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# EDITORRESOURCES

Supporting Taylor & Francis journal editors

# Understanding research metrics



## INTRODUCTION

Discover how to monitor your journal's performance through a range of research metrics. This page will take you through the "basket of metrics", from Impact Factor to usage, and help you identify the right research metrics for your journal.

# Contents

# What are research metrics?

Research metrics are the fundamental tools used across the publishing industry to measure performance, both at journal- and author-level.

For a long time, the only tool for assessing journal performance was the Impact Factor – more on that in a moment. Now there are a range of different research metrics available. This “basket of metrics” is growing every day, from the traditional Impact Factor to Altmetrics, *h*-index, and beyond.

But what do they all mean? How is each metric calculated? Which research metrics are the most relevant to your journal? And how can you use these tools to monitor your journal’s performance?

For a quick overview, [download our simple guide to research metrics](#). Or keep reading for a more in-depth look at what’s in the “basket of metrics” and how to interpret it.

# Citation-based metrics

## IMPACT FACTOR

### What is the Impact Factor?

The Impact Factor is probably the most well-known metric for assessing journal performance. Designed to help librarians with collection management in the 1960s, it has since become a common proxy for journal quality.

The Impact Factor is a simple research metric: it's the average number of citations received by articles in a journal within a two-year window.

The Web of Science Journal Citation Reports (JCR) publishes the official results annually, based on this calculation:

Number of citations received in one year to content published in *Journal X* during the two previous years, divided by the total number of articles and reviews published in *Journal X* within the previous two years.

For example, the 2017 Impact Factors (released in 2018) used the following calculation:

Number of citations received in 2017 to content published in *Journal X* during 2015 and 2016, divided by the total number of articles and reviews published in *Journal X* in 2015 and 2016.

### How can I get an Impact Factor for my journal?

Only journals selected to feature in the Science Citation Index Expanded (SCIE) and Social Sciences Citation Index (SSCI) receive an official Impact Factor.

To be eligible for coverage in these Web of Science indices, journals must meet a wide range of criteria. You can [find out more about the journal selection process](#) on the Clarivate website.

For many journals, the first step to receiving an Impact Factor is to feature in the Emerging Sources Citation Index (ESCI). [For more information on the ESCI, read our introduction here.](#)

## What are the disadvantages of the Impact Factor?

### **The Impact Factor is an arithmetic mean and doesn't adjust for the distribution of citations.**

This means that one highly-cited article can have a major positive effect on the Impact Factor, skewing the result for the two years. Most journals have a highly-skewed citation distribution, with a handful of highly-cited articles and many low- or zero-cited articles.

### **The JCR doesn't distinguish between citations made to articles, reviews, or editorials.**

So that the Impact Factor doesn't penalize journals that publish rarely-cited content like book reviews, editorials, or news items, these content types are **not** counted in the denominator of the calculation (the total number of publications within the two-year period). However, citations to this kind of content **are** still counted.

This creates two main problems. Firstly, the classification of content is not subjective, so content such as extended abstracts or author commentaries fall into an unpredictable gray area. Secondly, if such articles are cited, they increase the Impact Factor without any offset in the denominator of the equation.

### **The Impact Factor only considers the number of citations, not the nature or quality.**

An article may be highly cited for many reasons, both positive and negative. A high Impact Factor only shows that the research in a given journal is being cited. It doesn't indicate the context or the quality of the publication citing the research.

### **You can't compare Impact Factors like-for-like across different subject areas.**

Different subject areas have different citation patterns, which reflects in their Impact Factors. Research in subject areas with typically higher Impact Factors (cell biology or general medicine, for example) is not better or worse than research in subject areas with typically lower Impact Factors (such as mathematics or history).

The difference in Impact Factor is simply a reflection of differing citation patterns, database coverage, and dominance of journals between the disciplines. Some subjects generally have longer reference lists and publish more articles, so there's a larger pool of citations.

### **Impact Factors can show significant variation year-on-year, especially in smaller journals.**

Because Impact Factors are average values, they vary year-on-year due to random fluctuations. This change is related to the journal size (the number of articles published per year): the smaller the journal, the larger the expected fluctuation.

## What is the 5-year Impact Factor?

The 5-year Impact Factor is a modified version of the Impact Factor, using five years' data rather than two. A journal must be covered by the JCR for five years or from Volume 1 before receiving a 5-year Impact Factor.

The 5-year Impact Factor calculation is:

Number of citations in one year to content published in *Journal X* during the previous five years, divided by the total number of articles and reviews published in *Journal X* within the previous five years.

The 5-year Impact Factor is more useful for subject areas where it takes longer for work to be cited, or where research has more longevity. It offers more stability for smaller titles as there are a larger number of articles and citations included in the calculation. However, it still suffers from many of the same issues as the traditional Impact Factor.

## EIGENFACTOR

In 2007, the Web of Science JCR grew to include Eigenfactors and Article Influence Scores (see below). Unlike the Impact Factor, these metrics don't follow a simple calculation. Instead, they borrow their methodology from network theory.

### What is an Eigenfactor?

The Eigenfactor measures the influence of a journal based on whether it's cited within other reputable journals over five years. A citation from a highly-cited journal is worth more than from a journal with few citations.

To adjust for subject areas, the citations are also weighted by the length of the reference list that they're from. The Eigenfactor is calculated using an algorithm to rank the influence of journals according to the citations they receive. A five-year window is used, and journal self-citations are not included.

This score doesn't take journal size into account. That means larger journals tend to have larger Eigenfactors as they receive more citations overall. Eigenfactors also tend to be very small numbers as scores are scaled so that the sum of all journal Eigenfactors in the JCR adds up to 100.

Very roughly, the Eigenfactor calculation is:

Number of citations in one year to content published in *Journal X* in the previous five years (weighted), divided by the total number of articles published in *Journal X* within the previous five years.

# ARTICLE INFLUENCE SCORE

## What is an Article Influence Score?

The Article Influence Score is a measure of the average influence of a journal's articles in the first five years after publication. A score greater than 1.00 shows above-average levels of influence.

The Article Influence Score calculation is:

$(0.01 \times \text{Eigenfactor of } Journal X) \text{ divided by (number of articles published in } Journal X \text{ over five years, divided by the number of articles published in all journals over five years)}.$

These are then normalized so that the average journal in the JCR has a score of 1.

Like 5-year Impact Factors, journals don't receive an Article Influence Score unless they have been covered by the JCR for at least five years, or from Volume 1.

# CITESCORE

## What is CiteScore?

CiteScore is the ratio of citations to research published. It's currently available for journals and book series which are indexed in Scopus. CiteScore considers all content published in a journal, not just articles and reviews.

CiteScore was produced by Scopus in December 2016 and you can easily replicate it via the Scopus database. In addition to CiteScore, Scopus also publish additional rankings, such as the CiteScore percentile based on subject categories, and a monthly CiteScore tracker.

The CiteScore calculation is:

$\text{Number of all citations recorded in Scopus in one year to content published in } Journal X \text{ in the last three years, divided by the total number of items published in } Journal X \text{ in the previous three years.}$

Journals that publish a large amount of front matter (such as editorials or peer commentaries) will perform worse by CiteScore than by Impact Factor because this front matter is rarely cited.

## What are the differences between CiteScore and Impact Factor?

- 1 CiteScore is based on the Scopus database rather than Web of Science. This means the number of citations and journal coverage in certain subject areas is notably higher.
- 2 CiteScore uses a three-year citation window, whereas Impact Factor uses a two-year citation window.
- 3 The CiteScore denominator includes all content published in the journal. The Impact Factor denominator includes only articles and reviews.
- 4 CiteScore covers all subject areas, whereas the Impact Factor is only available for journals indexed in the SCIE and SSCI.

CiteScore suffers from some of the same problems as Impact factor; namely that it isn't comparable across disciplines and it is a mean calculated from a skewed distribution.

## SNIP - SOURCE NORMALIZED IMPACT PER PAPER

SNIP is a journal-level metric which attempts to correct subject-specific characteristics, simplifying cross-discipline comparisons between journals. It measures citations received against citations expected for the subject field, using Scopus data. SNIP is published twice a year and looks at a three-year period.

The SNIP calculation is:

Journal citation count per paper, divided by citation potential in the field.

SNIP normalizes its sources to allow for cross-disciplinary comparison. In practice, this means that a citation from a publication with a long reference list has a lower value.

SNIP only considers citations to specific content types (articles, reviews, and conference papers), and does not count citations from publications that Scopus classifies as "non-citing sources". These include trade journals, and many Arts & Humanities titles.

## SJR - SCIMAGO JOURNAL RANK

The SJR aims to capture the effect of subject field, quality, and reputation of a journal on citations. It calculates the prestige of a journal by considering the value of the sources that cite it, rather than counting all citations equally.

Each citation received by a journal is assigned a weight based on the SJR of the citing journal. So, a citation from a journal with a high SJR value is worth more than a citation from a journal with a low SJR value.



The SJR calculation is:

Average number of (weighted) citations in a given year to *Journal X*, divided by the number of articles published in *Journal X* in the previous three years.

As with SNIP and CiteScore, SJR is calculated using Scopus data.

## ***h*-INDEX**

### **What is the *h*-index?**

The *h*-index is an author-level research metric, first introduced by Hirsch in 2005. The *h*-index attempts to measure the productivity of a researcher and the citation impact of their publications.

The basic *h*-index calculation is:

Number of articles published which have received the same number of citations.

For example, if you've published at least 10 papers that have each been cited 10 times or more, you will have a *h*-index of 10.

### **What are the advantages of the *h*-index?**

#### **Results aren't skewed**

The main advantage of the *h*-index is that it isn't skewed upwards by a small number of highly-cited papers. It also isn't skewed downwards by a long tail of poorly-cited work.

The *h*-index rewards researchers whose work is consistently well cited. That said, a handful of well-placed citations can have a major effect.

### **What are the disadvantages of the *h*-index?**

#### **Results can be inconsistent**

Although the basic calculation of the *h*-index is clearly defined, it can still be calculated using different databases or time-frames, giving different results. Normally, the larger the database, the higher the *h*-index calculated from it. Therefore, a *h*-index taken from Google Scholar will nearly always be higher than one from Web of Science, Scopus, or PubMed. (It's worth noting here that as Google Scholar is an uncurated dataset, it may contain duplicate records of the same article.)

#### **Results can be skewed by self-citations**

Although some self-citation is legitimate, authors can cite their own work to improve their *h*-index.

### **Results aren't comparable across disciplines**

The  $h$ -index varies widely by subject, so a mediocre  $h$ -index in the life sciences will still be higher than a very good  $h$ -index in the social sciences. We can't benchmark  $h$ -indices because they are rarely calculated consistently for large populations of researchers using the same method.

### **Results can't be compared between researchers**

The  $h$ -index of a researcher with a long publication history including review articles cannot be fairly compared with a post-doctoral researcher in the same field, nor with a senior researcher from another field. Researchers who have published several review articles will normally have much higher citation counts than other researchers.

# Publisher-provided usage metrics

## USAGE DATA

### What is usage data?

Taylor & Francis measures online usage by the number of PDF downloads or HTML views an article or journal receives. As a metric, usage is helpful in providing an immediate reflection of a journal's reach.

### How can I access my journal's usage data?

You can easily access article-level usage data via the "Metrics" tab on [Taylor & Francis Online](#). We also provide more detailed annual usage reports to our journal editors. Find out more about the COUNTER compliant data we report with our [brief introduction to Project COUNTER](#).

There are other online platforms which provide journal access, including aggregator services such as JSTOR and EBSCO. Of course, some readers still prefer print over online, so it's important you consider these sources when building a broader picture of usage.

# Altmetrics

## What are altmetrics?

Alternative metrics (or “altmetrics”) help you to measure the impact of a journal by looking at the social activity around it. They use quantitative and qualitative data alongside traditional citation- and usage-based metrics to provide an insight into the attention, influence and impact of academic research.

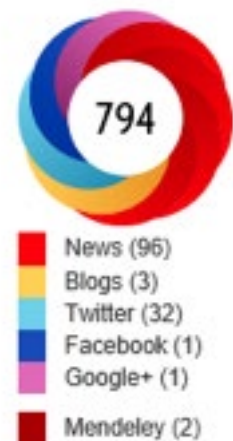
The most common method of reporting on altmetrics is the [Altmetric Attention Score](#). This tool tracks a wide range of online sources to capture the conversations happening around academic research.

## How is the Altmetric Attention Score calculated?

Altmetric monitors each online mention of a piece of research and weights the mentions based on volume, sources, and authors. A mention in an international newspaper contributes to a higher score than a tweet about the research, for example.

The Altmetric Attention Score is presented within a colorful donut. Each color indicates a different source of online attention (ranging from traditional media outlets to social media, blogs, online reference managers, academic forums, patents, policy documents, the Open Syllabus Project, and more). A strong Altmetric Score will feature both a high number in the center, and a wide range of colors in the donut.

Discover the different ways you can [make Altmetric data work for you by reading this introduction](#) from Altmetric’s Head of Marketing, Cat Chimes.



## What are the advantages of the Altmetric Attention Score?

### Receive instant, trackable feedback

Altmetric starts tracking online mentions of academic research from the moment it’s published. That means there’s no need to wait for citations to come in to get feedback on a piece of research.

### Get a holistic view of attention, impact and influence

The data Altmetric gathers provides a more all-encompassing, nuanced view of the attention, impact, and influence of a piece of research than traditional citation-based metrics. Digging deeper into the Altmetric Attention Score can reveal not only the nature

and volume of online mentions, but also who's talking about the research, where in the world these conversations are happening, and which online platforms they're using.

## What are the disadvantages of the Altmetric Attention Score?

### Biases in the data which Altmetric collects

There's a tendency to focus on English-speaking sources (there's some [great thinking around this by Juan Pablo Alperin](#)). There's also a bias towards Science, Technology and Medicine (STM) topics, although that's partly a reflection of the activity happening online around research.

### Limited to tracking online attention

The Altmetric Attention Score was built to track digital conversations. This means that attention from sources with little direct online presence (like a concert, or a sculpture) are not included. Even for online conversations, Altmetric can only track mentions when the source either references the article's Digital Object Identifier (DOI) or uses two pieces of information (i.e. article title and author name).

# How to use research metrics to monitor your journal

Now we've covered the main items in the "basket of metrics", you need to know how you can use them to monitor your journal's performance. These research metrics can help you assess your journal's standing in the community, raise its profile, and support growth in high-quality submissions. But only if you know how to interpret and apply them.

Catch up on our [Expert View of Journal Metrics Webinar](#) (2017), where a panel of experts, including Altmetric Founder, Euan Adie, and two of our journal editors, answered your questions on understanding and interpreting research metrics. Or keep reading for a more detailed run-down of how to use research metrics to monitor your journal's performance.

For more details on journal performance metrics, read our quick guide on [how to use ScholarOne Manuscripts for reporting on your peer review processes](#).

## HOW TO IDENTIFY THE RIGHT METRICS FOR YOUR JOURNAL

To monitor your journal's performance, first you need to identify which research metrics are the most appropriate. To do this, think about your journal and its objectives.

It may help to structure this thinking around some key questions:

### Who is your target audience?

For journals with a practitioner focus, academic citations may be less valuable than mentions in policy documents (as reported by Altmetric). If your journal is for a purely academic audience, traditional citation metrics like Impact Factor are more relevant. If your journal has a regional focus, then geographical usage might be important to you.

## What are you trying to achieve?

If your objective is to publish more high-quality, high-impact authors, consider analyzing the *h*-indices of authors in recent volumes to assess whether you're achieving this. If your aim is to raise your journal's profile within the wider community, it makes sense to consider altmetrics in your analysis. Perhaps your goal is to generate more citations from high-profile journals within your field – so looking at Eigenfactor rather than Impact Factor would be helpful.

## What subject area are you working in?

The relevancy of different research metrics varies hugely between disciplines. Is Impact Factor appropriate, or would the 5-year Impact Factor be more representative of citation patterns in your field? Which metrics are your competitors using? It might be more useful to [think about your journal's ranking within its subject area](#), rather than considering specific metrics in isolation.

## What business model does your journal use?

For journals following a traditional subscription model, usage can be particularly crucial. It's a key consideration for librarians when it comes to renewals.

# HOW TO INTERPRET RESEARCH METRICS

It's tempting to reach for simple numbers and extrapolate meaning, but be careful about reading too closely into metrics. The best strategy is to see metrics as generating questions, rather than answers.

The basket of metrics simply tells us "what". What are the number of views of the work? What are the number of downloads from the journal? What are the number of citations?

To interpret your metrics effectively, think less about "what" and use your metrics as a starting point to delve deeper into "who", "how", and "why":

- Who is reading the journal? Where are they based, what is their role, how are they accessing it?
- Who are the key authors in your subject area? Where are they publishing now?
- How are users responding to your content? Are they citing it in journals, mentioning it in policy documents, talking about it on Twitter?
- How is your subject area developing? What are the hot topics, emerging fields, and key conversations?
- Why was a specific article successful? What made the media pick up on it, what prompted citations from other journals, who was talking about it?

It's easy to damage the overall picture of your research metrics by focusing too much on one specific metric. For example, if you wanted to boost your Impact Factor by publishing more highly-cited articles, you might be disregarding low-cited articles used extensively by your readers. Therefore, if you chose to publish only highly-cited content for a higher Impact Factor, you could lose the value of your journal for a particular segment of your readership.

Generally, the content most used by practitioners, educators, or students (who don't traditionally publish) is not going to improve your Impact Factor, but will probably add value in other ways to your community.

Fundamentally, it's important to consider a range of research metrics when monitoring your journal's performance. It can be tempting to concentrate on one metric like Impact Factor, which is so widely recognized as a hallmark of quality. But citations are not the be-all and end-all.

Think about each research metric as a single tile in a mosaic: you need to piece them all together to see the bigger picture of journal performance.