International Journal of Physical Distribution & Logistics Management

On the measurement and benchmarking of research impact among active logistics scholars

Shashank Rao, Deepak Iyengar, Thomas J. Goldsby,

Received 21 July 2012
Revised 25 October 2012
20 January 2013
26 April 2013
Accepted 26 April 2013

On the measurement and benchmarking of research impact among active logistics scholars

Shashank Rao
Department of Supply Chain & Information Systems, College of Business, Auburn University, Auburn, Alabama, USA
Deepak Iyengar
Department of Finance & Supply Chain Management, College of Business, Central Washington University, Ellensburg, Washington, USA, and
Thomas J. Goldsby
Fisher College of Business, The Ohio State University, Columbus, Ohio, USA

Abstract
Purpose – Scholarly interest in carrying out impactful research continues to remain high. Yet, given that citations of scholarly work can never decrease with time, traditional measures of research impact (such as raw counts of citations) unwittingly discriminate against early career researchers and also make it hard to identify future high impact scholars. In the current study, the paper compares several commonly used measures of research impact to identify one that best normalizes for the effect of career stage. The measure thus applies equally across most career stages, providing a usable impact benchmark for logistics scholars irrespective of seniority level. The paper also aims to present benchmarks on that metric to help logistics scholars identify their research impact *vis-à-vis* their peers.

Design/methodology/approach – Bibliometric data on the research of 702 logistics scholars were collected and analyzed by dividing the scholars into different cohorts based on seniority. Comparisons of different citation metrics were then made.

Findings – The h-rate provides the most appropriate basis for comparing research impact across logistics scholars of various career stages. Benchmark h-rates are provided for scholars to identify their research impact.

Originality/value – The authors are unaware of any other work in the logistics field that measures the research impact of logistics scholars in this manner.

Keywords Citation, Bibliometrics, Logistics scholarship, Research impact

Paper type Research paper

Introduction
Knowledge creation, an activity that has traditionally been espoused within academia, is becoming ever more important at schools of business. Several programs that earlier may have considered research as a secondary activity now show an increased focus on research (Bennis and O'Toole, 2005). In addition, programs that already had a research inclination have increased that focus even more (Holsapple, 2008). This is true for most business disciplines, including logistics. For example, Carter *et al.* (2005) demonstrated an increase in the overall number of institutions that are showing an interest in publishing logistics research in the top journals. Given this enhanced focus on research and the generally high importance that research plays in a scholar's career

International Journal of Physical Distribution & Logistics Management
Vol. 43 No. 10, 2013
pp. 814-832

0960-0035
DOI 10.1108/IJPDLM-07-2012-0207

(Ford *et al.*, 2001), there is an interest in measuring research output and impact (Coleman *et al.*, 2012; Chapman and Ellinger, 2009).

In keeping with this growing interest, there have been quite a few recent attempts to measure scholarship within the logistics and supply chain management (SCM) fields. This has taken several forms, e.g. the measurement of individual researcher output (Coleman *et al.*, 2012), output of researchers at particular academic institutions (Carter and Ellram, 2003; Maloni *et al.*, 2012; Cantor *et al.*, 2010), and collaboration patterns between authors (Autry and Griffis, 2005).

While visibility within the research community through the number of publications is an important measure of an individual researcher's body of work, there is growing interest in the community for carrying out impactful research. For example, Fawcett *et al.* (2011) argue that "as the corporate and academic worlds recognize the centrality of logistics [...] our opportunity and responsibility to conduct meaningful research increases (emphasis added)". Similarly, Mckinnon (2013) argues that scholars need to look beyond mere counts of articles in high ranking journals and rather focus on the impact that the articles have to the scholarly field of logistics.

Researchers have pointed out that an important measure of research impact is the number of citations that a piece of scholarly work receives (Coleman *et al.*, 2012; Ranatunga and Romano, 1997). This is based on the assumption that authors usually cite an article when they have found it to be useful. Thus, the more frequently an article is cited, the greater the number of people who have found it useful – thus indicating a greater overall impact (Ranatunga and Romano, 1997; Leimu and Koricheva, 2005). In the logistics field, Cantor *et al.* (2010) argue that the number of citations that a research article receives is a good proxy for the economic worth of that article. Some have even argued that the number of times that a person's work is cited by others is a more objective measure of long-term individual productivity than a raw count of publications or even peer-reviews of a scholar's impact on the field (Leimu and Koricheva, 2005). Thus, it is logical to argue that there is substantial interest in the measurement of scholars' research on the academic field through measures of citation.

Despite the value of citation analysis in measuring and assessing a scholar's research contributions, there are some constraints on how it can be applied. One limitation is that the number of citations of a piece of work is affected by the field – papers in some fields tend to generate a larger number of citations as compared to other fields (Ranatunga and Romano, 1997; Peters and van Raan, 1994). For example, Mingers (2008) argues that papers in the social sciences usually receive fewer citations than those in the physical sciences. Similarly, the number of citations of a work depends on the age of the work, since papers that have been in the public domain for a short amount of time have not had as much opportunity to be cited as those that have been in the public domain for a longer amount of time (Coleman *et al.*, 2012; Peritz, 1992).

Based on the preceding arguments, one arrives at two conclusions. First, citation analysis can be a valuable benchmarking tool for assessing scholarly research contribution. Second, in developing a benchmark standard to evaluate that contribution, the nature of the academic discipline and the academic age/seniority of the scholar should be given due consideration (Mingers, 2008, 2009; Peritz, 1992). In light of the preceding arguments, we propose that it is valuable to establish citation benchmarks for logistics scholars. This benchmark should be such that it can be equally applied to scholars of all academic ages. Simply speaking, the questions that we seek to answer in this paper are:

RQ1. Among all the citation-related metrics, which one provides the most appropriate basis for comparing the research impact of logistics scholars of all academic ages[1]?

RQ2. What are the citation-related benchmarks for logistics scholars on this metric?

These questions are important to answer since such measures of impact can directly impact a scholar's standing within the academy. While scholars are generally aware of their standing in terms of the number of publications and how that rates with respect to their peers, they are not usually as clear about their relative impact on the field. Similarly, while it is considered normal to communicate information regarding publication expectations required to achieve a career milestone (e.g. annual reviews, tenure, promotion, etc.), measures of research impact are usually not as readily communicated. We contend that this is at least partially because there are very few benchmarks of research impact that are demonstrated to be accessible and applicable in a uniform manner across scholars of all levels of career stages. Such benchmarks, if available, would provide useful data over and above the count of publications when scholars are considered for tenure and promotion, increments, placements, etc. (Liebowitz and Palmer, 1984).

This paper makes several contributions to the literature. First, it identifies the metric that provides the most succinct basis of assessing the relative research contribution of logistics and SCM scholars by normalizing the differences in academic ages for most researchers. In addition, the paper also identifies the benchmark scores on that metric so that the achievement of such a score would place a logistics scholar at a certain position in our field from an impact-of-research standpoint. Another contribution is that it provides a benchmark index of research impact for the logistics community as a whole. It has been argued that citation-related indices vary from discipline to discipline and need to be measured and benchmarked accordingly (Hirsch, 2005; Mingers, 2009, 2008). This paper measures these indices for the logistics and SCM discipline.

The remainder of this paper is organized as follows. In the next section, we review the relevant literature and discuss how our study differs from prior work in this area. The third section describes the research method, while the fourth presents the data analysis and results. The fifth section discusses the implications of our work, while the sixth discusses limitations and concludes.

Literature review

The mathematical and statistical analysis of scholarly records usually falls in the field of study called bibliometrics, which consists of research methods usually grouped as "citation" or "co-citation" analyses (Pritchard, 1969). Citation analysis is based on the direct counts of references made to or received from other documents, while co-citation analysis exploits paired citations as a measure of association between documents or sets of documents. Citation analysis is frequently used to evaluate or compare papers, journals, academic programs, or institutions (Charvet *et al.*, 2008; Gupta, 1997; Cronin, 1981; Reinsch and Lewis, 1993). What follows is a discussion of some of the relevant studies on citation analysis in the logistics literature.

An early attempt to apply citation analysis in logistics management was carried out by Kumar and Kwon (2004) who used it to study journal quality and relevance. They compared three different citation-based approaches to rank the leading journals in transportation and logistics. Using this approach, the authors concluded that *Journal of Business Logistics*, *International Journal of Physical Distribution & Logistics Management*, and *The International Journal of Logistics Management* were the top three journals. This approach yielded similar results from other non-citation-based analyses of journal quality, with the top three journals being the same in both approaches (Menachof *et al.*, 2009; Gibson *et al.*, 2004), thus affirming the robustness of the technique. Citation analysis has also been used in non-logistics, but SCM-related disciplines. For example, Vokurka (1996) applied citation analysis to investigate the importance of different academic journals used in OM research. A selection of core papers from the journals *Management Science*, *Decision Science*, and the *Journal of Operations Management* over a three-year period was used as a representative sample and the author identified the top 25 citing journals. Based on citations, the author then identified the top five journals of relevance to OM researchers.

While journal evaluation has been one of the most commonly used applications of citation analysis in logistics, this has by no means been the only application of this technique. For example, Charvet *et al.* (2008) used this technique to identify academic thought clusters within the SCM literature. They proposed that the overall supply chain literature field is growing and is led by researchers from logistics and OM. In addition, they noted limited (if any) convergence of thought across the different contributing disciplines to SCM (i.e. marketing and OM). In another study, Cantor *et al.* (2010) utilized citation analysis but treated citations as the dependent variable of interest rather than as the independent variable in an analysis of collaboration among authors. They identified several factors that are indicative of paper citation within the SCM literature. They argued that some of the key factors that explain the citations that papers receive are the number of authors (papers with more authors are usually cited more often than those with fewer authors), international collaboration, and thought leader affiliation.

Table I provides a brief summary of some of the recent studies in the logistics domain that utilize citation analysis to answer key research questions. For a detailed synthesis of such research in the logistics field, the reader may refer to Wolf (2008).

As can be seen from Table I, most studies in our area investigate only a few aspects of the rich information that bibliometrics can provide. Existing applications include measurement of journal ranking/prestige, citation patterns, and the evolution of the discipline. We contend that this is a limited application of the potential of this technique. For example, it has been argued that citations of works can be useful to

Paper	Question
Kumar and Kwon (2004)	Compared three different citation-based approaches to identify the leading logistics journals
Charvet *et al.* (2008)	Analyzed the intellectual structure of the SCM field
Chapman and Ellinger (2009)	Developed impact factors for logistics journals that were yet to receive official impact factors
Ellinger and Chapman (2011)	Compared the relative performance of SCM journals over a two-year period
Cantor *et al.* (2010)	Investigated the relationship between research collaboration and citations
Coleman *et al.* (2012)	Identified the publication, citation, and h-index levels within the key logistics focused journals

Table I. Recent citation-related logistics research provide information not only about journals and theories, but also about authors, given that one key measure of the level of a scholar's accomplishment is the extent to which he or she is able to produce research that is highly cited (Vincent and Ross, 2011; Coleman *et al.*, 2012; Hult and Chabowski, 2008; Chapman and Ellinger, 2009).

Given this understanding and the fact that citations usually increase with time, the issue of what is an "average" or "good" citation rate for scholars (factoring in their academic age) is an important question to answer (Mingers, 2008). Another issue that is of interest is the fact that despite the multitude of citation-related metrics available to scholars these days, there is limited (if any) consensus among logistics scholars on which metric provides the most appropriate basis for comparing age-appropriate research impacts. In addition, it is impossible merely to benchmark logistics scholars to standards in other fields, given that citations vary by academic field (Gupta, 1997; Peritz, 1992). It would then be insightful for logistics scholars to know what their age-appropriate citation metrics mean, as compared to the overall logistics scholarly community.

To the best of our knowledge there are only two studies that attempt to answer either of these questions in the business discipline as a whole (Mingers, 2008; Coleman *et al.*, 2012). The Mingers (2008) study, however, looked at a very small subset of extremely senior scholars in the discipline (fellows of three research societies) and concentrated largely on operations research scholars. As a result, it was not able to focus on scholars of different academic ages, since most fellows of such societies are usually highly senior. In addition, the study was not focused on logistics scholarship *per se*. The other study that comes somewhat close to addressing our questions is a recent work by Coleman *et al.* (2012). In that study, the authors looked at the research publications by various SCM scholars in seven leading logistics journals over a 20-year period and also measured citation metrics (total citations and the Hirsch index (h-index)) of these publications. Based on these metrics, the authors identified various benchmarks that would put scholars at different percentiles based on the citations of their work in these journals. That study, while valuable, has several limitations which we discuss below.

The first limitation in Coleman *et al.* (2012) is that it only considers a researcher's publications in the seven journals identified by the authors. While these journals form a large set and include a large number of authors, these are not the only journals in which logistics scholarship is published. For example, it has been pointed out that the logistics and SCM fields have scholars who originate in other fields such as marketing and OM (Charvet *et al.*, 2008). Based on issues like departmental preferences, training, etc. such logistics scholars may have published their work in journals whose main focus is in other (non-logistics) areas. It could also be possible that some of the most influential works of these scholars (and arguably of the overall logistics field) could have been published in those journals. Yet, such work would have been excluded from the Coleman *et al.* (2012) data, thus putting such scholars lower on that ranking[2]. This is a limitation that Coleman *et al.* (2012) themselves acknowledge in their paper. This shortcoming can best be illustrated by way of an example. Consider three real logistics scholars[3], one each at the assistant, associate, and full professor levels. Their scholarship data are presented in Table II and include data on their total publications and citations.

Table II shows that the Coleman *et al.* (2012) study captures only a subset of the overall scholarship metrics for the researchers in question. In the current example, the percent of overall scholarship captured in that study ranges from 60 to 1 percent, depending on the metric and scholar. It is, however, reasonable to argue that a scholar's research productivity should not be restrictively measured by looking at a limited selected set of journals, but rather should encompass all of that scholar's publications (Holsapple, 2008; Holsapple and O'Leary, 2009). Similarly, a scholar's research impact should not be measured based on the citations of the subset of their work in a limited set of journals, but rather to their entire body of work. Thus, a restriction of the publication universe to seven journals is a key limitation of the Coleman *et al.* (2012).

Another limitation of that study is that it does not control for the academic age of the researchers or identify a metric that would normalize the effect of academic age differences when quantifying citations. This is important given that senior scholars often receive higher citations of their work than less seasoned scholars (Gupta, 1997). In addition, citations of one's work can never decrease with time; therefore more seasoned scholars are likely to outperform early career scholars when scholarly impact is measured through conventional approaches such as a total count of citations, as proposed by Coleman *et al.* (2012). These limitations of the prior research open an avenue of investigation that this paper addresses by answering our two research questions.

Research method

Data collection

Given the objective this study, we had to first choose an appropriate sample of research-active logistics scholars. It was determined that those scholars who published at least one research paper in one of the three journals, *Journal of Business Logistics*, *International Journal of Physical Distribution & Logistics Management*, or *International Journal of Logistics Management*, in the five-year period between 2007 and 2011 would form an appropriate research sample. The choice of journals was made based on the fact that these are generally recognized as being among the top few journals for logistics researchers (Kumar and Kwon, 2004; Gibson *et al.*, 2004). This set of journals has been used previously for scholarly investigation of logistics research (Kovacs and Spens, 2005; Spens and Kovacs, 2006; Halldorsson and Arlbjorn, 2005). In addition, a five-year time window was chosen to be consistent with the standard AACSB five-year review cycle, which expects academically qualified (AQ) faculty to maintain their status on a recurrent five-year basis. Thus, we would expect that a substantial percent of the AQ faculty in AACSB schools would have published at least one paper in one of these journals in the five-year time window. While we acknowledge that this probably will not include all the research-active logistics scholars in all the AACSB schools, we contend that it is a large enough group of scholars from which we can draw generalizable conclusions.

	Actual scholarly record			Scholarly record captured in the Coleman *et al.* study			% of scholarly record captured in the Coleman *et al.* study		
Level	TP	TC	h-index	TP	TC	h-index	TP (%)	TC (%)	h-index (%)
Assistant professor (P1)	7	51	3	1	10	1	14	20	33
Associate professor (P2)	25	839	13	1	6	1	4	1	8
Full professor (P3)	48	1,042	15	16	325	9	33	31	60

Notes: TP – total publications; TC – total citations

Table II. Scholarship data of three selected scholars showing total scholarship and the scholarship captured by Coleman *et al.*

After eliminating editorials and special issue introductions, we found 431 research papers. Given that we were interested in identifying the research impact of individual logistics scholars, we collected the names of the paper's authors in the following format: FirstName (Space) LastName, irrespective of how they were published in the paper itself. We were able to identify that 702 different authors were represented, with an average of 1.42 papers per author. The authorship count ranged from a high of six authors on a paper to a low of one. A first step in our analysis is to ensure the adequacy of our research sample for the purposes of the research question. Two issues that can be problematic with sampling are sample size and sample quality (representativeness). We address both of these concerns below.

Sample size. An appropriate sample size generally depends directly on the size of the "calling population" (Bartlett *et al.*, 2001; Wunsch, 1986). As we have argued, the Coleman *et al.* (2012) study is arguably the most comprehensive listing of recent logistics scholarship currently available. According to that study, the overall population of published logistics scholars over the past 20 years was 1,720. It would thus be fair to assume that this population of 1,720 represents the calling population for this study. Bartlett *et al.* (2001) suggest that for a population size of between 1,500 and 2,000, the sample size needed for a 99 percent confidence level in the results is between 306 and 323 even in the most conservative case. Our sample size of 702 is above this requirement and in fact, would be sufficient even if the size of the calling population were in excess of 10,000 (Bartlett *et al.*, 2001). Similarly, given that the overall number of papers in the Coleman *et al.* (2012) study was 3,312, the sample size requirement in terms of number of papers is between 323 and 351 (Bartlett *et al.*, 2001). Our sample size of 431 research papers is higher than this requirement as well and would be sufficient if the calling population were in excess of 10,000 (Bartlett *et al.*, 2001). Thus, in terms of size, our sample is appropriate for the purposes of this study.

Sample quality. We are confident in our sample quality, given that our set of journals has been used previously for scholarly investigation of logistics research (Kovacs and Spens, 2005; Spens and Kovacs, 2006; Halldorsson and Arlbjorn, 2005). In addition, while this set of journals is smaller than the set that has been used in other studies on scholarship, it is nevertheless representative of the larger logistics scholarship field from a citations standpoint. On comparing the average impact factor (which measures the citations of papers published in particular journals) of the seven-journal set in the Coleman *et al.* (2012) study (avg. $= 1.77$, SD $= 0.69$), we find that it is similar to the average impact factor of the journal set used in our data set (avg. $= 1.41$, SD $= 0.82$) ($t = 0.62, p = 0.54$). Thus, arguably, the citation rate for the average paper in our sample set should be no different than that for the larger Coleman *et al.* (2012) data set, which as we have argued represents the most comprehensive study of logistics scholarship currently available. Therefore, we contend that our sample meets the requirements of being a good sample from the perspective of both size and quality. We now proceed to a discussion of the other aspects of this study.

Given that the aim of our study is to investigate citation-related benchmarks for logistics scholars of different academic ages, we had to measure the citations of their papers and the academic age of the scholars. The two common search engines used by scholars in such cases are the Web of Science (WoS) and Google Scholar (GS) (Harzing and van der Wal, 2009; Bar-Llan, 2008). While the WoS is considered easier to use, a key limitation is that its results are limited to citations in journals that are included in the

WoS database. This excludes some mainstream journals, books, conferences, and dissertations. It can, therefore, underestimate a scholar's publications and citations, especially for business and management scholars, given that several business-related journals are not currently in this database (most of the top logistics journals, too, were only recently listed there). GS also has limitations: it can sometimes include non-peer-reviewed citations such as handbooks, and it too does not include all journals. However, studies have shown that when compared to WoS in terms of ranking of researchers, the results are very similar, with GS giving a wider and more nearly complete coverage (Saad, 2006). Due to these reasons, it was decided to use GS, which was accessed through the "Publish or Perish" (PoP) software (Harzing, 2007) that is specially designed to be used for citation analysis with GS.

We manually searched for each of the 702 different scholars who were represented in our dataset in PoP. By doing so, we collected publication and citation data for every paper published by these scholars in any journal during the course of their careers. Finally, we eliminated any unusual looking papers/dates (e.g. GS sometimes counts a paper multiple times or shows incorrect publication years) through visual inspection. As an additional quality check, several of the data points were collected independently for a second time by another researcher within three days of the original data collection and 100 percent reliability was obtained. This approach is consistent with techniques proposed by others who have used PoP (Mingers, 2008).

Metrics used in the study

Academic age. We define academic age of a scholar as the amount of time (in calendar years) that the scholar's first publication has been in print. That is to say that if a scholar published his/her first paper in 2010, then that paper will have been in the public domain for three calendar years as of 2012 (i.e. 2010, 2011, 2012). This approach is consistent with prior literature that has applied this metric (Bernauer and Gilardi, 2010; Franceschet, 2009).

Total citations and mean citations. van Raan (2003) discusses the citation-related measures that have been used in academic literature on a widespread basis. These are: *P* – number of publications; *C* – number of citations; *CPP* – mean citations per publication; *CPY* – mean citations per year; and % PNC – percent of papers never cited. For the purpose of the current study, the last metric (% PNC) is not relevant and is excluded. In addition, the total citations measure (C) does not control for the academic age of scholars as citations can only go up (or at worst, stay steady) with time. Thus, senior scholars will be naturally expected to outperform junior ones on this metric. Therefore, it is also excluded from further discussion.

van Raan (2003) argues that the CPP has the potential to control for the effect of scholarly academic age variance, because weighing the citations down by the number of publications (which is what the CPP does) will account for the fact that the number of publications increases over time as will citations (provided the scholar is research-active). A similar argument can be made for the CPY as well. These two metrics are therefore further examined in this paper.

Hirsch index. In order to account for some of the limitations of prior scholarly impact metrics, Hirsch (2005) proposed a new metric – the h-index – which is defined as follows:

> [. . .] a scientist has index h if h of his/her N papers have at least h citations each and the other papers (N − h) have no more than h citations each (Hirsch, 2005, p. 16569).

Stated simply, if a scholar's h-index ("h") is four, that means that the scholar has four papers that have received four or more citations, and the other papers authored by the scholar have received four or fewer citations. Hirsch (2005) argues that comparing two scholars of the same scientific age with a similar number of total papers or of total citation count and very different "h" values, the one with the higher "h" is likely to be the more impactful scholar.

An extension of the h-index, the h-rate. While the h-index does overcome some of the limitations of earlier measures, like total or average citations, it nevertheless suffers from certain limitations (van Raan, 2005), the most obvious among them that the h-index, just like citations, can only rise with time (Mingers and Burrell, 2006). This again, puts early career researchers (ECRs) at a relative disadvantage (Burrell, 2007). Dividing the h-index by the academic age of the scholar gives a new metric – the average annual rate of growth of the h-index – also called the h-rate (Mingers, 2009; Burrell, 2007). Mingers (2009) argues that this new metric (h-rate) allows ECRs to compete on a more equitable footing with more senior researchers. This idea is also alluded to by Hirsch (2005), who proposes that in comparing scholars by using the h-index, one must consider their academic ages as well.

Data analysis and results

Mingers (2008) demonstrates that in the management field, cumulative citations of a paper usually follow an S-shaped curve, starting off slow and staying that way till about the fifth year after publication. A stable citation pattern is achieved in the beginning of the sixth publication year, after which the citation pattern remains similarly high for another 20 years. Finally, citations begin to taper off around year 25, when the work becomes obsolete. It can thus be seen that the citation pattern appears to progresses in five-year increments, with the first increment lower than the remaining ones (until the onset of the fifth increment around the 25th year).

In order to measure this effect and to provide comparable benchmarks for scholars of all academic ages, we decided to split the sample into several sub-samples based on academic age. We thus grouped the scholars into six different cohorts, each covering an academic age bracket of five years (i.e. academic age ranges of ≤ 5 years[4], 6-10, 11-15, 16-20, 21-25 and > 25 years). We then analyzed each of the cohorts separately[5].

Our analysis relies on the following assumption – any metric that sufficiently corrects for/normalizes differences in academic age should show no variation across cohorts of different academic ages where we expect to see no variation and should show variation in cases where we expect to see variation. Simply speaking, the metric should be able to be applied across all cohorts that are expected to be similar to each other, in effect providing an appropriate comparison baseline across cohorts. This would indicate that the metric sufficiently "cuts across" all academic age brackets and can be used as a benchmark across different academic age groups in a "one-size-fits-all" format. With this understanding and the findings of Mingers (2008), this would indicate that the metric should show a difference between Cohorts 1 and 2, but there should be little or no difference between the other cohorts (Table III for results).

Cohort 1 (C1)

This was the youngest cohort in our sample, with an average academic age of 3.52 years. Evidently this is too short a time period for scholars to establish an impact.

	C1: ≤ 5 years		C2: > 5 years, ≤ ten years		C3: > 10 years, ≤ 15 years		C4: > 15 years, ≤ 20 years		C5: > 20 years, ≤ 25 years		C6: > 25 years	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Sample size	97		156		146		97		84		122	
Academic age	3.52	1.24	7.68	1.46	12.71	1.44	17.73	1.48	22.60	1.40	33.61	5.68
Total publications	4.18	4.24	13.83	13.54	27.40	21.89	35.43	27.08	46.42	32.22	65.39	57.12
Total citations	13.45	20.32	86.74	112.06	350.07	467.63	672.97	873.33	1,115.65	1,574.07	1,775.75	2,657.54
Mean citations/publication (CPP)	3.71	4.76	7.85	8.26	13.89	19.22	17.93	15.69	23.44	24.27	22.09	22.58
Mean citations/year (CPY)	3.02	3.89	10.76	13.38	26.7	34.3	37.64	47.99	48.96	68.00	51.79	74.49
h-index	1.39	1.18	3.69	2.39	7.05	4.44	10.03	7.15	12.51	8.86	15.33	10.52
h-rate	0.38	0.24	0.49	0.28	0.55	0.33	0.57	0.40	0.55	0.38	0.47	0.31

Table III.
Publication metrics for the cohorts

As Coleman *et al.* (2012, p. 170) argue, "while the authors in this position (early career stage) may be strong researchers, they clearly have not yet established themselves as thought leaders in the field". Similarly, Mingers (2008) argues that in the management field this rise in citations happens around the beginning of the sixth year. We found a similar pattern in our data as well, since this cohort had the lowest score on all the metrics (total citations, CPP, CPY, the h-index, and the h-rate). The mean total citations in this sample were 13.45, with 3.02 CPYs. The average h-index score was 1.39, with the highest being 6.

Cohort 2 (C2)

C2 had an average academic age of 7.71 years. Consistent with the work of prior researchers (Mingers, 2008), we would expect to see an increase in the citation metrics for scholars in this cohort over those in C1. We observed that C2 had a higher h-rate as compared to C1 ($t = 2.62$, $p = 0.008$), as well as a higher CPP ($t = 5.05$, $p = 0.00$) and a higher CPY ($t = 6.78$, $p = 0.00$). Thus, it appears that C2 has higher overall benchmarks as compared to C1, consistent with our a priori expectations.

Cohort 3 (C3)

C3 corresponds to scholars who have an academic age range of between ten and 15 years, with an average of 12.71 years. Consistent with Mingers (2008), for scholars in C3 we would expect limited overall difference (if any) in the age-weighted citation metrics over those in C2, if the metric is sufficiently correcting for differences in academic age. Unpaired *t*-tests reveal that among the three metrics, C3 showed no significant difference as compared to C2 on the h-rate ($M = 0.06$, $t = 1.54$, $p = 0.123$) while the CPP ($t = 3.50$, $p = 0.01$) and CPY were different between these cohorts ($t = 5.24$, $p = 0.00$). It thus appears that the h-rate better controlled for academic age by negating the differences in academic age between these cohorts.

Cohort 4 (C4)

C4 corresponds to scholars who have an academic age range of between 15 and 20 years, with an average of 17.73 years. Consistent with the Mingers (2008) study discussed previously, we would expect to see little, if any, difference between C4 and C3 on the age appropriate citation metrics if the proposed metrics sufficiently corrected for academic age (similar to what we observed between C3 and C2). Results indicate that the h-rate ($t = 0.39$, $p = 0.69$) was statistically similar across these two cohorts while the CPP ($t = 1.79$, $p = 0.07$) and CPY ($t = 1.94$, $p = 0.05$) were statistically different. This again indicates that the h-rate was the more reliable metric for comparing across these two cohorts.

Cohort 5 (C5)

C5 corresponds to scholars who have an academic age range of between 20 and 25 years, with an average of 22.6 years. As we have argued previously, we would expect to see little, if any, difference between C5 and C4 on the age appropriate citation metrics if the proposed metrics sufficiently corrected for academic age. Results indicate that the h-rate is statistically similar between Cohort 5 and Cohort 4 ($t = 0.706$, $p = 0.76$). The CPY is also statistically similar ($t = 1.275$, $p = 0.20$), while the CPP ($t = 1.78$, $p = 0.077$) is higher for C5 than for C4. This indicates that the CPP does not sufficiently correct for differences between academic age between these cohorts, while the h-rate and the CPY do.

Cohort 6 (C6)
C6 corresponds to scholars who have an academic age range of more than 25 years, with an average of 33.61 years. Results indicate that this cohort is similar to C5 on all the three metrics, i.e. h-rate ($t = 1.58$, $p = 0.11$), CPP ($t = 0.404$, $p = 0.68$), and CPY ($t = 0.282$, $p = 0.77$), consistent with our a priori expectations.

Discussion and implications

A comparison of the metrics across the various cohorts revealed some interesting insights. First, as would be expected, the total citations kept increasing as academic age increased (Table III). This is not a surprising finding since citations can in no circumstance decrease over time. And as scholars age, they will usually see an increase in the citations of their body of work. Thus, such a measure of research impact puts ECRs at a considerable disadvantage as compared to more seasoned researchers. Thus, it appears that the raw measure of total citations is not an appropriate measure to compare the impact of scholars of various academic ages. The same can be said of the h-index as well (Hirsch, 2005).

Table IV presents a summary of the results across the different cohorts for the age-weighted citation metrics (CPP, CPY, and h-rate). Note that, as we have argued, the most appropriate metric would be one that consistently shows non-variation across cohorts of different academic ages where we expect to see non-variation and shows variation in cases where we expect to see variation. Based on prior literature, we would expect to see that C1, which composes the youngest group of scholars (academic age ≤ 5 years), would have the lowest impact metric. On the other hand, consistent with prior research in the area (Mingers, 2008), we would also expect to see that once the five-year threshold has been crossed (implying crossover into C2), there should be few or no differences in the age-weighted citation metrics between cohorts. Only the h-rate satisfies all these criteria: among the metrics considered, only the h-rate has a 100 percent strike-rate as far as satisfying prior expectations is concerned. We can thus conclude that the h-rate seems to offer the most appropriate metric to compare the research impact of logistics scholars across academic ages. This answers our first research question.

Our second research question was:

RQ3. What are the citation-related benchmarks for logistics scholars at different levels of research impact?

Table V provides a detailed breakdown of the various h-rates and their associated percentile levels. For comparison, Table V also provides the same percentile levels for the CPP and the CPY, although as we have demonstrated, the h-rate provides the better

		Difference observed?		
	Difference expected	CPP	CPY	h-rate
C2 vs C1	Yes	Yes	Yes	Yes
C3 vs C2	No	Yes	Yes	No
C4 vs C3	No	Yes	Yes	No
C5 vs C4	No	Yes	No	No
C6 vs C5	No	No	No	No

Note: C – cohort

Table IV. A comparison of age weighted citation metrics benchmark compared to these. We contend that Table V provides an easy-to-apply comparison tool for benchmarking the research impact of logistics scholars of various academic ages. In addition, it allows various other stakeholders such as hiring/awards committees to identify the highest-impact scholars.

This study has two key scholarly takeaways. First, we have identified that the h-rate provides the most succinct basis of assessing the relative research contribution of logistics and SCM scholars of different academic ages. In addition, we have identified the benchmark h-rates that place such scholars at certain positions in their field as compared to the field as a whole. We are aware of no such study of age-weighted measures of scholarly contribution within our field. Given the increasing focus on carrying out "impactful research" (Fawcett *et al.*, 2011; Mckinnon, 2013), we contend that the scholarly community will be interested in measures of the relative impact of one's research program as a function of (and independent of) their career length. Our own experience also seems to suggest this. Conversations with academic colleagues seem to indicate that most of them are quite well aware of their highest cited papers and other indices such as their individual h-index, count of publications, etc. Yet, while this information is available to them, a lack of benchmarks and standards seems to inhibit its use for purposes of comparison. For example, what does an h-index of ten (or a citation count of 100) mean for a scholar who has been publishing for ten years? Does it mean the same thing for someone who has been publishing for over 20 years?

Second, scholars have argued that citation-related indices like the h-index, CPP, and CPY will vary from discipline to discipline and need to be measured appropriately (Hirsch, 2005; Mingers, 2009, 2008). Yet, to the best of our knowledge a study of this type had not previously been carried out in the logistics literature. The closest study was the Coleman *et al.* (2012) study, which while valuable had some key limitations, as we have earlier noted. We contend that this study, rather than being seen as an alternative to that work, should be viewed as an extension of it.

Limitations and future research

The conclusions of this study, while valuable, are subject to certain caveats. First, as we have observed, the h-rate is only useful in evaluating logistics scholars who have an academic age of more than five years. Thus, it may have limited applicability for evaluating the research impact of extremely young scholars.

Second, it should be noted that while we have demonstrated that the h-rate is the most appropriate metric to measure the research impact of scholars across most academic ages, it in no way implies that other commonly used measures like total citations, CPY, CPP, or the original h-index itself are of no value. They serve useful purposes as complementary measures of research impact, especially in light of

Table V.
Percentile scores of the metrics

	Percentile									
	10	20	30	40	50	60	70	80	90	100
h-rate	0.167	0.25	0.30	0.375	0.45	0.53	0.63	0.77	1.00	2.05
CPP	2.29	3.66	5.00	6.97	9.88	12.91	17.00	23.00	37.50	145.50
CPY	2.09	3.90	6.30	9.86	13.79	19.54	27.48	42.57	87.75	376.46

the fact that the correlation between these metrics is low (CPP − CPY = 0.73; h-rate − CPY = 0.33; h-rate − CPP = 0.063). It is likely that these other metrics tap into the wider domain of research impact, over and above what is measured by the h-rate. Thus, we are certainly not proposing that our discipline should replace all of these citation metrics with the h-rate for measuring the impact of logistics scholarship. On the contrary, we are proposing to supplement the traditionally used metrics (e.g. total citations) with the h-rate in order to evaluate the scholarly impact of ECRs on a more equitable footing with more senior scholars. There is considerable value to doing this; evidence suggests that the research impact rate is relatively constant over the lifetime of a scholar's career (Burrell, 2007), and thus high-impact young researchers are likely to remain impactful even later in their careers. That being the case, we propose that the h-rate provides one of many possible approaches to identifying future stars in our field.

Another limitation of the current study is that we chose to collect our data through GS. While GS is quite useful in such studies and has often been used in the academic literature (Mingers and Harzing, 2007; Walters, 2007), it has also been shown that it provides a higher citation count than other databases such as WoS or Scopus (Meho and Yang, 2007). This is because GS at times includes citations by non-peer-reviewed work, including handbooks, guides, etc. (Mingers, 2009). While it could be argued that such non-peer-reviewed citations are also measures of a scholar's impact in the field, we acknowledge that there are several scholars who would disagree with our assessment. In addition, given that GS results sometimes include non-peer-reviewed work including earlier versions of peer-reviewed manuscripts from open access sites such as SSRN, this could adversely affect metrics such as the academic age, which we have used in this study. Similarly, sometimes GS returns incorrect publication dates and gives spurious results with authors who have fairly common names (e.g. John, Johnson, etc.). While we have made every attempt to control for this bias by manually combing through the data and using our intuition in several cases (Mingers, 2009; Burrell, 2007), we agree these issues can be construed as limitations of this study.

Moreover, given that we have populated our data set with scholars who published at least one paper in one of the three mainstream logistics journals in the past five years, another limitation of the current study is that there could be several scholars that would not have made our list. For example, the dataset in the Coleman *et al.* (2012) study, which covered seven of the premier logistics journals in a similar time frame, consisted of 1,720 different scholars. In contrast, our data set was only about 40 percent of that size. It is possible that extending our data set to include a larger sample may alter the results somewhat. We contend that we have covered a sufficiently large sample in order to draw generalizable conclusions for our research questions given that our aim was not to carry out a census of logistics scholarly activity in a defined journal set, unlike Coleman *et al.* (2012). Nevertheless, future research could try to replicate our benchmarks with a larger data set.

Finally, there is a school of thought that argues that the impact of one's scholarly work cannot be measured on the basis of citations at all. There are several reasons for this argument, but a predominant one is that several of the citations could be self-citations or negative citations (MacRoberts and MacRoberts, 1989). Self-citations can increase (unfairly, some would argue) the number of overall citations to one's work. Thus, their effect on overall citation counts needs to be carefully considered. Moreover, in case the incidence of self-citations is unduly high, caution needs to be exercised in interpreting the results. This concern is somewhat mitigated in our case, since it has been pointed out that in general, compared to some of the other fields such as life sciences, medicine, and engineering, the incidence of self-citations is not as serious a concern in business and management fields (Wolfgang and Bart, 2004). Nevertheless, we do feel it prudent to add that the issue is not something that we can brush away completely. We urge future research to investigate this issue.

Notes

1. We define academic age of a scholar as the number of years that the scholar has been active in research, measured as a function of the time since the scholar's first research publication. This is explained in more detail later.
2. For example, one of the most heavily cited papers on "green supply chain management", Srivastava (2007), with 465 citations in five years (as of this writing), was published in the *International Journal of Management Reviews*. This paper would have been excluded from Coleman *et al.* (2012) study, thus putting the scholar at a considerable disadvantage relative to many peers. In addition, its exclusion would have depressed the overall citation-related benchmark scores that they propose.
3. Names are left undisclosed.
4. Note that two would be our lowest academic age, since we are collecting the data in 2012 and the last paper that we considered was published in 2011, thus entering its second calendar year (Chronologic age of one year $+ 1 = 2$).
5. Note that the results are similar if arranged in three year-splits instead of five-year splits.

References

Autry, C.W. and Griffis, S.E. (2005), "A social anthropology of logistics research: exploring productivity and collaboration in an emerging science", *Transportation J.*, Vol. 44 No. 4, pp. 27-44.

Bar-Llan, J. (2008), "Which h-index? A comparison of WoS, Scopus and Google Scholar", *Scientometrics*, Vol. 74 No. 2, pp. 257-271.

Bartlett, J.E. II, Kotrlik, J.W. and Higgins, C. (2001), "Organizational research: determining appropriate sample size for survey research", *Information Technology, Learning, and Performance J.*, Vol. 19 No. 1, pp. 43-50.

Bennis, W.G. and O'Toole, J. (2005), "How business schools lost their way", *Harvard Bus. Rev.*, Vol. 83 No. 5, pp. 96-105.

Bernauer, T. and Gilardi, F. (2010), "Publication output of Swiss political science departments", *Swiss Political Science Rev.*, Vol. 16 No. 2, pp. 279-303.

Burrell, Q. (2007), "Hirsch-index or Hirsch rate? Some thoughts arising from Liang's data", *Scientometrics*, Vol. 73 No. 1, pp. 19-28.

Cantor, D., Bolumole, Y., Coleman, B.J. and Frankel, R. (2010), "An examination of trends and impact of authorship collaboration in logistics research", *J. of Business Logistics*, Vol. 31 No. 1, pp. 197-215.

Carter, C.R. and Ellram, L.M. (2003), "Thirty-five years of the *Journal of Supply Chain Management*: where have we been and where are we going?", *J. of Supply Chain Management*, Vol. 39 No. 2, pp. 27-39.

Carter, C.R., Vellenga, D.B., Gentry, J.J. and Allen, B.J. (2005), "Affiliation of authors in transportation and logistics academic journals – a reassessment", *Transportation J.*, Vol. 44 No. 2, pp. 54-64.

Chapman, K. and Ellinger, A. (2009), "Constructing impact factors to measure the influence of supply chain management and logistics journals", *J. of Business Logistics*, Vol. 30 No. 2, pp. 197-212.

Charvet, F., Cooper, M.C. and Gardner, J.T. (2008), "The intellectual structure of supply chain management: a bibliometric approach", *J. of Business Logistics*, Vol. 29 No. 1, pp. 47-73.

Coleman, J., Bolumole, Y. and Frankel, R. (2012), "Benchmarking individual publication productivity in logistics", *Transportation J.*, Vol. 51 No. 2, pp. 164-196.

Cronin, B. (1981), "The need for a theory of citing", *J. of Documentation*, Vol. 37 No. 1, pp. 16-24.

Ellinger, A.E. and Chapman, K. (2011), "Benchmarking leading supply chain management and logistics strategy journals", *International J. of Logistics Management*, Vol. 22 No. 3, pp. 403-419.

Fawcett, S., Waller, M. and Bowersox, D. (2011), "Cinderella in the C-suite: conducting influential research to advance the logistics and supply chain disciplines", *J. of Business Logistics*, Vol. 32 No. 2, pp. 115-121.

Ford, J.B., LaTour, M.S. and Henthorne, T.L. (2001), "Author and institution productivity in *Industrial Marketing Management* from 1971 to 1998", *Industrial Mktg Mgmt*, Vol. 30 No. 5, pp. 441-452.

Franceschet, M. (2009), "A cluster analysis of scholar and journal bibliometric indicators", *J. of the Amer. Soc. for Inf. Sci. and Tech.*, Vol. 60 No. 10, pp. 1950-1964.

Gibson, B.J., Hanna, J.B. and Menachof, D.A. (2004), "Periodical usefulness: an international perspective", *International J. of Logistics: Research and Applications*, Vol. 7 No. 3, pp. 297-311.

Gupta, U. (1997), "Using citation analysis to explore the intellectual base, knowledge dissemination, and research impact of interfaces", *Interfaces*, Vol. 27 No. 2, pp. 85-101.

Halldorsson, A. and Arlbjorn, J.S. (2005), "Research methodologies in supply chain management – what do we know?", in Kotzab, H., Seuring, S., Muller, M. and Reiner, G. (Eds), *Research Methodologies in SCM*, Physica-Verlag, Heidelberg, pp. 107-122.

Harzing, A.W. (2007), "Publish or Perish", available at: www.harzing.com/pop.htm (accessed June 2012).

Harzing, A.W. and van der Wal, R. (2009), "A Google Scholar h-index for journals: an alternative metric to measure journal impact in economics and business", *J. of the Amer. Soc. for Inf. Sci. and Tech.*, Vol. 60 No. 1, pp. 41-46.

Hirsch, J.E. (2005), "An index to quantify an individual's scientific research output", *Proceedings of the Natl Acad. of Sci.*, Vol. 102 No. 46, pp. 16569-16572.

Holsapple, C.W. (2008), "A publication power approach for identifying premier IS journals", *J. of the Amer. Soc. for Inf. Sci. and Tech.*, Vol. 59 No. 2, pp. 166-185.

Holsapple, C.W. and O'Leary, D. (2009), "How much and where? Private vs public universities publication patterns in the information systems discipline", *J. of the Amer. Soc. for Inf. Sci. and Tech.*, Vol. 60 No. 2, pp. 318-331.

Hult, G.T.M. and Chabowski, B.R. (2008), "Sourcing research as an intellectual network of ideas", *Dec. Sci.*, Vol. 39 No. 3, pp. 323-335.

Kovacs, G. and Spens, K.M. (2005), "Abductive reasoning in logistics research", *Intl J. of Physical Distribution and Logistics Mgmt*, Vol. 35 No. 2, pp. 132-144.

Kumar, V. and Kwon, I.W.G. (2004), "A pilot study on normalized weighted approach to citation study: a case of logistics and transportation journals", *Intl J. of Physical Distribution and Logistics Mgmt*, Vol. 34 No. 10, pp. 811-826.

Leimu, R. and Koricheva, J. (2005), "Does scientific collaboration increase the impact of ecological articles?", *BioScience*, Vol. 55 No. 5, pp. 438-443.

Liebowitz, S.J. and Palmer, J.P. (1984), "Assessing the relative impact of economics journals", *J. of Econ. Literature*, Vol. 22 No. 1, pp. 77-84.

Mckinnon, A. (2013), "Starry eyed: *Journal Rankings and the Future of Logistics Research*", *Intl J. of Physical Distribution and Logistics Mgmt*, Vol. 43 No. 1, pp. 1-13.

MacRoberts, M. and MacRoberts, B. (1989), "Problems of citation analysis: a critical review", *J. of the Amer. Soc. for Inf. Sci. and Tech.*, Vol. 40 No. 5, pp. 342-349.

Maloni, M., Carter, C. and Kaufmann, L. (2012), "Author affiliation in supply chain management and logistics journals: 2008-2010", *Intl J. of Physical Distribution and Logistics Mgmt*, Vol. 42 No. 1, pp. 83-101.

Meho, L. and Yang, K. (2007), "Impact of data sources on citation counts and rankings of LIS faculty: Web of Science versus Scopus and Google Scholar", *J. of the Amer. Soc. for Inf. Sci. and Tech.*, Vol. 58 No. 13, pp. 2105-2125.

Menachof, D.A., Gibson, B.J., Hanna, J.B. and Whiteing, A.E. (2009), "An analysis of the value of supply chain management periodicals", *Intl J. of Physical Distribution and Logistics Mgmt*, Vol. 39 No. 2, pp. 145-166.

Mingers, J. (2008), "Exploring the dynamics of journal citations: modelling with S-curves", *J. of the Op. Res. Soc.*, Vol. 59 No. 8, pp. 1013-1025.

Mingers, J. (2009), "Measuring the research contribution of management academics using the Hirsch-index", *J. of the Op. Res. Soc*, Vol. 60 No. 9, pp. 1143-1153.

Mingers, J. and Burrell, Q. (2006), "Modelling citation behavior in management science journals", *Info. Processing and Mgmt*, Vol. 42 No. 6, pp. 1451-1464.

Mingers, J. and Harzing, A.W. (2007), "Ranking journals in *Business and Management*: a statistical analysis of the Harzing dataset", *European J. of Information Systems*, Vol. 16 No. 4, pp. 303-316.

Peritz, B.C. (1992), "On the objectives of citation analysis: problems of theory and method", *J. of the Amer. Soc. for Inf. Sci. and Tech.*, Vol. 43 No. 6, pp. 448-451.

Peters, H.P.F. and van Raan, A.F.J. (1994), "On the determinants of citation scores: a case study in chemical engineering", *J. of the Amer. Soc. for Inf. Sci. and Tech.*, Vol. 45 No. 1, pp. 39-49.

Pritchard, A. (1969), "Statistical bibliography or bibliometrics?", *J. of Documentation*, Vol. 25 No. 1, pp. 348-349.

Ranatunga, J. and Romano, C. (1997), "A citation classics analysis of articles in contemporary small enterprise research", *J. of Business Venturing*, Vol. 12 No. 3, pp. 197-212.

Reinsch, N.L. Jr and Lewis, P.V. (1993), "Author and citation patterns for the *Journal of Business Communication*, 1978-1994", *J. of Business Communication*, Vol. 30 No. 4, pp. 435-462.

Saad, G. (2006), "Exploring the h-index at the author and journal levels using bibliometric data of productive consumer scholars and business-related journals respectively", *Scientometrics*, Vol. 69 No. 1, pp. 117-120.

Spens, K.M. and Kovacs, G. (2006), "A content analysis of research approaches in logistics research", *Intl J. of Physical Distribution and Logistics Mgmt*, Vol. 36 No. 5, pp. 374-390.

Srivastava, S. (2007), "Green supply chain management – a state of the art review", *International J. of Management Reviews*, Vol. 9 No. 1, pp. 53-80.

van Raan, A.J. (2003), "The use of bibliometric analysis in research performance assessment and monitoring of interdisciplinary scientific developments", *Technological Assessment – Theory & Practice*, Vol. 1 No. 12, pp. 20-29.

van Raan, A.J. (2005), "Comparison of the h-index with standard bibliometric indicators and with peer judgement for 147 chemistry research groups", *Scientometrics*, Vol. 67 No. 3, pp. 491-502.

Vincent, A. and Ross, D. (2011), "On the evaluation of faculty research impact of citation analysis", *J. of Applied Bus. Res.*, Vol. 16 No. 2, pp. 1-14.

Vokurka, R.J. (1996), "The relative importance of journals used in operations management research: a citation analysis", *J. of Operations Management*, Vol. 14 No. 4, pp. 345-355.

Walters, W. (2007), "Google Scholar coverage of a multidisciplinary field", *Info. Processing and Mgmt*, Vol. 43 No. 4, pp. 1121-1132.

Wolf, J. (2008), "The nature of SCM research", doctoral dissertation, European Business School, Gabler-Verlag, Wiesbaden.

Wolfgang, G. and Bart, T. (2004), "The influence of author self-citations on bibliometric macro indicators", *Scientometrics*, Vol. 59 No. 3, pp. 281-310.

Wunsch, D. (1986), "Survey research: determining sample size and representative response", *Bus. Education Forum*, Vol. 40 No. 5, pp. 31-34.

Further reading

Carter, C.R., Easton, P.L., Vellenga, D.B. and Allen, B.J. (2009), "Affiliation of authors in transportation and logistics academic journals: a reevaluation", *Transportation J.*, Vol. 48 No. 1, pp. 42-52.

Kuhn, T. (1962), *The Structure of Scientific Revolutions*, University of Chicago Press, Chicago, IL.

Svensson, G., Slatten, T. and Tronvoll, B. (2008), "'Scientific identity' and 'ethnocentricity' in top journals of logistics management", *Intl J. of Physical Distribution and Logistics Mgmt*, Vol. 38 No. 8, pp. 588-600.

Appendix

A scholar's h-rate can be calculated as follows.

Suppose a scholar has published five peer-reviewed papers in his/her lifetime. In addition, suppose the citations and years of publication for those papers are as follows:

- Publication 1 – Published in 2001, cited 20 times.
- Publication 2 – Published in 2002, cited two times.
- Publication 3 – Published in 2004, cited ten times.
- Publication 4 – Published in 2006, cited three times.
- Publication 5 – Published in 2010, cited 0 times.

In this case, the scholar's h-index is 3 (i.e. three papers cited at least three times each).

The h-rate is calculated as:

$$\text{h-rate} = \left\{\frac{\text{h-index}}{\text{Academic Age (i.e. Current Year-Year Just Preceding 1st Publication)}}\right\}$$

Thus, the h-rate is:

$$\text{h-rate} = \left\{\frac{3}{2012\text{-}2000}\right\} = 0.25$$

Corresponding author
Shashank Rao can be contacted at: shashank.rao@auburn.edu

This article has been cited by:

1. ZhangYucheng, Yucheng Zhang, WuYenchun Jim, Yenchun Jim Wu, GohMark, Mark Goh, LiuXinhong, Xinhong Liu. Supply chain management scholar's research impact: moderated mediation analysis. *Library Hi Tech*, ahead of print. [Abstract] [Full Text] [PDF]
2. McKinnonAlan C., Alan C. McKinnon. 2017. Starry-eyed II: the logistics journal ranking debate revisited. *International Journal of Physical Distribution & Logistics Management* **47**:6, 431-446. [Abstract] [Full Text] [PDF]
3. Christopher Rajkumar, Lone Kavin, Xue Luo, Jan Stentoft. 2016. Doctoral dissertations in logistics and supply chain management: a review of Nordic contributions from 2009 to 2014. *Logistics Research* **9**:1. . [Crossref]
4. Drakopoulou DoddSarah, Sarah Drakopoulou Dodd, JonesPaul, Paul Jones, McElweeGerard, Gerard McElwee, HaddoudMohamed, Mohamed Haddoud. 2016. The price of everything, and the value of nothing? Stories of contribution in entrepreneurship research. *Journal of Small Business and Enterprise Development* **23**:4, 918-938. [Abstract] [Full Text] [PDF]
5. Lutz Kaufmann, Julia Gaeckler. 2015. A structured review of partial least squares in supply chain management research. *Journal of Purchasing and Supply Management* **21**:4, 259-272. [Crossref]
6. J. B. Arbaugh, Alvin Hwang. 2015. What Are the 100 Most Cited Articles in Business and Management Education Research, and What Do They Tell Us?. *Organization Management Journal* **12**:3, 154-175. [Crossref]
7. Michael Maloni, Craig Carter, Lutz Kaufmann, Zachary Rogers. 2015. Publication Productivity in the Supply Chain Management Discipline:. *Transportation Journal* **54**:3, 291-311. [Crossref]