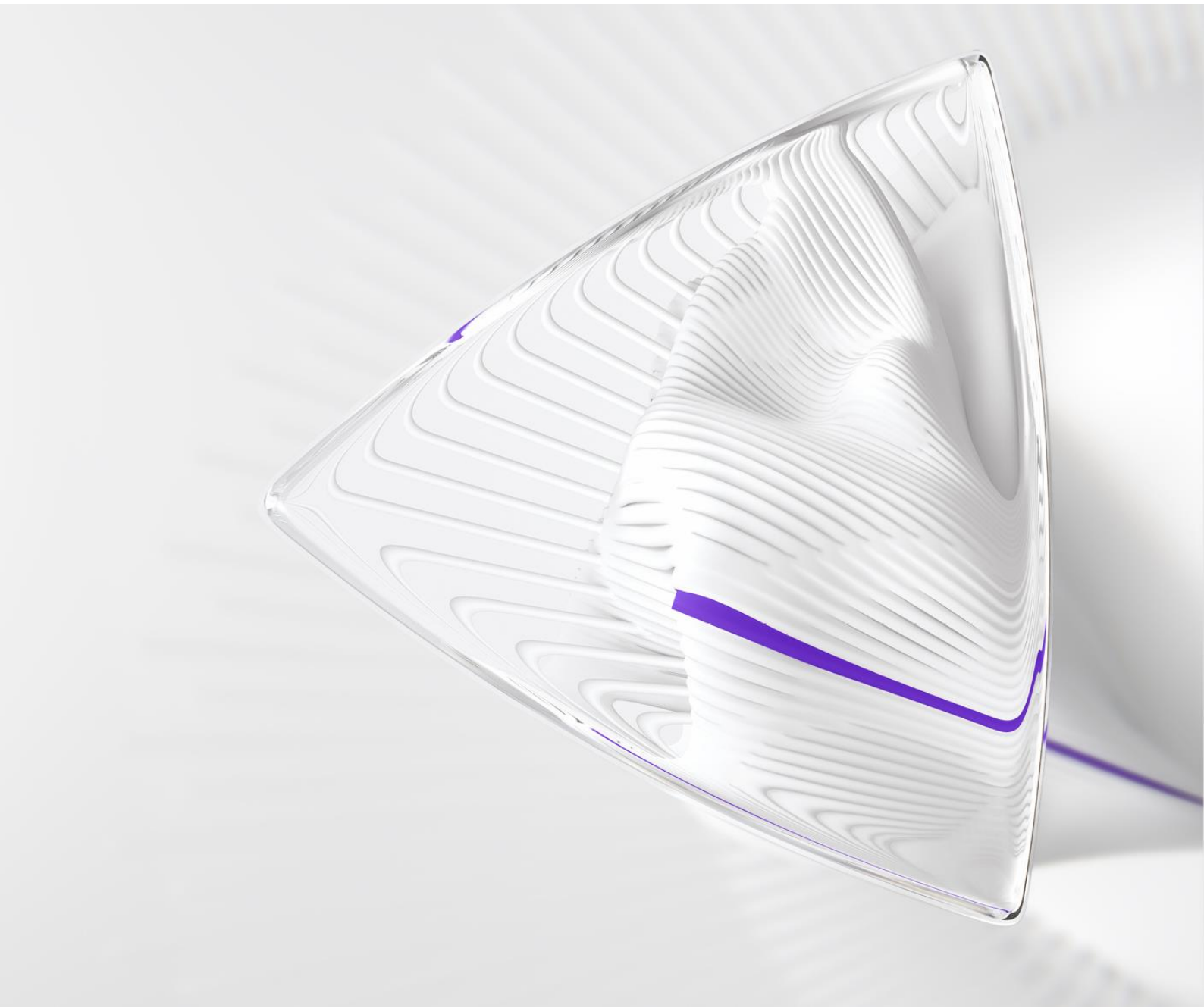
Clarivate™

Introducing the Journal Citation Indicator

A new approach to measure the citation impact of journals in the Web of Science Core Collection



The Journal Citation Indicator is a new way to measure the citation impact of a journal's recent publications using a field-normalized calculation. This new approach provides a single value that is easy to interpret and compare, complementing current journal metrics and further supporting responsible use. Starting from the 2021 JCR release, it will be calculated for all journals in the Web of Science Core Collection™.

Background

Since the publication of the first Journal Citation Reports (JCR)™ in 1976, the Journal Impact Factor (JIF)™ has become a standard way to measure the citation impact of a journal. The JCR was created to describe and define the network of journals as an aggregate of the article citation network in the Science Citation Index™. It was intended to provide an objective measure regarding scholarly use of journals to support both libraries and authors in publication evaluation. The utility of the JIF to these simple purposes evolved to other areas of research assessment, helping authors choose where to publish papers and enabling publishers and editors to monitor the success of their portfolios. Due to the rigorous and independent selectivity process used, inclusion in the JCR has also become a hallmark for editorial quality and research integrity, helping the research community identify trusted sources of scholarly content.

The JIF is simple and easy to calculate – all you need to know is the number of scholarly works that a journal published in the last two years (also referred to as citable items) and how many citations they received from papers published in the JCR data year. Various factors influence how many citations could be accumulated including the typical number of references made in a paper, the age of papers referenced, the total number of papers published and even the meaning of a citation itself. Due to these differences, comparisons for the JIF should be made in category or between adjacent fields.

In the last 20 years, the bibliometric community has devoted much attention to these issues of interpretation and comparison, devising more sophisticated ways to measure citation impact than by counting the number of citations. Among these, normalization has become the de facto standard – rather than using a citation count as a measure of impact, the citations received by a paper are compared against a cohort of similar papers and expressed as a ratio or percentile. Three main factors have been identified that help us determine the relevant cohort:

- **Field or discipline** – compare papers only to others in an area with similar publication volume, cited reference counts and cited reference ages
- **Publication type** – certain publication types, such as review papers, can attract more citations than others so they should be compared separately
- **Year of publication** – older papers will have had more time to accumulate citations and cannot be compared to more recent papers

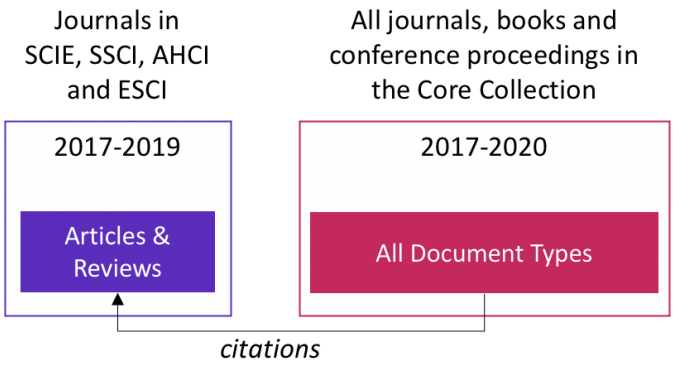
Hence, it is now commonplace to see measures of citation impact expressed as a percentile (as utilized in the Web of Science™ Author Impact Beamplots) or ratio. Both of these are included in our analytics product InCites™ and are used in a variety of research evaluation settings to measure citation impact of papers, individuals, institutions, funders and regions.

Therefore, the natural evolution for a journal citation impact metric is towards a normalized indicator – one that accounts for variation and provides a number that can be more easily interpreted and compared across disciplines.

Journal Citation Indicator

The Journal Citation Indicator is a new field-normalized metric that will be calculated for all journals in the Web of Science Core Collection and will be published in the JCR. The value represents the average category-normalized citation impact for papers published in the prior three-year period. For example, the 2020 Journal Citation Indicator will be calculated for journals that published citable items (i.e. research papers classified as articles or reviews in the Web of Science) in 2017, 2018 and 2019, counting all citations they received from any document indexed between 2017 and 2020, as shown in Figure 1.

Figure 1
Journal Citation Indicator time period



The value of the Journal Citation Indicator is the mean Category Normalized Citation Impact (CNCI) for all articles and reviews published in the most recent three years (e.g. between 2017 and 2019 for the 2020 indicator value). CNCI (see here for full description) is an article-level metric that uses three important facets for normalization, namely field (category), document type (article, review, etc.) and year of publication. CNCI represents the relative citation impact of a particular paper as the ratio of citations compared to a global baseline. A CNCI of 1.0 represents world average – values higher than 1.0 correspond to more than average citation impact (e.g. 2.0 being twice the average), and values lower than 1.0 define less than average citation impact (e.g. 0.5 being half the average).

The Journal Citation Indicator is calculated on the same snapshot of Web of Science data that is used for the preparation of the other metrics in the JCR, with some expansion to accommodate the additional years of citations used. As with other JCR metrics, these data are finalized at the time of JCR extraction so that a stable metric can be provided, even while the article citation performance may continue to change in the Web of Science and InCites. During the design of the Journal Citation Indicator, a number of important decisions were made regarding the makeup of data and parameters for normalization, as discussed below:

- **Time period of citable items -** Naturally, we want the indicator to be as up-to-date as possible, but recognize that recent publications have yet to reach their full citation potential. The three prior year window was chosen to balance recency (i.e. to reflect changes in citation impact in a timely way) and accuracy (in terms of the full citation count that is ultimately accumulated). It is important to note that recent articles are not unduly penalized for having a lower citation count because they are normalized only to other recent publications in the same field which also have lower citation counts.
- **Citation window** – We count citations from any Web of Science Core Collection document published in the past three years and the current year. This differs to the current JIF calculation which counts citations from the current year. This is consistent with how the CNCI metric is calculated in other Clarivate products and gives full citation entitlement to any papers measured.
- **Citing document sources –** As with the JIF, we count citations from any source in the Web of Science Core Collection, including the Emerging Sources Citation Index (ESCI)™, books and conference proceedings.
- **Category schema** –CNCI can be calculated using any categorical scheme and InCites includes many different options. We elected to use the Web of Science journal categories for field normalization as they are an accepted standard within the bibliometrics community. It also means the Journal Citation Indicator is aligned with how percentile metrics are calculated in Author Impact Beamplots and in other research assessment settings.
- **Journals in multiple categories –** Over 30% of the journals indexed in the Web of Science are assigned to more than one category. With the JIF, these categories are vital to understanding the relative standing of a journal as they enable a user to compare the JIF against similar publications. When calculating the CNCI value for any paper that is assigned multiple categories, the mean normalized citation impact across all categories assigned is used, as described here.
- **Document type schema –** Another important facet in the normalization process is document type – it dictates how different scholarly outputs are compared and is used

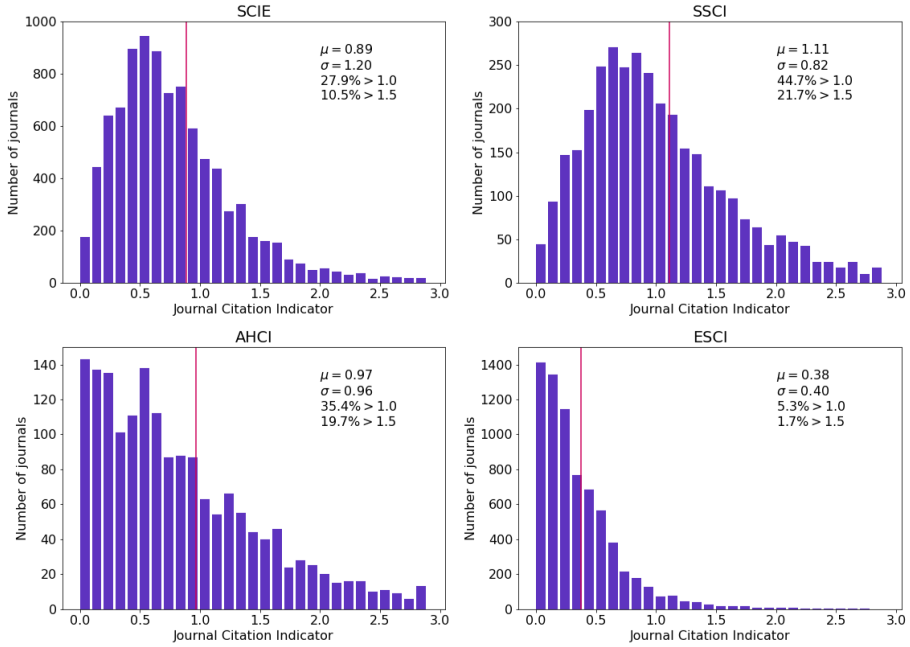
to identify citable items. For this, we use the Web of Science document types. Only citations to articles or reviews – the "citable items" used for the JIF denominator – are used in the calculation of the Journal Citation Indicator. While non-scholarly materials may be cited, they have a very different communications role in journals, and are not part of the scholarly contribution to the field.

- **Multidisciplinary journals –** Since the Journal Citation Indicator is calculated using an article-level metric, items published in multidisciplinary journals can be benchmarked more accurately. Any papers indexed in multidisciplinary journals are assigned a specific Web of Science category if their cited reference list clearly identifies the domain of the paper (i.e. the most frequently cited category). Papers that do not receive a specific category assignment remain in the multidisciplinary category and are compared to each other.
- **Early access content –** The Journal Citation Indicator will follow the same plan as the JIF in terms of transition to inclusion of early access content, as described here.
- **Fractional counting –** There is much debate in the bibliometrics community on how to properly portion citation credit given many papers now have multiple authors and a growing number rely on contributions from teams with hundreds or thousands of researchers. Many different schemes have been defined that utilize author position and the total number of authors to divide credit, but none have yet gained consensus as best practice. Given the level of aggregation in the Journal Citation Indicator (i.e. a journal's portfolio of all articles and reviews), it is not required to consider fractional counting.

Interpretation

The Journal Citation Indicator provides a field-normalized measure of citation impact where a value of 1.0 means that, across the journal, published papers received a number of citations equal to the average citation count in that category. However, because citation counts are skewed (i.e. most papers receive a small number of citations, and few gain more than average), most journals will not have an average impact above 1.0. To illustrate this, Figure 2 contains histograms showing the number of journals (y-axis) across a range of different Journal Citation Indicator values (x-axis) for the four main journal collections in the Web of Science Core Collection: Science Citation Index Expanded (SCIE)™ (top left), Social Sciences Citation Index (SSCI)™ (top right), Arts & Humanities Citation Index (AHCI)™ (bottom left) and the Emerging Sources Citation Index (ESCI) (bottom right). In each plot, the mean value (μ), standard deviation (σ) and percentage of journals with a Journal Citation Indicator above 1.0 and 1.5 are given. The red line also highlights the mean value.

Figure 2
Distribution of Journal Citation Indicator values in different Web of Science collections



From these data, it is clear that journals in ESCI have lower values of the Journal Citation Indicator. This is an expected outcome since those journals don't meet the four evaluation criteria for impact that would enable them to be included in the flagship collections (as described here). While their coverage enriches the subject and citation environment of the Web of Science for research evaluation, the journals themselves tend to have lower citation impact. We also see that there are more journals in AHCI with a Journal Citation Indicator less than 0.5 compared to SCIE and SSCI. In the arts and humanities, references to journals are a smaller part of the diverse materials that are cited in these fields. The lower values do not imply the journals have less impact in their area, but that they are connected to a broader set of primary and scholarly works that may not be indexed in the Web of Science.

The normalization steps make it more reasonable to compare journals across disciplines, but careful judgement is still required. Adjacent fields (e.g. those in the physical sciences) can be more readily compared since the bibliometric characteristics of scholarly publication are similar, and the value of a citation is more comparable. However, in the arts and humanities, citations provide a weaker signal of academic impact, and other qualitative measures should also be considered. Comparing journals in the arts and humanities to those in the sciences or social sciences based solely on their Journal Citation Indicator would be ill advised.

The composition of article types in any journal should also be considered, since only citations to articles and reviews (the "citable items") are used in the calculation of Journal Citation Indicator. For some journals (especially in AHCI), these document types are not the primary output type. In some cases, the Journal Citation Indicator will only reflect citation impact for a small fraction of the published items.

As with any bibliometric indicator, sample size is important. The larger the volume of papers that has been measured, the more stable the indicator value will be. Smaller journals (e.g. those with <250 citable items in the survey period) will be more susceptible to variation in the Journal Citation Indicator since a single article with an exceptionally high citation count will influence the indicator value more.

When compared to the Journal Impact Factor, most indicator values that are based on citations will be correlated – both the Journal Citation Indicator and the JIF are most affected by citations to citable items. However, differences between Journal Citation Indicator and JIF will occur for the following reasons:

- The time period of articles and reviews is slightly different, with the Journal Citation Indicator considering an additional year of content.
- The JIF calculation is based on citations made in the current year, whereas the Journal Citation Indicator sums citations across the whole time period following publication, up to the end of the current year.
- The JIF calculation includes unlinked citations – those that could only be attributed to a journal, but not linked to a specific item. Since CNCI is an article-level metric, unlinked citations are not counted in the Journal Citation Indicator.
- The JIF calculation counts all citations made to any item published in the journal (the numerator) and is not limited to only the citable items. The Journal Citation Indicator only counts citations made to the citable items – any citations to non-citable items (e.g. letters, news, editorials) are ignored.

For reference, Table 1 summarizes how the Journal Citation Indicator compares to the JIF.

Table 1
Comparison of Journal Citation Indicator to Journal Impact Factor

Feature	Journal Impact Factor	Journal Citation Indicator
All Web of Science Core Collection journals	N	Y
Field-normalized citation metric	N	Y
Fixed dataset	Y	Y
Counts citations from the entire Core Collection	Y	Y
Counts citations from the current year only	Y	N
Includes Early Access (EA) content from 2020 onward	Y	Y
Includes unlinked citations	Y	N
Fractional counting	N	N

Conclusions and future work

The Journal Citation Indicator will bring citation impact metrics to the full range of journals indexed in the Web of Science Core Collection, increasing the utility of the JCR as it expands its coverage to more than 21,000 scholarly publications. Providing this information for around 7,000 journals in the ESCI will increase exposure to journals from all disciplines, ranging from international and broad scope publications to those that provide deeper regional or specialty area coverage. This will enable users to understand how they compare to more established sources of scholarly content. By incorporating field normalization into the calculation, the Journal Citation Indicator will also allow users to compare citation impact between disciplines more easily and fairly. It is designed to complement the JIF and other metrics currently used in the research community, and when used responsibly will support more nuanced research assessment.

In the future, the JCR will continue to incorporate new features that provide insight into the nature of scholarly communication, especially those that reflect change in the research ecosystem, such as information on Open Access uptake that was added in 2020. More global research, increasing international collaboration and growing interest in domestic and regional outputs are all areas where a richer suite of analytics will provide further utility.

About Clarivate

Clarivate™ is a global leader in providing solutions to accelerate the lifecycle of innovation. Our bold mission is to help customers solve some of the world's most complex problems by providing actionable information and insights that reduce the time from new ideas to life-changing inventions in the areas of science and intellectual property. We help customers discover, protect and commercialize their inventions using our trusted subscription and technology-based solutions coupled with deep domain expertise. For more information, please visit clarivate.com.

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