

Scholarly metrics are a way for the impact of an article, author, or journal to be measured quantitatively. The scholarly communication community acknowledges that while these metrics are flawed, they are, to date, the primary way impact is being measured. A new approach to assessing scholarly work is required.

### Citation Tracking

Citation tracking looks at the number of times that a particular work, author or journal have been cited in the bibliographies of other works. This gives an indication of how they have been received by the academic community. Large numbers are associated with greater impact and influence. Article and author level citation counts are available on Web of Science, Google Scholar, PLoS, BioMed Central, plus numerous discipline-specific databases.

### H-index

A measure of author influence, an h-index is the number where the number of articles published by an author intersects on a graph with the number of citations for each article. For instance, an author with h-index of 10 has published 10 papers that have been cited at least 10 times each. The h-index is the first (and most well-known) of many author metrics. Available on Web of Science and Google Scholar if the scholar has created a user profile.

### Journal Impact Factor

A journal Impact Factor (IF) is a measure of the average number of citations made to articles within an academic journal, over the course of a year. Impact factor is used to understand the level of significance and impact an academic journal has within its field of research; journals with high impact factors – where there are a high average number of citations – is considered to have greater impact and importance in that field of study.

Many institutions rely on IFs to inform decisions about hiring, reappointment, tenure and promotion. This practice is criticized as a narrow method of evaluation, given the issues with measure, as described below. Further, some believe that publishers take

## INSTITUTIONAL MOBILIZATION TOOLKIT

### What Can I Do?

- Be aware that the increasing cost of journals is outpacing the increase of library budgets, putting pressure on your library to do more with less.
- Be open to a conversation with your librarian about your scholarly content needs in terms of your research and teaching, in an environment where tough content retention decisions may have to be made.

### What Are Libraries Doing?

- Working through consortia to leverage greater purchasing power.

### Tools:

- Introduction
- Evolution of Journal Pricing
- Canadian Economic Environment
- Innovation in Scholarly Communication
- Sustainability Challenges
- **Understanding Scholarly Metrics**
- Glossary of Scholarly Communication Terms
- Selected Bibliography

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[imtg@crkn.ca](mailto:imtg@crkn.ca)

advantage of the fact IFs figure so prominently in promotion decisions.

## The History of the Impact Factor

The impact factor was created and developed by Eugene Garfield (Chairman Emeritus of Thomson ISI, now known as Thomson Reuters) in 1955, in an attempt to select journals for the new *Science Citation Index* (SCI). They calculated the number of citations for each author in the list of journals, and then sorted the results by journal, so that they could see which journals not only published the most articles, but which journals contained the articles that were most highly cited within their field. This approach ensured that journals were judged based on merit, as opposed to size or how long they'd been in publication.

How to calculate a journal's impact factor:

How to calculate a journal's impact factor:
A = total cites in 1992
B = 1992 cites to articles published in 1990-91 (a subset of A)
C = number of articles published in 1990-91
D = B/C = 1992 impact factor

In 1975, Thomson Reuters began to publish Journal Citation Reports (JCR), which continues today as the tool for ranking, evaluating, categorizing and comparing journals in the SCI and Social Sciences Citation Index (SSCI).

Since 1975, the impact factor calculation has gained popularity because it is a simple approach to measuring the significance of a journal, without being biased against small and or new journals. Today, journal impact factor is considered such an important measure that academic departments encourage their faculty to publish only in journals with high impact factors; in many cases, funding, hiring, tenure and promotion decisions are made based on how many articles a faculty member has published in journals with the highest impact factors.

Garfield maintains that citation studies should be normalized to take certain variables into account, such as citation density (there are fewer citations in some disciplines, more in others), and how long articles are relevant in terms of how quickly a discipline changes. Still, in most science and social science disciplines, the impact factor is the single most important measure for faculty assessment.

## Criticism of Journal Impact Factors

As with any system, errors are possible. For instance, citations can be incorrectly attributed to the wrong author if a spelling error has occurred, or when two or more authors share the same or similar name. In addition, journals contain reviews as well as articles, and citations in these reviews are counted in the impact factor; this means that a single issue could contain more reviews than original research, and yet the impact factor could still be high.

Another reason to be skeptical of impact factors is that the system can be gamed to boost the number of citations in an article, in some cases through promiscuous self-citing. In 2014, a journal published by

SAGE was found to be victim of a peer citation ring, where a reviewer used several email addresses to pose as more than one reviewer. In the end, 60 articles were retracted from the journal, and the fraudulent reviewer resigned his post at his institution.

In recent years, Clarivate Analytics, Elsevier, and Google have released competing bibliometric tools. As well, other measures of scientific impact have been adopted, such as the usage factor that is promoted by the UK Serials Group and the Y factor, developed by Google.

Further, academic publishing has undergone a great deal of change with the rise of the Internet as a global communication tool. Most academics want their work to have impact outside academic circles and in fact influence policy makers and perhaps even the general public. To influence policy makers, research must be read and discussed outside of journals, and in the 21<sup>st</sup> century, the Internet provides a wealth of communication channels in the form of social media. However, impact factors only measure citation counts in academic journals, and do not take any other credit into account. While social media is in no way close to peer review, the impact social media can have on public policy cannot be ignored.

Discussion of scholarly work is taking place on the Internet, via a wide variety of tools such as online reference managers (for example Zotero and Mendeley), and web-based scholarly communities such as Academia.edu and ResearchGate. A significant – some report over a third – of academics are using Twitter to discuss their work. Clearly, Internet-based conversations are significant and increasingly so.

## [An Alternative: Altmetrics](#)

Altmetrics – also known as cybermetrics or webometrics – are non-traditional metrics that are proposed as an alternative to traditional citation impact metrics. Altmetrics.org, the organization leading the Altmetrics movement, proposes to create new metrics that includes social web activity, such as:

- Usage, based on the number of downloads
- Peer-review – when a scholar is considered to have be an expert
- Citations – using traditional methodologies
- Alt-metrics – analyzing links, bookmarks and conversations

Work in this area is in the early stages, it will take time to develop convincing methodologies for measuring the impact of social media in a community that is very traditional and slow to change. As faculty at universities around the world go beyond the boundaries of the peer-reviewed journal to communicate their work, how impact is assessed must adjust.

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## About the Canadian Research Knowledge Network

The Canadian Research Knowledge Network is a partnership of Canadian universities, dedicated to expanding digital content for the academic research and teaching enterprise in Canada.