Original article

CiteScore metrics are suitable to address different situations – a case study

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Abstract
Background: The "basket of metrics" provides a diverse set of metrics for all entities. It includes novel alongside traditional metrics, and both types remain important. CiteScore metrics, a set of citation-based metrics for journals, have recently been introduced. This case study illustrates the importance of having access to different but related metrics to provide responsible input into different situations.

Methods: A set of six journals, ranked 10th by their CiteScore, was selected. Their free CiteScore metrics values for 2015 were taken from journalmetrics.scopus.com.

Results: The CiteScores of these journals, consistently ranked 10th in their subject fields, differ by almost 4.5 units. Journals with relatively high CiteScores also have high CiteScore Percentiles.

Conclusion: CiteScore should only be used to evaluate the citation impact of titles within the same subject field. CiteScore Percentile is suitable for comparing citation impact of titles in different fields. The basket of metrics supports a valuable and responsible input to decision making. The question being asked needs to be clearly articulated to identify suitable metrics. Using more than one metric to help answer a question prevents penalising diverse types of excellence, and helps to prevent changes in the behaviour that is being measured.

Keywords: CiteScore, CiteScore Percentile, CiteScore metrics, Impact Factor, research metrics, basket of metrics, Scopus, bibliometrics

Introduction

Research metrics, together with qualitative input, give a complete, balanced, multi-dimensional view of performance when they are used with common sense. The "2 Golden Rules" embody this aim; they are a distillation of extensive engagement with a wide variety of stakeholder groups all over the world: authors, editors, bibliometricians, research office managers, funders, and librarians to name just a few. The first Golden Rule is always use both qualitative and quantitative input into your decisions. The second Golden Rule is always use more than one research metric as the quantitative input[1].

The second Golden Rule is best addressed by a diverse set of metrics that provides insight into different types of excellence. For a journal, these types of excellence can be measured by metrics that cover the size and diversity of the community that contributes to its content; the number and types of contributions; the consumption of its content by citation, usage and sector; the academic authority and reputation of the journal; and its impact outside the academic world[2]. These diverse metrics should be available not only for the journal, but also for individual articles and the researchers — authors, readers, reviewers, and editors — associated with it. This concept of multiple metrics available for multiple entities is called the "basket of metrics"[2]. The range and multiplicity of the basket of metrics helps to guard against undesired, unintended consequences that may arise when using any single research metric.

An example of an undesired consequence of using any one metric is that this fails to recognise the diversity of ways in which a journal can contribute to the research community; journal excellence is multi-faceted and cannot be captured by any one metric. What one editor considers excellent, such as a global distribution of contributors, may not represent what excellence means to another editor, who may focus on securing articles and readers from the corporate as well as academic sector for an applied title[2]. The San Francisco Declaration on Research Assessment, or DORA statement[3], is one example of concern that is expressed about an unduly strong focus on one metric, in this example the Impact Factor, as the only parameter for measuring performance; in addition to being used in ways it was never designed for, such as helping to evaluate articles rather than journals, this focus encourages the publisher, editor and/or author to focus primarily on citations, at the expense of other types of desired behaviour such as being read, collaborating, or being talked about in social or mass media.

A second undesired consequence of using a single metric is that it is likely to change the behaviour that is being measured: researchers changed their practice in response to the principal evaluation criterion applied in UK Research Assessment Exercise (RAE), showing that researchers increased their article production for the 1992 RAE that requested total publication counts, and focused on publishing in journals with a relatively high citation impact for the 1996 RAE that focused more on "quality" than "quantity"[4].

The research community is increasingly interested in new types of metrics, such as alternative metrics, usage metrics, and research data metrics, and expects these metrics to be available at multiple levels such as articles, researchers and institutions. This interest is driving investments in new metrics by Elsevier amongst others. However, our user research shows that these newer trends exist alongside an ongoing expectation and demand for traditional metrics that reflect the citation impact of publication outlets, namely citation-based metrics for journals.

Scopus, Elsevier's abstract and citation database of peer-reviewed literature, which at the date of preparing this paper actively indexes 22,748 serial titles[5], has offered two citation-based journal metrics since 2010. Source-

Normalised Impact per Paper (SNIP) and Scimago Journal Rank (SJR) are based on rather complex algorithms that inherently account for the different practices of academics in different fields, by calculating a value that shows citation impact of a title relative to the average citation impact of the set of titles that refer to the title in question[6,7,8]. A SNIP or SJR of 1.000 means average citation impact for that title's field. Each metric uses a different method of accounting for field differences, and can be used to directly compare titles even if they are in different subject fields. SNIP[6,7] indicates the citation impact of a title relative to the average in its subject field, and SJR[8] indicates the prestige of a title based on the citation status of the titles that cite it.

There is a need for simple metrics alongside complex metrics[2]. Simple metrics provide transparency onto the data underlying the metrics, while complex metrics help users to take into account variables such as different behaviours between subject fields that affect metric values and can cloud differences in performance. Scopus did not offer any simple citation-based journal metrics to complement SNIP and SJR, and CiteScore metrics were developed to address this need.

CiteScore citation-based metrics, a set of simple metrics for journals, conference proceedings and book series, have recently been introduced to the basket of metrics that is available from Scopus. CiteScore does not inherently account for the different practices of academics in different fields, unlike SNIP and SJR, but is complemented by a set of related metrics that, used together, provide a deeper insight into and understanding of the serial titles being investigated.

In this paper, we illustrate the value of CiteScore metrics as a coherent, cohesive set that can be used to investigate the citation impact of serial titles in different situations.

Methods

Metrics

All metric values discussed are free, and are taken from journalmetrics.scopus.com.

CiteScore is calculated by counting the citations received by a Scopus-indexed serial title in a given year by any document published in the three previous years and dividing this by the count of documents published in those previous three years[9]. Citations to and from all document types are included. The only exception is that citations from and to articles-in-press are not included, since articles-in-press in Scopus do not include cited references and are not indexed consistently for all publishers.

CiteScore Percentile divides each subject field into 100 equal-sized percentiles based on the number of titles, and assigns a serial to a percentile based on its CiteScore[9]. CiteScore Percentile of serial S is calculated by taking all serial titles with CiteScores in serial S's subject field, and ordering them by their CiteScore from high to low.

CiteScore Percentile of

$$S = [(L + (0.5 \times S)) / N] \times 100$$

where L = number of serial titles in subject field with a CiteScore lower than X; S = number of serial titles in the subject field with the same CiteScore value as S; N = total number of serial titles in the subject field with any CiteScore.

"% Cited" is the percentage of content that has contributed at least one citation to CiteScore[9], and indicates the consistency with which recent content is cited.

Sample of journals

A set of six journals published by four publishers was selected that share the characteristic of being ranked 10th in their Scopus subject field by CiteScore 2015 (Table 1). These six subject fields were chosen as having distinct characteristics, so as to clearly illustrate the importance of appropriately using the set of CiteScore metrics to help to address different questions.

Results

The CiteScore 2015 values are shown in Table 2. The range of *CiteScores* in this consistent small sample set varies by almost 4.5 units, from 1.42 to 5.82. CiteScore Percentile 2015 is also presented in Table 2; the CiteScore Percentile of *Human Nature* is 96% (it is ranked according to CiteScore as high or higher than 96% of titles in Anthropology).

CiteScore Percentiles differ from 79% (*Journal of Statistical Physics*) to 96% (*Human Nature*). CiteScore Percentile for *Macromolecules* is 96% (based on 160 titles in Organic Chemistry), and for *Journal of World Business* is 93% (based on 147 titles in Marketing).

SNIP ranks *Journal of World Business* highest in terms of contextual citation impact of this set of titles, and SJR ranks *Astrophysical Journal* as the most prestigious (Table 2).

Astrophysical Journal, as well as being ranked high according to CiteScore, is also a title with a very strong presence in Space and Planetary Science, with almost 9,000 documents indexed in Scopus over the period 2012-2014, that have together been cited over 42,000 times in 2015 (Table 3). Around 7,470 of the almost 9,000 documents (% Cited = 84%) have been cited at least once in 2015.

Table 1: Journals selected for the case study

Journal (ranked 10th in the subject field)	**Scopus subject field**	**Publisher**
Macromolecules	Organic Chemistry	ACS Publications
Clinical Microbiology and Infection	Infectious Diseases	Elsevier
Astrophysical Journal	Space and Planetary Science	IOP Publishing Ltd
Journal of World Business	Marketing	Elsevier
Human Nature	Anthropology	Springer Nature
Journal of Statistical Physics	Mathematical Physics	Springer Nature

Table 2: CiteScore 2015 and CiteScore Percentile 2015 for six journals in different fields

Journal	CiteScore 2015	CiteScore Percentile 2015 (in subject field in which ranked 10th)	Number of titles (in Scopus subject field in which ranked 10th)	SNIP 2015	SJR 2015	Scopus subject field (in which ranked 10th)
Macromolecules	5.82	94%	160	1.603	2.497	Organic Chemistry
Clinical Microbiology and Infection	5.11	96%	246	1.851	2.530	Infectious Diseases
Astrophysical Journal	4.80	87%	77	1.210	3.266	Space and Planetary Science
Journal of World Business	3.99	93%	147	1.899	1.656	Marketing
Human Nature	2.62	96%	273	0.934	1.459	Anthropology
Journal of Statistical Physics	1.42	79%	46	1.229	1.065	Mathematical Physics

Discussion

CiteScore can be used effectively to evaluate the citation impact of titles within the same subject field: it is correct to say, for example, that *Macromolecules* has a higher citation impact than *Organic Chemistry Frontiers* (ranked 18th, with CiteScore 2015 of 4.51) and a lower citation impact than *Progress in Polymer Science* (ranked 1st, with CiteScore 2015 of 28.32), which are all in the Organic Chemistry subject field of Scopus. It is not necessarily true, although it may be, to say that *Macromolecules* has a higher citation impact than *Journal of World Business*, even though their 2015 CiteScores are quite different (5.82 and 3.99 respectively), because these titles are indexed in different subject fields. These statements are true for all citations-per-document-type metrics such as CiteScore.

This variation in CiteScore 2015 values for journals ranked 10th in different subject fields does not necessarily reflect a difference in their citation impact, although it may; it is more likely a consequence of the different approaches to research, and communicating about research, of academics in different subject fields. It is well-known that researchers working in Organic Chemistry and Infectious Diseases, for instance, tend to publish more frequently with more co-authors, and include longer reference lists, than researchers in Anthropology and Mathematical Physics[10]. This means that CiteScore values tend to be higher in some areas than they are in others; this trend is illustrated more generally in Figure 1. This consequence of different behaviours between fields may often be used to advantage when promoting a title that happens to enjoy a relatively high CiteScore, but it is very important to take it into account when performing an evaluation.

Knowing that the different behaviours between subject fields can also have an effect on the value of CiteScore, in addition to the titles' actual citation impact, how then can CiteScore metrics be used to judge the relative citation impact of titles in different fields? This question can be answered by looking at journal ranks: *Macromolecules* is ranked 10th out of 160 titles, *Clinical Microbiology and Infection* 10th out of 246 titles, *Astrophysical Journal* 10th out of 77 titles, and so on (Table 2). However, this tends to cause a user to try to mentally calculate how comparable being ranked 10th out of different numbers of titles is, and is not a convenient way of communicating relative position. This is the role of CiteScore Percentile, which is the most appropriate of the CiteScore metrics to help to understand the differing citation impact of titles in different fields. CiteScore Percentile expresses the rank of a title within a subject field, and also corrects for the different sizes of subject fields.

Table 3: CiteScore 2015 and related metrics for selected titles

Journal	CiteScore 2015	Citations 2015 (to documents published 2012-2014)	Documents (2012-2014)	% Cited
Macromolecules	5.82	18,076	3,107	93%
Clinical Microbiology and Infection	5.11	5,236	1,025	86%
Astrophysical Journal	4.80	42,679	8,889	84%
Journal of World Business	3.99	722	181	86%
Human Nature	2.62	223	85	73%
Journal of Statistical Physics	1.42	1,065	748	56%

CiteScore Percentile is, however, an imperfect metric, as are all metrics. Table 2 shows that even though all of these titles are ranked at 10th position in their subject fields, their CiteScore Percentiles differ 17% (from 79% to 96%). This is a result of the different number of titles in the subject field that is used in the Percentile calculation; being 10th out of 46 titles (*Journal of Statistical Physics*) gives a lower CiteScore Percentile value than being 10th out of 273 titles (*Human Nature*). It can be argued that being ranked 10th out of more titles is properly reflected with a CiteScore Percentile that is higher than being ranked 10th out of relatively few titles, but the user should form their own opinion about this. Regardless, CiteScore Percentile, when used responsibly and especially in combination with the rank out of metric, provides a more reliable way of comparing citation impact of titles in different subject fields than does CiteScore itself.

The count of citations and documents that contribute to a particular CiteScore are an indication of a title's raw impact in its subject field. These metrics indicate that *Astrophysical Journal* is a large and present title in Space and Planetary Science, and that its high CiteScore and position in its field is supported by the selection of consistently citable documents by the editorial board. Note though that the volume of content published and the rate of citations also vary by subject field, just as is the case for the count of citations, and so these metrics should be assessed in the context of other titles in the same subject fields; % Cited, for example, varies from 50% to 75% for the top 10 titles in Mathematical Physics, although these rates of citation might be considered low in a different field such as Organic Chemistry.

CiteScore metrics also encompass metrics that are straightforward counts of activity. The count of citations and documents that contribute to a particular CiteScore[9] are an indication of a title's raw impact in its subject field, by indicating in a simple way how much attention of academics it receives, measured by citations, and commands, measured by documents.

The question, "Which is the best metric to measure serial titles?" is often posed. We hope that the examples discussed in this case study show that this question is not useful, since the "best metric" depends on the particular question being asked. A more useful question is, "Which is the best metric to help me answer the question XXX?". It is only when there is clarity on the question, and "XXX" is clearly articulated, that the "best metric" can be identified. Therefore we propose a guide for choosing the most suitable CiteScore metric in Table 4.

Table 4: Summary of different CiteScore metrics that provide complementary views on the performance of journals, conference proceedings, and book series

CiteScore metric	Metric measures…	Suitable situations in which to use this metric	Situations in which this metric should not be used
CiteScore	Citations per document	- Investigating the relative citation impact of titles within the same subject field - Showcase performance of titles with high CiteScores (likely in subject fields that tend to be highly cited)	- Investigating the relative citation impact of titles in different subject fields
CiteScore Percentile	Relative position within subject field based on CiteScore	- Investigating the relative citation impact of titles within the same subject field - Investigating the relative citation impact of titles in different subject fields	- Investigating the relative citation impact of titles in different subject fields composed of very different numbers of serials
CiteScore rank out of	Position of serial title out of the total titles indexed in the subject field	- Investigating the relative citation impact of titles within the same subject field - Helping to interpret the meaning of CiteScore Percentile	- Comparing the relative position of titles in subject fields with different numbers of titles
Document Count	Raw scale of a serial title within the research community	- Questions relating to a strong presence in a serial's subject field	- Questions relating to citation impact
Citation Count	Raw citation impact of a serial title on the research community	- Questions relating to a strong raw citation impact in a serial's subject field	- Questions relating to relative citation impact, where size is important
% Cited	Proportion of a serial's documents that have contributed citation(s) to the CiteScore	- Investigating the reliability with which a typical document in this serial cited at least once	- Questions relating to the total number of citations received

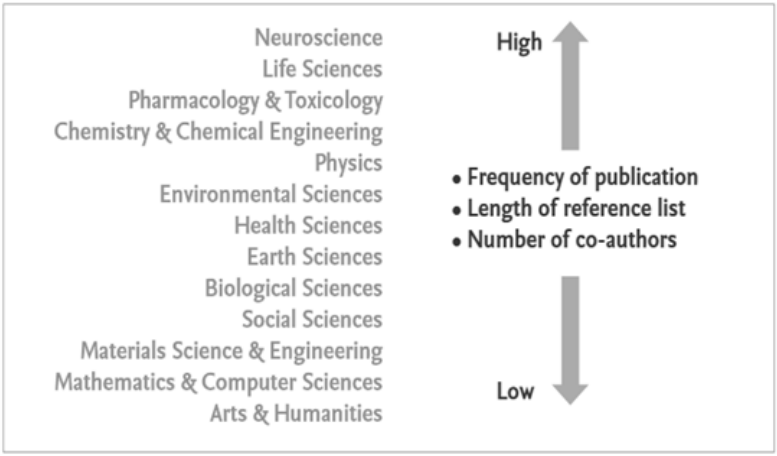

Figure 1: The characteristic behaviour of academics differs between disciplines[11]

We strongly advise against employing any one metric, even a single metric very well suited to the question being asked, in helping to answer a question, for reasons described in the introduction. The proper question to ask is, "Which are the best metrics to help me answer the question XXX?". The ideal situation is that a citation-based metric will be used together with one or more different types of metrics, such as a usage metric, and/or a metric about the effectiveness of peer review, and/or a metric about the ability of a journal to attract strong authors. The addition of CiteScore metrics to the basket of metrics improves the range of different sorts of metrics that can be supported and used by the research community.

The basket of metrics is the most responsible manner of providing metrics that can help to answer the questions of the research community. When selected appropriately, metrics are a valuable and responsible input to decision making.

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