013b). Referencing other disciplines adds diversity to KM research resulting in an epistemological research continuum spreading between two extreme points being hard-centric and soft-centric. Hard-centric research has a technocratic, IT, computer science, and engineering focus, which considers knowledge an object. In contrast, soft-centric research focuses on people, HR, and behavioral issues, and it considers knowledge a process (Bjørnson and Dingsøyr, 2008; Griffiths and Morse, 2009; Nie *et al.*, 2009; Dwivedi *et al.*, 2011; Lee and Chen, 2012). It is critical to know whether one of these KM platforms dominates the KM research arena.

In addition to mainstream KM research areas, the learning organization sub-domain investigates key research issues pertaining to KM foundations, trends, applications, consequences, systemic and holistic views, outcomes, unique characteristics, and paradigm shifts (Eijkman, 2011; Song *et al.*, 2014). In knowledge-based development research, most studies focus on urban planning and development, geography, information technologies, and innovation policy (Ergazakis and Metaxiotis, 2011; Ergazakis *et al.*, 2013). It is, however, unknown which of these are growing, stable and declining research trends.

A few prior studies concentrate on historical changes in KM research. Wei and Nakamori (2010) identify growing, stableand declining subject areas of KM research. Lee and Chen (2012) report that research themes pertaining to knowledge engineering and organizational memory have gradually gained popularity, whereas knowledge creation and knowledge ontologies have lost their momentum. Landrum *et al.* (2010) find that KM researchers heavily cite a few seminal works published over 15 years ago and rarely cite recent articles. Zhong and Song (2008) conclude that past research mainly concentrated on information technology, knowledge workers, managing knowledge, and organizational learning and recommend that future scholars focus on competitive advantage, absorptive capacity and dynamic capabilities of the firm.

On the one hand, the findings of the previous studies have merit; on the other hand, they do not report detailed longitudinal changes in KM research trends by topics. Most importantly, they do not take into consideration the significance of KM citation classics, which, as this study assumes, represent the core of the academic body of knowledge. Thus, researchers know little about which KM research topics are growing, stable and declining. Therefore, the present study proposes the following research question:

*RQ1*. What are the growing, stable and declining research trends as evidenced by KM citation classics?

## Theoretical background

Since the seventeenth century, scholarly journals have performed five critical functions within academia and beyond (Greco *et al.*, 2006; de Vaujany *et al.*, 2011; Davis, 2014). First, they certify knowledge by validating ideas through a rigorous peer-review process, convene an audience by bringing together like-minded readers, and ensure that publications are worth reading. Second, they disseminate academic findings among academics, students, practitioners and policymakers. Third, academic journals allow authors to get credit for making their intellectual property public. Fourth, they signify the existence of an academic discipline and define its identity. Fifth, highly influential, widely read and frequently cited articles identify popular research areas, establish research directions and determine the future development of entire academic domains. Particularly, scholarly journals often create small clusters of well-cited articles containing ideas that advance academic thought. Therefore, highly cited academic articles offer insights into topics that interest researchers and scholars and are useful for developing future research that builds upon their findings.

Most academic articles published in credible academic journals contain new discoveries or present normative viewpoints on how research, practice and policy might change for the better (Serenko and Dumay, 2015). Some articles receive wide recognition, attract attention from follow-up researchers who use or extend the research, and become frequently cited. These articles enable ideas, findings, research methods and social interests to converge as new research fronts, which are collections of relatively recently cited articles (Price, 1965). Citation classics, defined as works within a discipline that have high citation counts (Garfield, 1977, 1989), also represent research fronts, especially for new and niche disciplines such as KM. Several researchers argue that direct citation count of academic articles is a valid approach to discovering active research fronts in all fields (Shibata *et al.*, 2009; Liu *et al.*, 2013).

Research fronts develop in two possible directions (Small, 2003; Upham and Small, 2010). First, if a research front grows and gains popularity, it transforms into an independent school of thought or a niche discipline. Second, if a research front gains high visibility and impact, it may diffuse or be absorbed within its own discipline. Scientific communities and research topics are often interwoven, connected, and co-evolving (Yan *et al.*, 2012). As a result, research fronts occasionally become interdisciplinary, bringing together scholars with diverse backgrounds, and create an interconnected web of dedicated scholars who approach the phenomena from different perspectives (Small, 1999). Overall, this provides evidence that research fronts make an impact on their disciplines and advance science.

Scholars recognize that research fronts exhibit several life-cycles, and that they may use the diachronous method to analyze them (Stinson and Lancaster, 1987; Cano and Lind, 1991; Levitt and Thelwall, 2008, 2009). When using the diachronous method, researchers take a fixed sample of scholarly literature and study citation frequency and distribution over time (Glänzel, 2004; Ohba and Nakao, 2012; Bouabid and Larivière, 2013). Kurtz *et al.* (2005) argue that citations are a valid proxy of impact because the number of citations a scholarly work receives closely relates to the number of times scholars read the article. Therefore, studying citations gives researchers an insight into how scholars use research topics and how their life cycles develop or change over time.

However, researchers often lose interest in particular topics and start citing corresponding articles less often. As a result, research fronts stop growing, decline and eventually disappear. The main reason for researching life cycles of citation classics is to understand potential scientific obsolescence (also referred to as durability, longevity, or aging of literature). Obsolescence results in the decline in an academic article's validity, relevance, and use over time, measured using a longitudinal frequency distribution of citations

(Line and Sandison, 1974; Egghe, 1992, 2010). To understand the obsolescence, researchers use analytical concepts and tools, such as the citation half-life, utility factor, Rasch model and annual aging factor (Burton and Kebler, 1960; Brookes, 1970; Alvarez *et al.*, 2000; Száva-Kováts, 2002). Whereas some topics may become obsolete, others may be stable or even growing. In terms of the KM discipline, it is important for discipline stakeholders to be aware of topics representing growing, stable and declining research trends so that they can understand how knowledge is evolving (or not) in the KM field. Understanding how KM knowledge is developing is especially important because it guides researchers toward research gaps and away from over-researched topics.

## Methodology

Serenko and Dumay (2015) set the boundary for KM citation classics at 100 articles selected from KM-centric academic journals using Google Scholar citation counts. As a result, their sample consists of articles having 145 or more citations as of January 3, 2014. These citation classics were selected from 25 KM-centric journals ranked by Serenko and Bontis (2013a). To answer the research question, the same articles and research framework are used in this study, based on examining attributes of citation classics (see Table I in Serenko and Dumay (2015)), and the diachronous citation analysis method.

Analysis of citation life cycles of the seminal journal articles is considered a valid approach in scientometrics (Calabretta *et al.*, 2011; Ho, 2014). In this study, it is argued that KM citation classics constitute the core of the KM body of knowledge and represent the topics of great interest of the KM research community. It is for this reason, these articles received a large number of citations and were included in the list of citation classics. Thus, a longitudinal analysis of the distribution of citations to these seminal works should reveal the growing, stable and declining research trends in KM research.

The below-described procedure was followed. First, for each citation classic article, the number of citations each year was calculated based on Google Scholar. As a result, a data set was created that contained data on how many times each citation classic was cited in each year including the year of its publication. For example, if a citation classic was published in 1999, the number of citations to this work in the years 1999, 2000, 2001 [. . .] 2012 and 2013 was calculated.

Second, for each article, the raw number of citations per year was converted to percentage, and the total percentage of citations for each article was set at 100 per cent. Third, citation classics were aggregated per topic (knowledge as a process, managing/competitive advantage, organizational culture, information technology, communities of practice, knowledge innovation, KM strategy, scientometrics and problem solving), which were identified in the Serenko and Dumay (2015) study. Fourth, the average percentage of citations per topic per each year, from 1999 to 2013, was calculated, and corresponding graphs were constructed that visualized the distribution of citations over time for each topic.

**Table I** Definitions of categories of appropriateness and accuracy of citations

| *Category* | *Definition* |
|---|---|
| Clear support | The cited article provides clear, explicit and unambiguous support of the statement in its text or data |
| Ambiguous support | The statement (either text or data) in the cited article has been interpreted one way, but could also be interpreted in other (i.e. opposite) ways. The cited article presents several different interpretations of the cited statement, but the citing source only considers one of them |
| Empty citation | The cited statement was not a key focus of the cited article. The statement was only briefly mentioned in the cited article, and it was only supported by citing other articles. It excludes review and meta-analysis articles |
| No support | The cited article does not provide clear, explicit and unambiguous support of the statement in its text or data, or it contradicts the statement |

**Source:** Adapted from Todd *et al.* (2007 and 2010)

Fifth, according to scientific information diffusion theory (Avramescu, 1979) and the theory of residual citations (Bouabid, 2011; Bouabid and Larivière, 2013), a majority of high-quality works are quickly noticed by the scientific research community after their publication and immediately start attracting citations. The shorter the time gap between the year of publication and received citations, the higher the quality of the work (Finardi, 2014). The number of citations accumulates, reaches its peak within three to seven years and gradually declines. The peak citation year and speed of decline depend on the nature of a scientific discipline and the type of works (Glänzel and Schoepflin, 1995). For example, 88 per cent of highly cited papers in science reflect "late citedness, peaking in the sixth year following publication, and declining gradually" (Aversa, 1985, p. 385). Citation classics in medicine and biochemistry exhibit a peak of citations four to seven after their publication (Cano and Lind, 1991). Pollman (2000) shows that in most sciences, citations peak in the fourth year and decline afterward.

Thus, to better explore the longitudinal distribution of citations, the year of the first peak of citations was recorded for each article. A visual inspection of the dataset revealed that many citation classics also had the second peak of citations. Therefore, the year of the second peak of citations was recorded for some articles, when:

- the second peak of citations was higher than the first one; and
- the second peak occurred before the year 2013.

The results of citations peak distribution were aggregated for the entire set of articles.

## Results

A common attribute of the citation classic articles is that scholars noticed and began immediately citing the articles with 53 per cent receiving their first citation in the publication year, 45 per cent in the next year, and only 2 per cent in year two. Additionally, 67 per cent of all citation classics had bimodal citation distribution peaks. In this study, a citation pattern was considered bimodal only if:

- there were two citation peaks;
- the second peak was higher than the first one; and
- the second peak occurred prior to 2013 (i.e. prior to the final year of collecting citations data).

On average, the first peak occurs 4.2 years after publication, ranging from 2 to 9 years, and the second peak occurs 9.5 years after publication, ranging from 4 to 15 years. A total of 23 per cent had a second highest point in year 2013 (i.e. which was excluded from the count above), and it is possible the trend will continue in 2014 and beyond. Ten per cent had only one peak. Note that most of the one-citation peak articles are from 2005 and 2006 and did not have enough time to generate a second citation peak. For most bimodal distributions, the second peak happens between 2008 and 2012.

The results show that the overall volume of citations has been growing. A slight reduction (less than one per cent) in the number of citations was noticed in 2013. However, it likely occurred because Google Scholar had not indexed all works that were published in 2013 and that cited the selected citation classics.

To the surprise of the authors, no distinct citation patterns (i.e. growing, stable, and declining) were identified. Citation classics devoted to information technology (Figure 1), organizational culture (Figure 2), scientometrics (Figure 3), and communities of practice (Figure 4) generally attract growing citation numbers, and this trend is likely to continue in the future. Citation classics focusing on knowledge innovation (Figure 5), knowledge as a process (Figure 6), and managing/competitive advantage (Figure 7) attract growing citation numbers up to 2012, followed by a very minor decline in 2013, which most likely occurred because Google Scholar had not yet indexed all publications that cited the

**Figure 1** Average number of citations per year – information technology

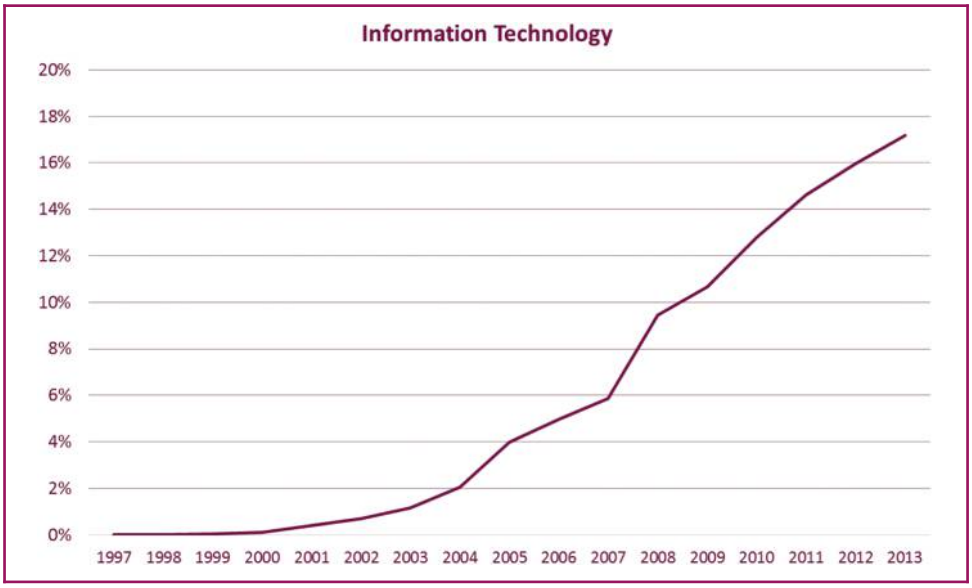
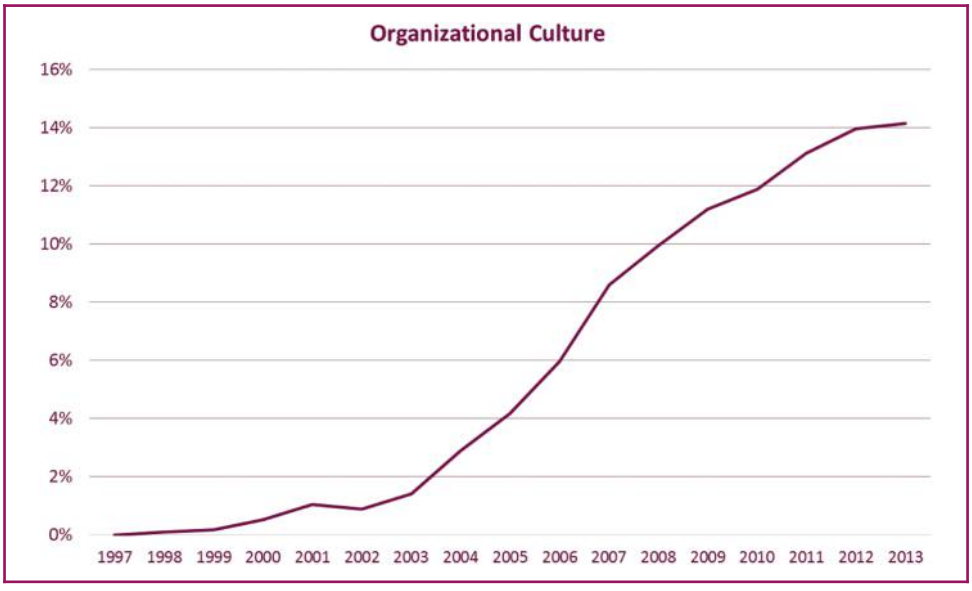



**Figure 2** Average number of citations per year – organizational culture




corresponding citation classics. Google Scholar indexes recently published journal articles very quickly, but it has delays when it covers conference proceedings, books, and book chapters that are often not immediately available online after their publication. Thus, the minor decline in 2013 is because of Google Scholar indexing practices and is not a sign of a declining interest in particular KM topics. Publications pertaining to KM strategy (Figure 8) and problem-solving (Figure 9) exhibited stabilizing citation patterns, but these topics were represented by only two articles and one article, respectively, which makes it difficult to make a generalizable conclusion. Most importantly, the number of citations for 97 articles has been growing and decreasing for only three.

No noticeable differences in terms of citation trends were observed between two sets of citation classics: those that applied a theory and those that did not. No differences were

**Figure 3** Average number of citations per year – scientometrics

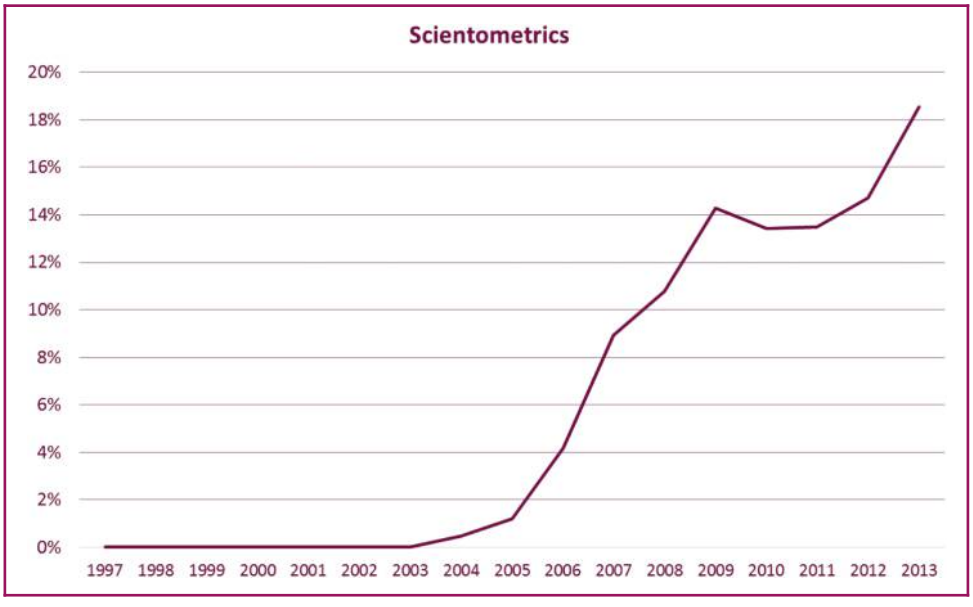
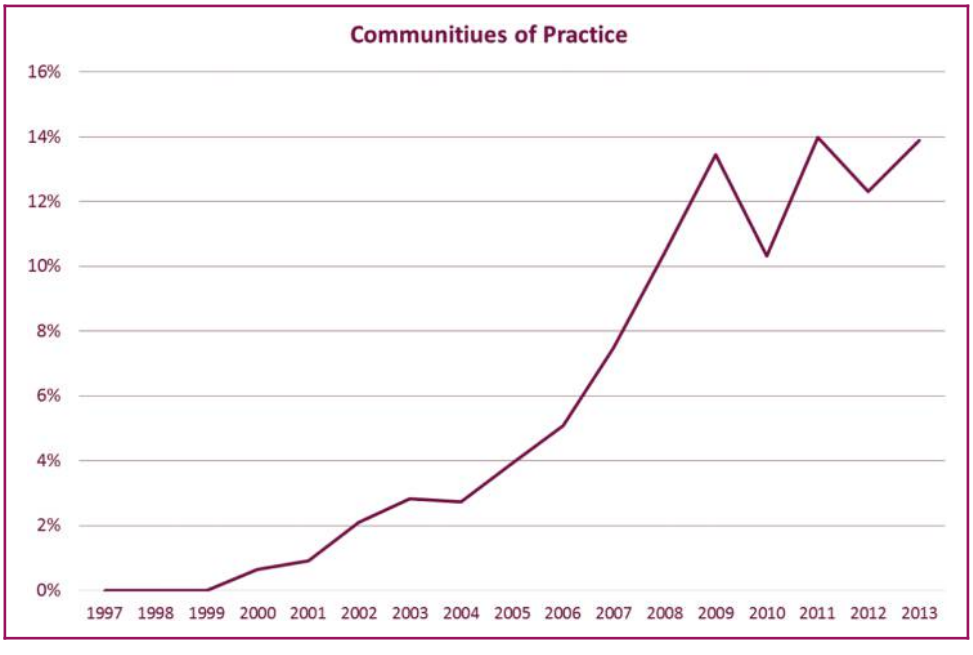



**Figure 4** Average number of citations per year – communities of practice




also found among the three categories of citation classics depending on whether a framework/model was applied:

1. no framework/model used;
2. used a previously developed framework/model; and
3. proposed a new framework/model.

After 2008, multi-authored citation classics started to attract slightly more citations than single-authored ones (see Figure 10). After 2007, citations classics based on empirical evidence were cited slightly more frequently than conceptual ones (see Figure 11). A more

**Figure 5** Average number of citations per year – knowledge innovation

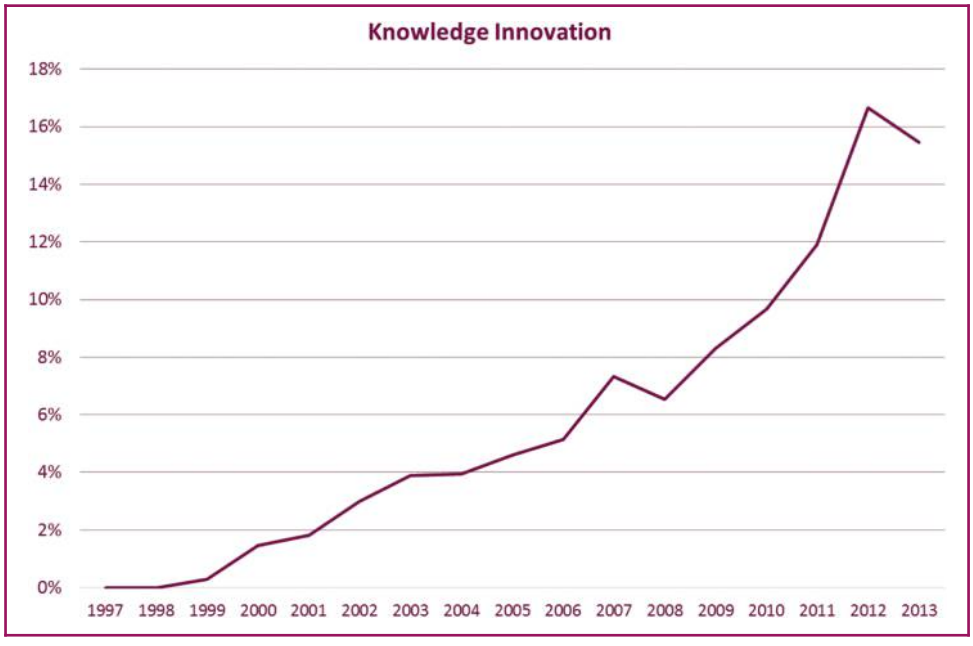
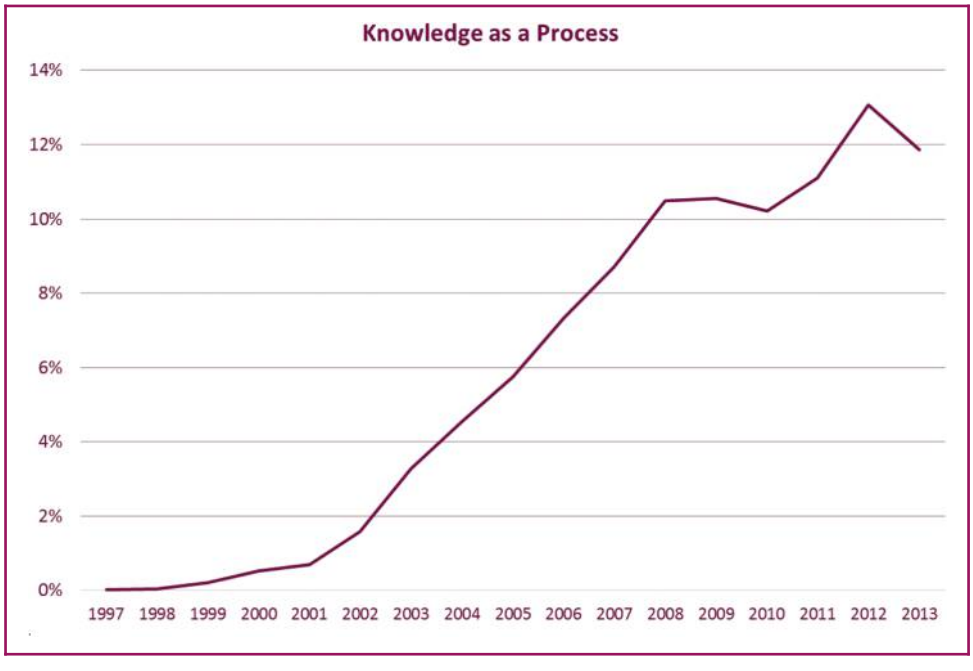



**Figure 6** Average number of citations per year – knowledge as a process




detailed analysis revealed that after 2009, the number of citations to articles that employed surveys, interviews or qualitative methods has been growing faster than the number of citations to articles based on case studies.

## Discussion

The purpose of this section is to discuss the key implications of the findings, which have led to the discovery of what the authors term the Google Scholar Effect. The authors then argue

**Figure 7** Average number of citations per year – managing/competitive advantage

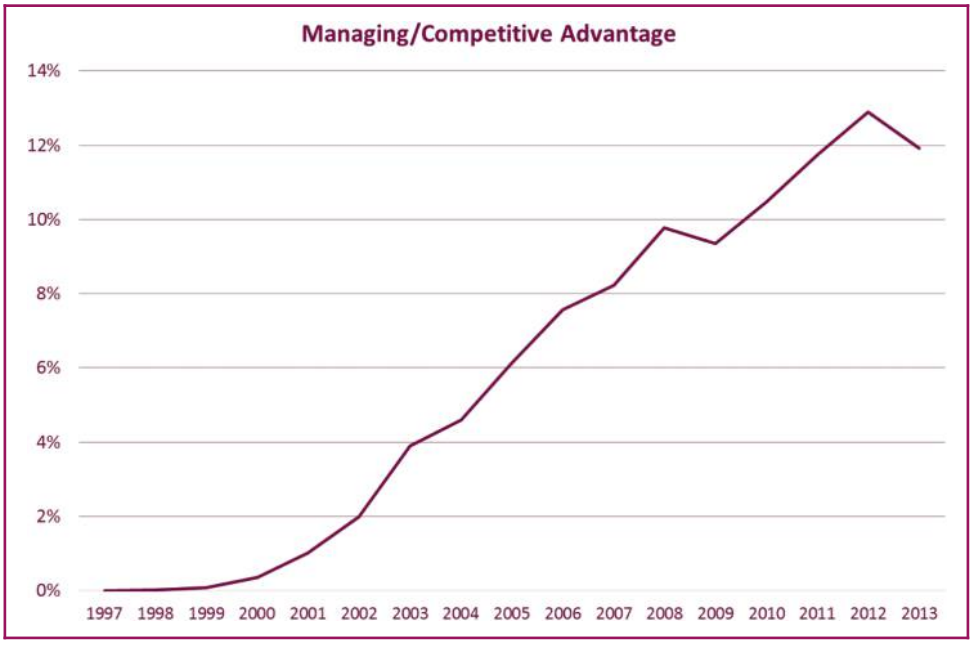
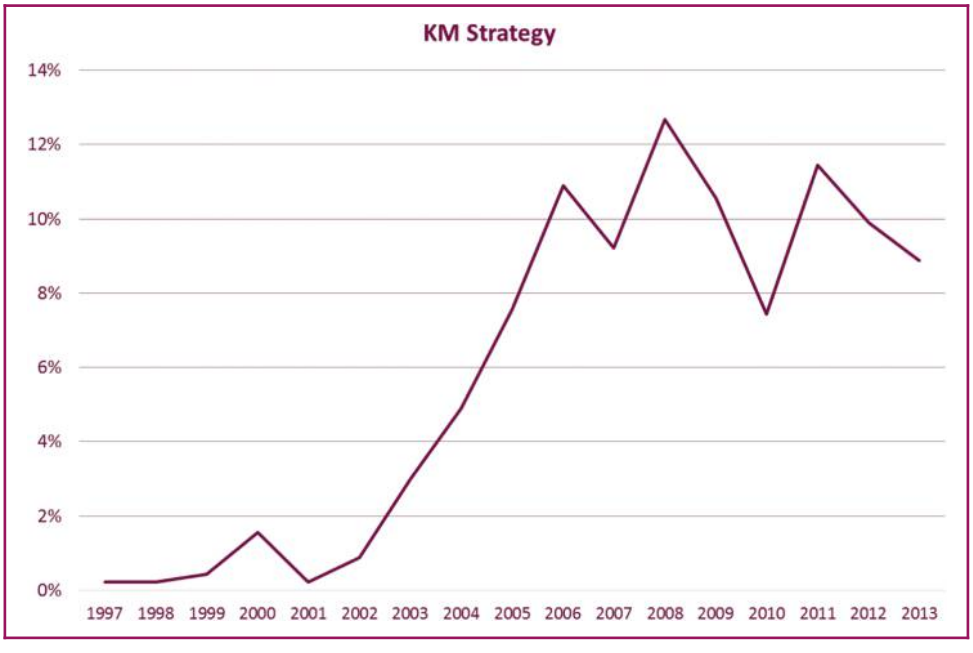



**Figure 8** Average number of citations per year – KM strategy




that the Google Scholar Effect is causing an increase in the number of erroneous citations in the KM domain.

### Implication # 1*: A majority of KM citation classics exhibit a bimodal peak of citations distribution*

In this study, a majority of citation classics exhibited a bimodal pattern of citations distribution. The first peak may be explained by the scientific information diffusion theory (Avramescu, 1979) and the theory of residual citations (Bouabid, 2011; Bouabid and

**Figure 9** Average number of citations per year – problem solving

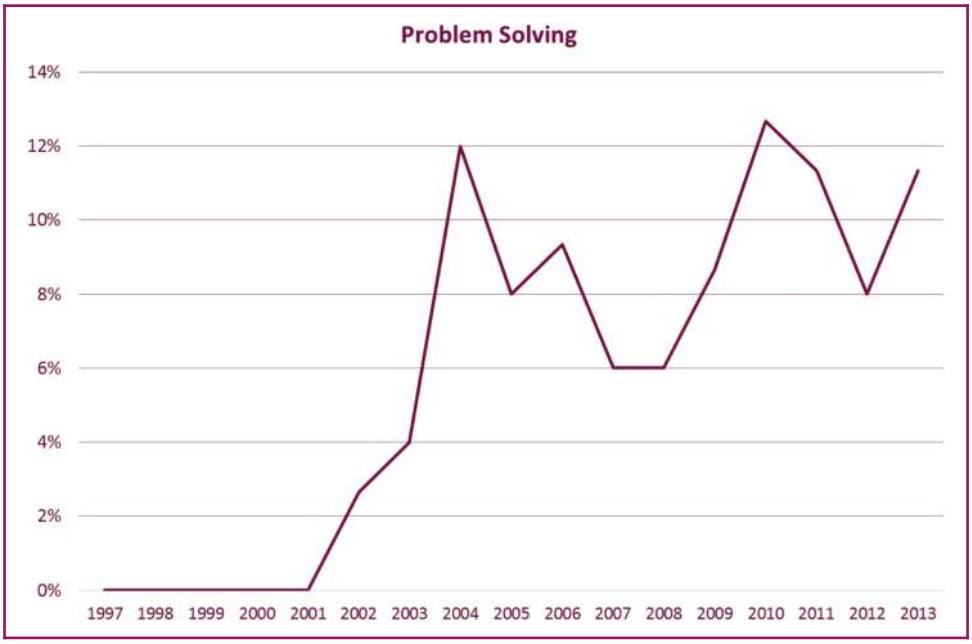
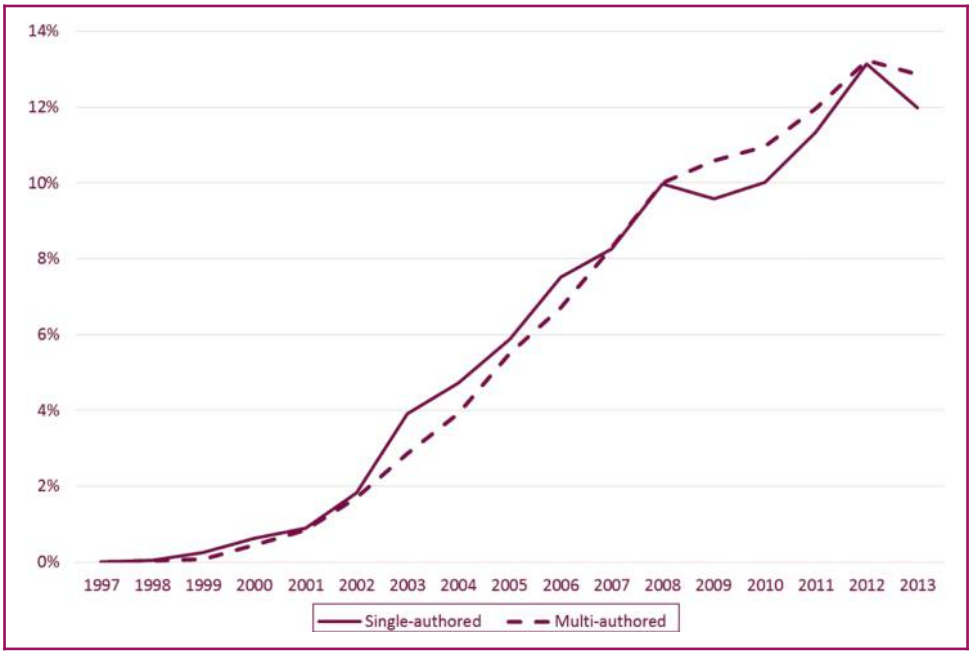
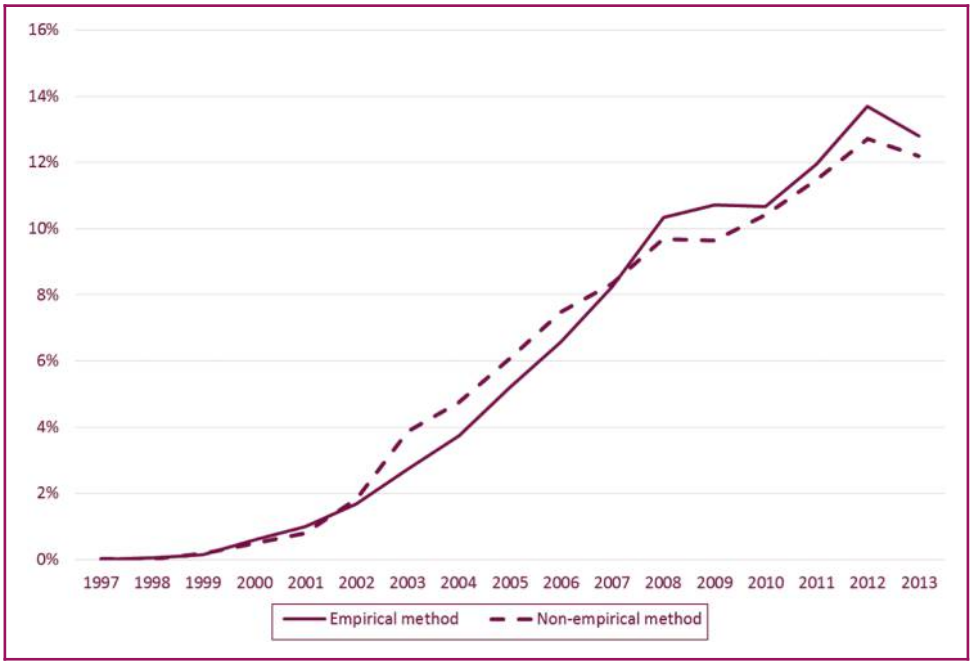



**Figure 10** Average number of citations per year – single-authored vs multi-authored articles




Larivière, 2013), according to which the number of citations to scientific works reaches its peak within three to seven years after publication and declines afterward. The second peak, however, may be because of several factors. First, Levitt and Thelwall (2008, p. 58) claim that "late peaks may be associated with fruitful, broadly relevant theoretical insights or broadly useful methodologies". It is possible that the papers identified as citation classics in this study have made a dramatic impact on the development of KM theory and practice and, therefore, were noticed and used by the research community beyond the use

**Figure 11** Average number of citations per year – empirical vs non-empirical articles




of regular (i.e. non-citation classics) papers. Second, most bimodal citation distributions had their second peak from 2008 to 2012. It is possible that since 2008, there has been a steady and growing interest in KM topics, and the citation classics served as a foundation for subsequent works. In addition, by 2008, there were over 40 KM-centric and KM-relevant peer-reviewed journals (Serenko and Bontis, 2013a), which further facilitated the growth of academic literature.

### Implication # 2*: There are only growing trends in KM research*

This study showed that the overall volume of citations to the identified citation classics has been steadily increasing. In contrast to theoretical assumptions that each academic discipline should be represented by growing, stable and declining research trends, it was discovered that all KM topics have been consistently receiving increasing attention in academia. Some of these observations are expected. For example, information technologies are an irrevocable part and a driving force of organizational KM initiatives. To facilitate successful use of KM technologies, a positive knowledge-sharing culture is required, which is a well-established fact in KM research. Various KM stakeholders, including journal editors, publishers, conference organizers, funding agencies, scholars, students, university administrators, are interested in the results of scientometric studies because these may guide their decision-making processes (Serenko, 2013). At the same time, it is strange that no other research topic exhibits a declining trend. Other scholars also reported that, in general, the volume of KM publications has been continuously growing (Hislop, 2010; Curado *et al.*, 2011; Grant, 2011; Qiu and Lv, 2014).

As such, this study reveals that citation classics are increasingly very well cited, and this trend is likely to continue. One possible reason behind growing citations for classic articles is the increasing impact of older articles in general as Verstak *et al.* (2014, p. 1), who also used Google Scholar to collect citations data, report:

> [. . .] the impact of older articles has grown substantially over 1990–2013. Our analysis indicates that, in 2013, 36 per cent of citations were to articles that are at least 10 years old and that this fraction has grown 28 per cent since 1990.

Therefore, the observation above may not be unique to the KM discipline, and older articles may be generally well-cited in other academic domains.

### Implication # 3: *The KM discipline has not reached academic maturity, but it is progressing toward it*

Some findings point to the embryonic stage of KM discipline development. In a mature scientific discipline, articles that applied or created a theory, a framework, or a model are expected to attract more citations than those that did not. This, however, was not observed in the present study.

In a well-established, advanced scholarly field, critical and performative works, which are based on solid empirical evidence, should attract more attention than normative studies, which are based on literature reviews or speculations. It was observed that since 2007, empirical citation classic articles have been cited more frequently than conceptual ones. Most importantly, since 2009, citation impact of articles that utilized surveys, interviews, or qualitative methods has been particularly noticeable. Thus, even though the KM discipline is not yet mature, there are signs that it has been progressing in a desirable direction. Overall, this conclusion is consistent with those reported by other scholars in their independent investigations of the state and future development of the KM field (e.g. see Grant, 2011).

## *Identifying the Google Scholar Effect*

The findings above were somewhat unexpected. First, it was surprising to discover a bimodal distribution of most citations, and particularly, that the second citations peak was observed between 2008 and 2012. The phenomenon of bimodal distribution of citations was briefly reported earlier. Slyder *et al.* (2011) observe that a small proportion of citation classics in geography and forestry exhibit a bimodal citation pattern. Li and Ye (2014) mention that publications occasionally show wave-type citation patterns. However, these studies report that only a fraction of all papers exhibit the bimodal citation pattern. In addition, no convincing explanation for this finding has been yet offered. Second, no research topics identified in the citation classics exhibited a declining trend. There are at least two factors that may explain this phenomena.

First, a possible reason for increasing citations toward the classics is the insistence by editors and publishers that reviewers answer predefined questions for journal article reviews, such as those found on the publisher's Web site of one KM journal, which specifically ask reviewers "Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?" An author does not want to look like a fool and miss well-known works, and thus these articles get citations for the sake of it rather than because authors are critically evaluating their content and/or using their findings. Therefore, it is possible that the review process forces authors to ensure they cite the classics for fear of receiving critique or criticism that the citation classics do not appear in the paper under review. At the same time, it may be argued that ensuring that authors employed major prior works, which often represent citation classics, to develop their theoretical arguments or methodology is an irrevocable part of the peer-review process.

Second, it is possible that these phenomena occurred because of the appearance of Google Scholar, which had become a very popular academic literature search engine by 2008. Because only two of 25 KM-centric journals are indexed by Thomson Reuters (Serenko and Bontis, 2013a), KM researchers must employ other tools to search for relevant articles and mostly they turn to Google Scholar. When someone performs a search for academic articles, Google Scholar tends to give particular weight to the number of article citations when determining its ranking. Generally, the top five articles in most searches are the most frequently cited ones. Thus, these articles are more likely to be read and cited, which further improves their Google Scholar ranking position.

It is possible that Google Scholar created the Matthew Effect (Merton, 1968, 1988), by making it more likely that some researchers will simply pick articles from the top results on Google Scholar, automatically assume their credibility (e.g. based on the sheer number of prior citations), and cite them in their works. Some authors may also assume that they need to cite the citation classics reported by Google Scholar because journal editors and reviewers have also seen these works in the top ranking of Google Scholar. Thus, citation classics receive even more citations, thus further improving their Google Scholar ranking. This creates the Matthew Effect, also referred to as the superstar effect (Rosen, 1981), which means that a relatively small number of publications attract a disproportionally growing number of citations, whereas a majority of other works remain largely uncited.

Therefore, it is possible that some authors tend to select and cite the top results from Google Scholar (i.e. which have very large citation counts and often already represent citation classics) regardless of their actual fit and contribution to the current work because they believe that reviewers and editors expect to see these citations in the work submitted for publication. This can be a dangerous trend for the development of new knowledge because it may lead to an exponentially growing cycle of erroneous citations. If this proposition holds true, at least some citations to the studied citation classics should be inaccurate and fail to support the citing authors' claims.

In this study, the above-discussed phenomenon is referred to as the Google Scholar Effect, defined as a situation when older academic publications continue to be cited because of their appearance in the top rankings of Google Scholar, which makes some authors believe that journal reviewers and editors expect to see these citations, regardless of their actual fit and contribution to the citing work. It is hypothesized that the Google Scholar Effect is at least partially responsible for the continuously growing number of citations to the KM citation classics studied in the present project. This proposition, however, warrants further empirical investigation. The following sub-sections describe the process and findings in detail.

### *Erroneous citations*

As Isaac Newton described himself as "standing on the shoulders of the giants who have gone before" (Merton, 1993, p. 8), rigorous practices of correctly citing the work of previous researchers have become a key part of academic publishing. However, faulty, erroneous, inappropriate, or incorrect citations, also referred to as miscitations, sometimes appear in peer-reviewed works and undermine the value, credibility, and potential impact of academic research output (Harzing, 2002; Wright and Armstrong, 2008). In this study, it was assumed that the Google Scholar Effect may at least partially manifest itself through miscitations. Five articles were randomly chosen from the list of KM citation classics. For each work separately, 20 journal articles that cited the citation classic were randomly identified and analyzed to see whether the original work (i.e. citation classic) was cited correctly. Journal articles were selected as citing sources because they were (presumably) subjected to a rigorous peer-review process and should, therefore, contain only correct claims. If the same citation classic was cited multiple times in the same paper, only the first citation was analyzed. Definitions of categories of appropriateness and accuracy of citations were adapted from Todd *et al.* (2007 and 2010) (Table I).

The results indicate that 70 per cent of all analyzed citations provided clear support of the statements. At the same time, 18 per cent provided no support of the statement, 8 per cent were ambiguous citations, and 4 per cent were empty citations (in all cases of empty citations, the citing authors almost copied and pasted a sentence together with supporting references from the introduction or literature review section of the cited article). Thus, 30 per cent of all citations may be considered problematic. A number of similar studies in other domains reveal that clear support of the cited statement was observed in 73 per cent (Lukić *et al.*, 2004), 75.8 per cent (Todd *et al.*, 2010), 76.1 per cent (Todd *et al.*, 2007), 81 per cent (Haussmann *et al.*, 2013), and 88 per cent (Larsson, 1995) of citations. Therefore, the

quality of citing practices in the KM discipline may be less rigorous than that in other academic domains, which may be due to the Google Scholar Effect.

A longitudinal analysis of correct vs incorrect citations was done by recording the publication years of citing journal articles. All types of incorrect citations (i.e. ambiguous support, empty citation, and no support) were aggregated. It was observed that from 2004 to 2008, the number of incorrect citations was below 30 per cent. However, since 2009, the number of incorrect citations has exceeded 30 per cent each year. Given that Google Scholar has gained its momentum after 2008, it is likely that Google Scholar has facilitated the mis-citation behavior for some authors, which confirms the presence of the Google Scholar Effect.

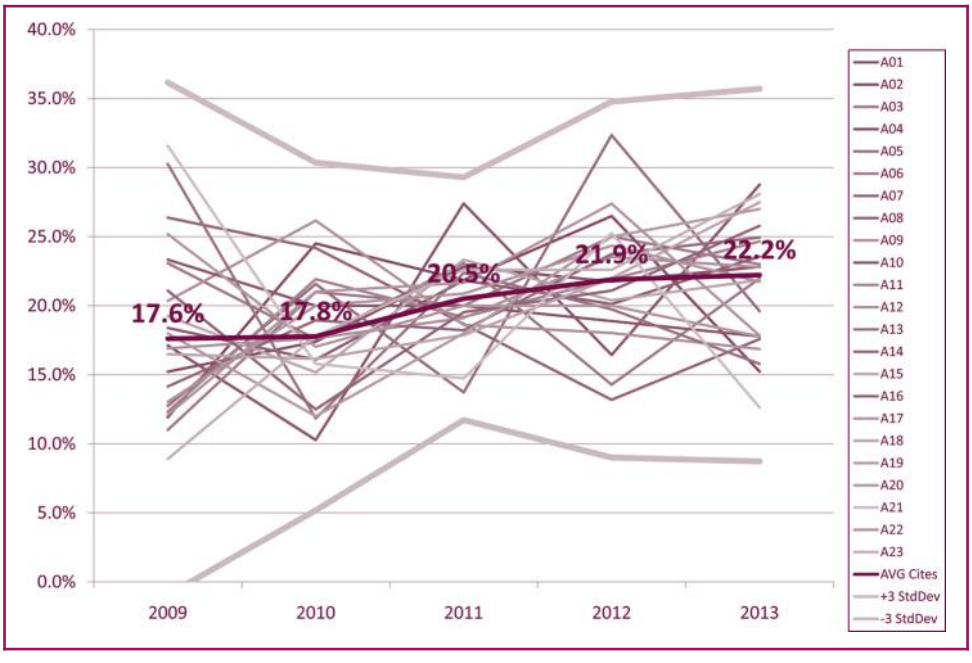
### *Five-year trend analysis*

Examining the impact of each citation classic article for the past five years will indicate if the articles are becoming more popular or declining in popularity over time relative to one another. Hence, it was hypothesized that if a citation classic article is still relevant, its number of citations should significantly deviate from receiving the same average number of citations as other citation classic articles. To investigate the hypothesis, citation classic articles published in 2003 and 2004 (23 articles) were selected and their citation counts for the past five years (2009 to 2013) were examined. Note that the years 2009–2013 represent the time period when Google Scholar gained its momentum. The five-year time window was selected because:

- it allows for a sufficient amount of time for the article to gain citations;
- the articles become citation classics well after the establishment of KM as a research field; and
- this is how Google Scholar measures the current journals' and authors' relevance.

The results presented in Figure 12 show the citations each article receives per year (2009-2013) as a percentage of all citations (100 per cent) for citation classic articles published in 2003 and 2004 along with the average across all articles as shown on the

**Figure 12** Average citations per year (2009–2013) for citation classic articles published in 2003 and 2004



"AVG Cites" line. The "AVG Cites" line represents the average number of citations received by these 23 articles in total. The "AVG Cites" line shows that the citation classic articles gained more cites on an average in every year from 2009 to 2013. From 2009 to 2013, the overall volume of citations grew by 4.6 per cent. However, as demonstrated in the previous sub-section, the overall number of miscitations started to increase after 2009. Given that at least 30 per cent of all citations per year are in fact miscitations and their number has been increasing since 2009, it is likely that the observed growth in citations was because of the Google Scholar Effect.

Figure 12 also shows that at some point in the 2009 to 2013 period, every article except one (Serenko and Bontis, 2004) has two or more years, whereby the average number of citations is higher than the "AVG Cites" line, and no article is above the line in all five years. Similarly, only one article (Wong and Aspinwall, 2004) has citations more or less than three standard deviations from the "AVG Cites" line in any year. All citation classics do not deviate much from the average increase in citations received across all articles. In other words, all of them receive a growing number of citations. Thus, it is concluded that KM citation classic articles are subject to what this study terms the "Google Scholar Effect", whereby citation classic articles become increasingly cited every year.

## Conclusion

### *The Google Scholar Effect*

The initial purpose of this study was to discover growing, stable and declining KM research trends. For this, citations to 100 KM citation classics identified by Serenko and Dumay (2015) were collected and analyzed. First, it was observed that most KM citation classics exhibit a bimodal peak of citations distribution, which should not be theoretically expected. Second, all research topics have been growing, which, again, contradicts theory. These somewhat unexpected findings warranted further theoretical elaboration and empirical investigation. The analysis of erroneous citations (i.e. miscitations) and a five-year trend revealed that the continuously growing volume of citations may result from what this study refers to as the Google Scholar Effect when older classic works continue being cited because they appear in the top ranking results of Google Scholar, and some authors assume that reviewers and editors may consider such publications important and expect to see them in the submitted manuscript, regardless of their actual fit and contribution to the line of research. This may explain why Landrum *et al.* (2010) discovered that KM researchers tend to cite a small number of older seminal works and ignore recent publications.

This study is a must read for all KM scholars and for all scholars seeking to advance knowledge in their fields by "standing on the shoulders of the giants who have gone before" (Merton, 1993, p. 8). This is because advances in technology, the increasing number of journals and the pressure to demonstrate a high volume of research output are radically changing the way authors cite those who have gone before them. As (Guthrie *et al.* 2015, p. 4) outline:

> Less than 50 years ago, a relatively small number of printed refereed journals, run by a handful of commercial publishing houses, communicated about 50 per cent of the global research findings and academic knowledge. [..]However, this century we have seen a significant rise in scholarly output from a range of emerging countries (e.g. China, Brazil, Russia, South Korea) and there is now a global knowledge network of producers and consumers of research. Similarly, how research is being produced and consumed is changing through open access publishing and e-journals.

Similarly, Google Scholar data are now becoming more important for measuring scholarly impact because it includes a wide variety of sources from highly regarded journal articles and is freely available to all scholars (Harzing and van der Wal, 2008; Harzing, 2014). Thus, based on findings, it is concluded that the Google Scholar Effect is playing an increasingly

relevant role in measuring scholarly impact and is increasingly influential in determining how KM researchers cite citation classic articles.

Additionally, if authors continue to miscite articles because of the Google Scholar Effect, then they jeopardize the production of new knowledge and risk giving academic research a bad name. In essence, researchers need to be aware of how technology is changing their profession and the way they perform their work "because the pressure to "publish or perish" causes researchers to take methodological shortcuts" which prevents research from being state-of-the-art (Dumay, 2014b, p. 1258). Similarly, this means that reviewers and editors need to be more aware of the pressure and prevalence of miscitations and take actions to raise awareness and prevent miscitations from occurring. The Google Scholar Effect is particularly dangerous because younger researchers tend to over-rely on information that is quickly provided by search engines instead of reading and critically assessing online information (Rowlands *et al.*, 2008).

This study is also important from a scientometric research perspective as it is one of the growing bodies of research using Google Scholar to measure the impact and power it has in influencing what gets cited and by whom (Dumay, 2014a; Verstak *et al.*, 2014; Massaro *et al.*, 2015; Serenko and Dumay, 2015). What this study concludes is that traditional ways of measuring citations may soon be obsolete if the Google Scholar Effect continues to expand and, thus, impact article "life-cycles" as some articles become perpetually cited. Therefore, scholars need to devise new research methods that account for or negate the Google Scholar Effect, so that researchers can have a clearer picture of what influences research to make sure they are correctly perched on the shoulders of the giants.

It is unarguable that digital technologies, including Google, have transformed scholarly practices, and their impact will persist in the future (Weller, 2011). Therefore, authors, editors, reviewers and university administrators should proactively eliminate or at least minimize the unwanted impact of the Google Scholar Effect on the quality and rigor of academic works. Researchers must always read the cited source in detail and develop a good understanding of the authors' ideas, conclusions and key assumptions. They need to develop a sense of scholarly moral integrity and to realize that relying on the opinion of the third party and reusing citations from other (i.e. non-original) sources is not only unethical but also detrimental to the quality of their publications. Journal editors should explicitly describe proper citation practices in their manuscript submission guidelines and offer examples of correct and incorrect use of citations. Unfortunately, this practice has not yet been adopted. Altogether, the authors of this paper published over 100 journal articles but could not recall a single description of proper citation practices on a publisher's Web site (except for citation formatting requirements).

Referees should read and diligently assess the sources which are used to develop a theoretical background and methodology of the reviewed work. At the bare minimum, they should conduct random checks of citations and report their conclusions to the editor. University administrators should create and enhance the culture of research ethics among faculty members and emphasize the importance of proper citation practices. They should also organize seminars, workshops and tutorials for graduate students and help them develop good citation habits early in their academic careers. The issue of reference accuracy and research ethics has already gained recognition in academia (Ferguson *et al.*, 2007; Barroga, 2014), but it has not been addressed in the KM field.

### *Future research opportunities*

The results from this study open up two significant research opportunities. First, more research is needed to understand the impact Google Scholar is having on domains beyond KM. The research is necessary because if Google Scholar is having any counterproductive impact on how new knowledge is created, then this needs to be addressed by scholars, reviewers, editors and Google Scholar's developers.

Second, more comprehensive research on the impact of erroneous citations is needed because these have the most potential for damaging academic discourse and reputation. Citing for the sake of getting published is not only a bad practice, but it is also ethically questionable. Retraction of academic publications from peer-reviewed journals is more common than most researchers imagine because some researchers fabricate data, misreport their findings, or use questionable citation practices[1]. Therefore, misciting is also a serious malady. Thus, everyone involved in the academic research process has an obligation to ensure that what they cite is correct, and they do not cite KM classics just to impress reviewers and readers.

This is the second publication within a larger project with the purpose to explore the history, present and future potential of the KM discipline from the perspective of citation classics. The goal of the third study will be to survey the authors of these citation classics to better understand the attributes of these works and why these articles have become well-recognized. The objective of the fourth study will be to explore the social and personal characteristics of citation classics' authors.

### *Limitations*

The main limitation of this study is that the authors confine it to the KM discipline, which the authors argue is still an emerging paradigm. As highlighted above, other disciplines need to conduct more research to validate our findings and conclusions. Doing so will open up a fruitful discourse that promises to improve academic research and citation behavior, so the researchers can truly "stand upon the shoulders of the giants who have gone before" (Merton, 1993, p. 8).

## Note

1. See http://retractionwatch.com/ for daily updates on retracted scholarly publications.

## References


Alvarez, P., Escalona, I. and Pulgarín, A. (2000), "What is wrong with obsolescence?", *Journal of the American Society for Information Science*, Vol. 51 No. 9, pp. 812-815.

Aversa, E.S. (1985), "Citation patterns of highly cited papers and their relationship to literature aging: a study of the working literature", *Scientometrics*, Vol. 7 Nos 3/6, pp. 383-389.

Avramescu, A. (1979), "Actuality and obsolescence of scientific literature", *Journal of the American Society for Information Science*, Vol. 30 No. 5, pp. 296-303.

Barroga, E.F. (2014), "Reference accuracy: authors', reviewers', editors', and publishers' contributions", *Journal of Korean Medical Science*, Vol. 29 No. 12, pp. 1587-1589.

Bjørnson, F.O. and Dingsøyr, T. (2008), "Knowledge management in software engineering: a systematic review of studied concepts, findings and research methods used", *Information and Software Technology*, Vol. 50 No. 11, pp. 1055-1068.

Bouabid, H. (2011), "Revisiting citation aging: a model for citation distribution and life-cycle prediction", *Scientometrics*, Vol. 88 No. 1, pp. 199-211.

Bouabid, H. and Larivière, V. (2013), "The lengthening of papers' life expectancy: a diachronous analysis", *Scientometrics*, Vol. 97 No. 3, pp. 695-717.

Brookes, B.C. (1970), "Obsolescence of special library periodicals: sampling errors and utility contours", *Journal of the American Society for Information Science*, Vol. 21 No. 5, pp. 320-329.

Burton, R.E. and Kebler, R.W. (1960), "The 'half-life' of some scientific and technical literatures", *American Documentation*, Vol. 11 No. 1, pp. 18-22.

Calabretta, G., Durisin, B. and Ogliengo, M. (2011), "Uncovering the intellectual structure of research in business ethics: a journey through the history, the classics, and the pillars of Journal of Business Ethics", *Journal of Business Ethics*, Vol. 104 No. 4, pp. 499-524.

Cano, V. and Lind, N.C. (1991), "Citation life cycles of ten citation classics", *Scientometrics*, Vol. 22 No. 2, pp. 297-312.

Chatzkel, J. (2004), "Moving through the crossroads", *Journal of Intellectual Capital*, Vol. 5 No. 2, pp. 337-339.

Curado, C., Oliveira, M. and Maçada, A.C.G. (2011), "Mapping knowledge management authoring patterns and practices", *African Journal of Business Management*, Vol. 5 No. 22, pp. 9137-9153.

Davis, G.F. (2014), "Editorial essay: why do we still have journals?", *Administrative Science Quarterly*, Vol. 59 No. 2, pp. 193-201.

de Vaujany, F.X., Walsh, I. and Mitev, N. (2011), "An historically grounded critical analysis of research articles in IS", *European Journal of Information Systems*, Vol. 20 No. 4, pp. 395-417.

Dumay, J. (2014a), "15 years of the Journal of Intellectual Capital and counting: a manifesto for transformational IC research", *Journal of Intellectual Capital*, Vol. 15 No. 1, pp. 2-37.

Dumay, J. (2014b), "Reflections on interdisciplinary accounting research: the state of the art of intellectual capital", *Accounting, Auditing & Accountability Journal*, Vol. 27 No. 8, pp. 1257-1264.

Dwivedi, Y.K., Venkitachalam, K., Sharif, A.M., Al-Karaghouli, W. and Weerakkody, V. (2011), "Research trends in knowledge management: analyzing the past and predicting the future", *Information Systems Management*, Vol. 28 No. 1, pp. 43-56.

Egghe, L. (1992), "Citation age data and the obsolescence function: fits and explanations", *Information Processing & Management*, Vol. 28 No. 2, pp. 201-217.

Egghe, L. (2010), "The distribution of the uncitedness factor and its functional relation with the impact factor", *Scientometrics*, Vol. 83 No. 3, pp. 689-695.

Eijkman, H. (2011), "The learning organization as concept and journal in the neo-millennial era: a plea for critical engagement", *The Learning Organization*, Vol. 18 No. 3, pp. 164-174.

Ergazakis, K. and Metaxiotis, K. (2011), "The knowledge-based development agenda: a perspective for 2010-2020", *VINE: The Journal of Information and Knowledge Management Systems*, Vol. 41 No. 3, pp. 358-377.

Ergazakis, K., Metaxiotis, K. and Askounis, D. (2013), "Knowledge-based development research: a comprehensive literature review 2000-2010", *Knowledge Management Research & Practice*, Vol. 11 No. 1, pp. 78-91.

Ferguson, K., Masur, S., Olson, L., Ramirez, J., Robyn, E. and Schmaling, K. (2007), "Enhancing the culture of research ethics on university campuses", *Journal of Academic Ethics*, Vol. 5 Nos 2/4, pp. 189-198.

Finardi, U. (2014), "On the time evolution of received citations, in different scientific fields: an empirical study", *Journal of Informatics*, Vol. 8 No. 1, pp. 13-24.

Garfield, E. (1977), "Introducing citation classics: the human side of scientific reports", *Current Contents*, Vol. 1 No. 1, pp. 5-7.

Garfield, E. (1989), "Citation classics and citation behavior revisited", *Current Contents*, Vol. 12 No. 5, pp. 3-8.

Glänzel, W. (2004), "Towards a model for diachronous and synchronous citation analyses", *Scientometrics*, Vol. 60 No. 3, pp. 511-522.

Glänzel, W. and Schoepflin, U. (1995), "A bibliometric study on ageing and reception processes of scientific literature", *Journal of information Science*, Vol. 21 No. 1, pp. 37-53.

Grant, K. (2011), "Knowledge management, an enduring but confusing fashion", *Electronic Journal of Knowledge Management*, Vol. 9 No. 2, pp. 117-131.

Greco, A.N., Wharton, R.M., Estelami, H. and Jones, R.F. (2006), "The state of scholarly Journal Publishing: 1981-2000", *Journal of Scholarly Publishing*, Vol. 37 No. 3, pp. 155-214.

Griffiths, D.A. and Morse, S.M. (2009), "Knowledge management: towards overcoming dissatisfaction in the field", *World Academy of Science Engineering and Technology*, Vol. 54 No. 1, pp. 724-735.

Guthrie, J., Parker, L.D. and Dumay, J. (2015), "Academic performance, publishing and peer review: peering into the twilight zone", *Accounting, Auditing & Accountability Journal*, Vol. 28 No. 1, pp. 2-13.

Guthrie, J., Ricceri, F. and Dumay, J. (2012), "Reflections and projections: a decade of intellectual capital accounting research", *The British Accounting Review*, Vol. 44 No. 2, pp. 68-92.

Harzing, A.W. (2002), "Are our referencing errors undermining our scholarship and credibility? The case of expatriate failure rates", *Journal of Organizational Behavior*, Vol. 23 No. 1, pp. 127-148.

Harzing, A.W. (2014), "A longitudinal study of Google Scholar coverage between 2012 and 2013", *Scientometrics*, Vol. 98 No. 1, pp. 565-575.

Harzing, A.W. and van der Wal, R. (2008), "Google Scholar as a new source for citation analysis", *Ethics in Science and Environmental Politics*, Vol. 8 No. 1, pp. 61-73.

Haussmann, N.S., McIntyre, T., Bumby, A.J. and Loubser, M.J. (2013), "Referencing practices in physical geography: how well do we cite what we write?", *Progress in Physical Geography*, Vol. 37 No. 4, pp. 543-549.

Heisig, P. (2015), "Future research in knowledge management: results from the global knowledge research network study", in Bolisani, E. and Handzic, M. (Eds), *Advances in Knowledge Management: Celebrating Twenty Years of Research and Practice*, Springer, Berlin, pp. 151-182.

Hislop, D. (2010), "Knowledge management as an ephemeral management fashion?", *Journal of Knowledge Management*, Vol. 14 No. 6, pp. 779-790.

Ho, Y.S. (2014), "Classic articles on social work field in Social Science Citation Index: a bibliometric analysis", *Scientometrics*, Vol. 98 No. 1, pp. 137-155.

Holsapple, C.W. and Wu, J. (2008), "In search of a missing link", *Knowledge Management Research & Practice*, Vol. 6 No. 1, pp. 31-40.

Kurtz, M.J., Eichhorn, G., Accomazzi, A., Grant, C., Demleitner, M., Murray, S.S., Martimbeau, N. and Elwell, B. (2005), "The bibliometric properties of article readership information", *Journal of the American Society for Information Science and Technology*, Vol. 56 No. 2, pp. 111-128.

Landrum, W.H., Jourdan, Z., Hall, D. and Lang, T. (2010), "Citation analysis and trends in knowledge management", *Proceedings of the Sixteenth Americas Conference on Information Systems*, *Lima*.

Larsson, K.S. (1995), "The dissemination of false data through inadequate citation", *Journal of Internal Medicine*, Vol. 238 No. 5, pp. 445-450.

Lee, M.R. and Chen, T.T. (2012), "Revealing research themes and trends in knowledge management: from 1995 to 2010", *Knowledge-Based Systems*, Vol. 28 No. 1, pp. 47-58.

Levitt, J. and Thelwall, M. (2008), "Patterns of annual citation of highly cited articles and the prediction of their citation ranking: a comparison across subjects", *Scientometrics*, Vol. 77 No. 1, pp. 41-60.

Levitt, J. and Thelwall, M. (2009), "The most highly cited Library and Information Science articles: interdisciplinarity, first authors and citation patterns", *Scientometrics*, Vol. 78 No. 1, pp. 45-67.

Li, J. and Ye, F.Y. (2014), "A probe into the citation patterns of high-quality and high-impact publications", *Malaysian Journal of Library & Information Science*, Vol. 19 No. 2, pp. 17-33.

Line, M.B. and Sandison, A. (1974), "Progress in documentation: 'obsolescence'and changes in the use of literature with time", *Journal of Documentation*, Vol. 30 No. 3, pp. 283-350.

Liu, X., Jiang, T. and Ma, F. (2013), "Collective dynamics in knowledge networks: emerging trends analysis", *Journal of Informetrics*, Vol. 7 No. 2, pp. 425-438.

Lukić, I.K., Lukić, A., Gluncić, V., Katavić, V., Vucenik, V. and Marusić, A. (2004), "Citation and quotation accuracy in three anatomy journals", *Clinical Anatomy*, Vol. 17 No. 7, pp. 534-539.

Massaro, M., Dumay, J. and Guthrie, J. (2015), "On the shoulders of the giants: undertaking a 'Structured Literature Review'", *Accounting, Auditing & Accountability Journal*, Vol. 28 No. 1.

Merton, R.K. (1968), "The Matthew effect in science", *Science*, Vol. 159 No. 3810, pp. 56-63.

Merton, R.K. (1988), "The Matthew effect in science, II: cumulative advantage and the symbolism of intellectual property", *Isis*, Vol. 79 No. 4, pp. 606-623.

Merton, R.K. (1993), *On the Shoulders of Giants*, University of Chicago Press, Chicago.

Nie, K., Ma, T. and Nakamori, Y. (2009), "An approach to aid understanding emerging research fields – the case of knowledge management", *Systems Research and Behavioral Science*, Vol. 26 No. 6, pp. 629-643.

Ohba, N. and Nakao, K. (2012), "Sleeping beauties in ophthalmology", *Scientometrics*, Vol. 93 No. 2, pp. 253-264.

Pollman, T. (2000), "Forgetting and the ageing of scientific publications", *Scientometrics*, Vol. 47 No. 1, pp. 43-54.

Price, D.J.D.S. (1965), "Networks of scientific papers", *Science*, Vol. 149 No. 3683, pp. 510-515.

Qiu, J. and Lv, H. (2014), "An overview of knowledge management research viewed through the web of science (1993-2012)", *Aslib Journal of Information Management*, Vol. 66 No. 4, pp. 424-442.

Rosen, S. (1981), "The economics of superstars", *American Economic Review*, Vol. 71 No. 5, pp. 845-858.

Rowlands, I., Nicholas, D., Williams, P., Huntington, P., Fieldhouse, M., Gunter, B., Withey, R., Jamali, H.R., Dobrowolski, T. and Tenopir, C. (2008), "The Google generation: the information behaviour of the researcher of the future", *Aslib Proceedings: New Information Perspectives*, Vol. 60 No. 4, pp. 290-310.

Serenko, A. (2013), "Meta-analysis of scientometric research of knowledge management: discovering the identity of the discipline", *Journal of Knowledge Management*, Vol. 17 No. 5, pp. 773-812.

Serenko, A. and Bontis, N. (2004), "Meta-review of knowledge management and intellectual capital literature: citation impact and research productivity rankings", *Knowledge and Process Management*, Vol. 11 No. 3, pp. 185-198.

Serenko, A. and Bontis, N. (2013a), "Global ranking of knowledge management and intellectual capital academic journals: 2013 update", *Journal of Knowledge Management*, Vol. 17 No. 2, pp. 307-326.

Serenko, A. and Bontis, N. (2013b), "The intellectual core and impact of the knowledge management academic discipline", *Journal of Knowledge Management*, Vol. 17 No. 1, pp. 137-155.

Serenko, A. and Bontis, N. (2013c), "Investigating the current state and impact of the intellectual capital academic discipline", *Journal of Intellectual Capital*, Vol. 14 No. 4, pp. 476-500.

Serenko, A. and Dumay, J. (2015), "Citation classics published in Knowledge Management Journals, Part I: articles and their characteristics", *Journal of Knowledge Management*, Vol. 19 No. 2, pp. 401-431.

Shibata, N., Kajikawa, Y., Takeda, Y. and Matsushima, K. (2009), "Comparative study on methods of detecting research fronts using different types of citation", *Journal of the American Society for Information Science and Technology*, Vol. 60 No. 3, pp. 571-580.

Slyder, J.B., Stein, B.R., Sams, B.S., Walker, D.M., Beale, B.J., Feldhaus, J.J. and Copenheaver, C.A. (2011), "Citation pattern and lifespan: a comparison of discipline, institution, and individual", *Scientometrics*, Vol. 89 No. 3, pp. 955-966.

Small, H. (1999), "A passage through science: crossing disciplinary boundaries", *Library Trends*, Vol. 48 No. 1, pp. 72-108.

Small, H. (2003), "Paradigms, citations, and maps of science: a personal history", *Journal of the American Society for Information Science and Technology*, Vol. 54 No. 5, pp. 394-399.

Song, J.H., Park, C.H. and Fu, I.P. (2014), "Investigating the research trends of learning organization studies between 1979 and 2011: an approach of the citation network research", *Learning and Performance Quarterly*, Vol. 2 No. 2, pp. 37-63.

Stinson, E. and Lancaster, F.W. (1987), "Synchronous versus diachronous methods in the measurement of obsolescence by citation studies", *Journal of Information Science*, Vol. 13 No. 2, pp. 65-74.

Száva-Kováts, E. (2002), "Unfounded attribution of the 'half-life' index-number of literature obsolescence to Burton and Kebler: a literature science study", *Journal of the American Society for Information Science and Technology*, Vol. 53 No. 13, pp. 1098-1105.

Todd, P.A., Guest, J.R., Lu, J. and Chou, L.M. (2010), "One in four citations in marine biology papers is inappropriate", *Marine Ecology Progress Series*, Vol. 408 No. 1, pp. 299-303.

Todd, P.A., Yeo, D.C., Li, D. and Ladle, R.J. (2007), "Citing practices in ecology: can we believe our own words?", *Oikos*, Vol. 116 No. 9, pp. 1599-1601.

Upham, S.P. and Small, H. (2010), "Emerging research fronts in science and technology: patterns of new knowledge development", *Scientometrics*, Vol. 83 No. 1, pp. 15-38.

Verstak, A., Acharya, A., Suzuki, H., Henderson, S., Iakhiaev, M., Lin, C.C.Y. and Shetty, N. (2014), "On the shoulders of Giants: the growing impact of older articles", *arXiv*, Cornell University Library, Ithica, New York, NY.

Wei, Z. and Nakamori, Y. (2010), "Shaping and futurizing our global knowledge", *Proceedings of the 5th International Conference on Knowledge Management in Asia Pacific*, *Xi'an*.

Weller, M. (2011), *The Digital Scholar: How Technology is Transforming Scholarly Practice*, Bloomsbury Academic, New York, NY.

Wong, K.Y. and Aspinwall, E. (2004), "Characterizing knowledge management in the small business environment", *Journal of Knowledge Management*, Vol. 8 No. 3, pp. 44-61.

Wright, M. and Armstrong, J.S. (2008), "The ombudsman: verification of citations: fawlty towers of knowledge?", *Interfaces*, Vol. 38 No. 2, pp. 125-139.

Yan, E., Ding, Y., Milojević, S. and Sugimoto, C.R. (2012), "Topics in dynamic research communities: an exploratory study for the field of information retrieval", *Journal of Informatics*, Vol. 6 No. 1, pp. 140-153.

Zhong, Q.Y. and Song, J. (2008), "The developing trend research of knowledge management overseas based on word frequency analysis", *Proceedings of the 4th International Conference on Wireless Communications, Networking and Mobile Computing*, *Dalian*.

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John Dumay is Associate Professor in Accounting at Macquarie University, Sydney. He worked for over 15 years as an independent business consultant across a wide variety of industries before joining academia after completing his PhD in 2008. The PhD entitled Intellectual Capital in Action: Australian Studies won the prestigious Emerald/EFMD Outstanding Doctoral Research Award for 2008 in the Knowledge Management category. John continues to research on the topics of intellectual capital, knowledge management, non-financial accounting and reporting, innovation, management accounting, qualitative research methods and academic writing. Since starting his thesis in 2006, John has achieved an outstanding record as the author or co-author of more than 30 peer-reviewed academic journal articles in prestigious journals such as *Accounting Auditing & Accountability Journal*, *British Accounting Review*, *Financial Accountability & Management*, *Journal of Intellectual Capital*, *Public Management Review* and *VINE*. He has co-authored with different authors from many countries such as Australia, Italy, Canada, Russia, the USA, Poland, Japan and China. He has won Highly Commended Paper award thrice for the *Journal of Intellectual Capital* (2008 and 2012, 2014) and once for the *Journal of Accounting and Organisational Change* (2014). John also won the Outstanding Reviewer Award for the *VINE* journal (2012). John is the Australasian Regional Editor of the *Journal of Intellectual Capital*. He is also a member of the Editorial Boards of Advice for the *Accounting Auditing & Accountability Journal*, *Journal of Accounting & Organisational Change*, *Meditari Accountancy Research*, and *Electronic Journal of Knowledge Management*.