

Scholarly Impact Metrics

Research
note

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The value of academic research outputs is subject to increasing attention from governments and university administrators. Unfortunately, researchers remain ill-informed about the criteria of scholarly impact assessment. At the same time, the shortcomings of traditional metrics are bringing these measures under scrutiny. One response is the development of altmetrics that quantify the circulation of publications online via downloads, social media mentions, news stories, blog posts, etc., rather than tracking citations in peer-reviewed publications.

How do we measure scholarly impact?

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What are the impact factor and traditional research impact metrics?

Traditional research impact metrics, such as the journal impact factor (JIF), calculate the degree to which contributions to a journal are cited in the years following their publication. These citations are tracked by citation indexes, i.e. databases that map the bibliographic references of peer-reviewed articles. The best known citation index is Web of Science, founded in 1964 by the Institute for Scientific Information (ISI) and now produced by a firm called Clarivate Analytics. Two others were added in 2004: Scopus, from the European scholarly publishing giant Elsevier, and Google Scholar, from the web giant of the same name.

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The JIF is the best known indicator. Recorded in the *Journal Citation Reports* (JCRs), this metric is based on citation data in the Web of Science Core Collection. This indicator has traditionally been calculated based on the “*nombre de citations reçues [par exemple] en 2015 par les articles publiés par une revue au cours des deux années précédentes (2013-2014), divisé par le nombre d’articles publiés par cette revue au cours de ces deux années précédentes* [number of citations for instance in 2015 by articles published by a journal over the last two years (2013-2014) divided by the number of articles published by that journal over the course of the last two years].”¹

$$\text{2015 journal impact factor} = \frac{\text{number of citations collected in 2015 for articles published in 2013-2014}}{\text{number of articles published in 2013-2014}}$$

¹ Larivière, Vincent. “Remettre le facteur d’impact à sa place”. *Acfas Magazine*, April 21, 2016. acfas.ca/publications/magazine/2016/04/remettre-facteur-impact-place

The two-year window of this formula has been criticized because research, especially in the social sciences, takes longer to disseminate.² That's why the JCRs now publish two JIF numbers, one using a two-year window and one using a five-year window. Most importantly, the JIF was initially created to guide librarians in choosing to which *journals* they should subscribe. Through an unfortunate slippage in usage, it is now used to measure the quality of the individual *articles* which they publish.³

Other indicators are calculated for each journal based on data available in Scopus (the CiteScore, inspired by the JIF) and Google Scholar (the h5 index and the h5 median, rather based on Jorge E. Hirsch's H-Index⁴ that clumsily combines productivity and impact). However, bibliometrics experts agree that all these indicators have significant limitations and other publication contexts must be taken into account when assessing research impact.

² Larivière, "Remettre le facteur d'impact à sa place".

³ Archambault, Éric and Vincent Larivière. "History of the Journal Impact Factor: Contingencies and Consequences". *Scientometrics* 79, no 3 (June 1, 2009): 635-49. doi.org/10.1007/s11192-007-2036-x

⁴ Hirsch, Jorge E. "An Index to Quantify an Individual's Scientific Research Output". *Proceedings of the National Academy of Sciences* 102, no 46 (November 15, 2005): 16569-72. doi.org/10.1073/pnas.0507655102

What are the critiques levelled against traditional research impact metrics?

ASSESSING RESEARCH QUALITY ACCORDING TO THE PUBLICATION VENUE

The *San Francisco Declaration on Research Assessment* (DORA) was written in 2012 by a group of American Society for Cell Biology researchers and the journal editors gathered for the learned society's annual conference. It has since been circulated throughout the scientific community to be signed and translated into multiple languages.⁵

The declaration acknowledges the need to determine both the quality and impact of scientific publications for research funding (funding agencies) and for hiring and promotion decisions (academic institutions). Its 18 recommendations offer the means to do so by moving beyond assessing just the peer-reviewed journal in which the scientific contribution has been published.

The declaration calls for more transparency on the part of organizations that fund research and institutions that employ researchers, asking these bodies to explicitly state their criteria for decisions regarding grants, hiring, tenure, and promotion. The declaration recommends using more than just scientific publications to judge research. Even in the social sciences and humanities, where dataset and software development is rarer, qualitative assessment of the role research plays in practices and policy would certainly be welcome. The majority of DORA's recommendations nevertheless focus on quantitative indicators. They include a call to create article-level indicators instead of journal-level ones. To foster this development, the declaration asks all journals to make available the references in each article as open data.⁶

⁵ Ouedraogo, Abdrahamane, Celine Carret, Serge Bauin, Marc Rubio and Jean-François Nominé, translators. "Déclaration de San Francisco sur l'évaluation de la recherche". San Francisco, 2012. sfdora.org/wp-content/uploads/2018/11/DORA_French_V2.pdf

⁶ Shotton, David. "Open Letter to Publishers". *OpenCitations Blog*, January 3, 2013. Updated September 27, 2013 and April 4, 2017. opencitations.wordpress.com/2013/01/03/open-letter-to-publishers/

The DORA signatories' critique is extremely precise: it argues against assessing the part (the article) according to the whole (the journal), with an indicator that can easily be manipulated to boot. However, this declaration does not oppose the traditional idea of assessing a publication based on the number of times it is cited. Other wider-reaching critiques have addressed this approach to impact metrics.

UNDERREPRESENTATION OF THE SOCIAL SCIENCES AND THE ARTS AND HUMANITIES IN THE CITATION INDEXES

A 2016 study found that the two main citation indexes were particularly limited in their coverage of the social sciences and the arts and humanities.⁷ It compared the journals indexed in Web of Science (13,000) and Scopus (20,000) to the 63,000 journals in Ulrich's periodical directory. Though these databases cover respectively 33% and 38% of journals, important differences arise between disciplines as well as languages and countries of publication. In 2014, less than a quarter of social sciences journals and arts and humanities journals were indexed in Scopus; less than 15% could be found in Web of Science.

It is worth noting that the local component of social science as well as arts and humanities research objects limits the chances for a journal to be indexed, especially if it is issued in a language other than English.⁸ Additionally, many databases offer very limited coverage of book-length studies despite the fact that these are the main mode of knowledge dissemination in the social sciences and the arts and humanities.

⁷ Mongeon, Philippe and Adèle Paul-Hus. "The Journal Coverage of Web of Science and Scopus: A Comparative Analysis". *Scientometrics* 106, no 1 (January 1, 2016): 213-28. doi.org/10.1007/s11192-015-1765-5

⁸ Gingras, Yves. "Dérives et effets pervers de l'évaluation quantitative de la recherche". *Academic Matters*, Winter 2017. academicmatters.ca/derives-et-effets-pervers-de-levaluation-quantitative-de-la-recherche/

What are next-generation metrics?

In the course of their work on open science [see [research note on Open Access](#)], European organizations have moved to so-called next-generation metrics.⁹ This designation encompasses both “*the responsible use of existing bibliometrics*” and “*the use of new bibliometric measures which are aligned with the ambitions of Open Science.*”¹⁰

ALTMETRICS

Altmetrics, short for alternative metrics, were introduced in 2010 to widen the definition of impact beyond citations in academic papers. They do not replace traditional indicators but complement them, quantifying the online circulation of scholarly publications by compiling web data. In this way, altmetrics accord with the mandate of open science: to open up, to expand the understanding of impact.¹¹

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⁹ Wildson, James, Judit Bar-Ilan, Robert Frodeman, Elisabeth Lex, Isabella Peters, and Paul Wouters. “Next-Generation Metrics: Responsible Metrics and Evaluation for Open Science.” Report of the European Commission Expert Group on Altmetrics. Brussels: Directorate-General for Research and Innovation, March 15, 2017. ec.europa.eu/research/openscience/pdf/report.pdf

¹⁰ Ayris, Paul, Alea López de San Román, Katrien Maes, and Ignasi Labastida. “Open Science and Its Role in Universities: A Roadmap for Cultural Change”. Advice paper. Leuven: League of European Research Universities (LERU), May 2018, p. 18. leru.org/publications/open-science-and-its-role-in-universities-a-roadmap-for-cultural-change

¹¹ Friesike, Sascha and Thomas Schildhauer. “Open Science: Many Good Resolutions, Very Few Incentives, Yet”. In *Incentives and Performance: Governance of Research Organizations*, edited by Isabell M. Welpe, Jutta Wollersheim, Stefanie Ringelhan et Margit Osterloh, 277-89, p. 283 (Table 1). Cham: Springer International Publishing, 2015. doi.org/10.1007/978-3-319-09785-5_17

ALTERNATIVE IMPACT DATA SOURCES

Altmetrics are as varied as the range of practices they are trying to measure and they come from different sources. Under common classifications, an article can be:

- **viewed**, as indicated by the number of downloads;
- **saved** in softwares and sites like CiteULike, Mendeley, and Delicious;
- **discussed** in blogs or through sharing on social media like Twitter and Facebook;
- **cited** in academic papers and on Wikipedia;
- **recommended** in the printed press.¹²

A 2016 study looked at how these activities reflect varied levels of engagement with a specific research publication or researcher.

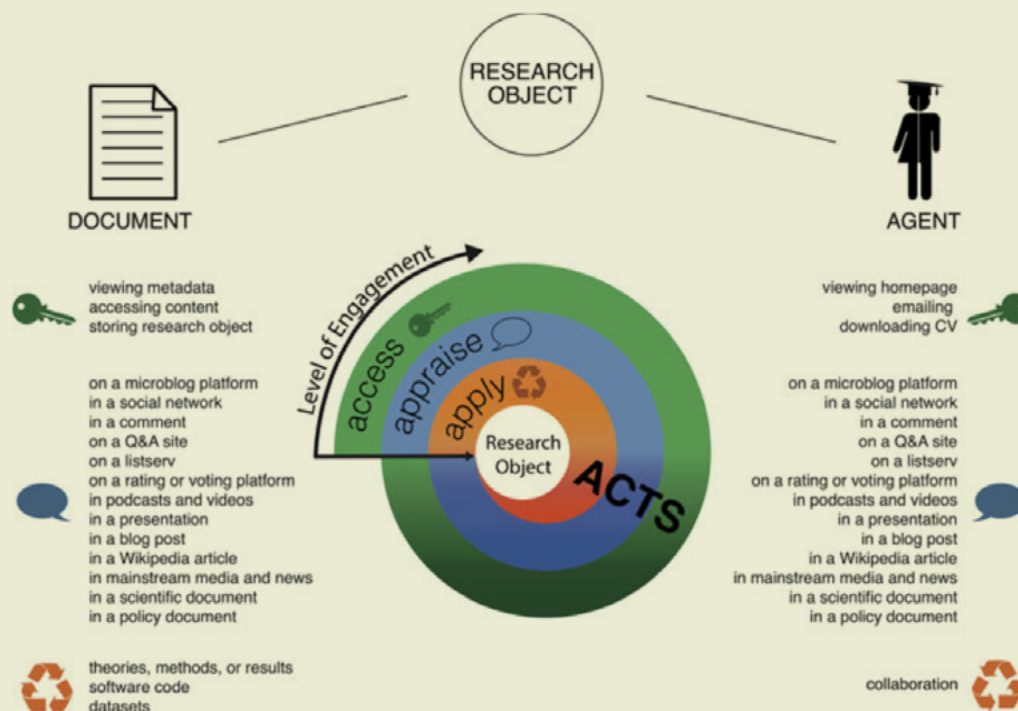


Figure 1: Framework of categories and types of acts referring to research objects (scholarly documents and agents).

Source : Hausteijn, Stefanie, Bowman, Timothy D. et Costas, Rodrigo « Interpreting 'altmetrics': Viewing Acts on Social Media through the Lens of Citation and Social Theories ». Dans *Theories of informetrics and scholarly communication*, dirigé par Cassidy R. Sugimoto, 372–405. Berlin : De Gruyter Saur, 2016, p. 377 (Figure 1). <https://www.degruyter.com/view/book/9783110308464/10.1515/9783110308464-022.xml>.

¹² Piwowar, Heather. "A New Framework for Altmetrics". *Our Research Blog*, September 14, 2012. blog.ourresearch.org/31524247207/; Lin, Jennifer and Martin Fenner. "Altmetrics in Evolution: Defining and Redefining the Ontology of Article-Level Metrics". *Information Standards Quarterly* 25, n° 2 (2013): 20. doi.org/10.3789/isqv25no2.2013.04

ALTMETRICS DATA AGGREGATORS

A few tools — altmetrics data aggregators — have been built to provide indicators for scientific papers as well as other types of documents such as presentations and videos. Most of them charge a fee, but a few non-commercial initiatives have emerged.

Altmetric.com: One of the products of British company Digital Science. Among the top performing altmetrics data aggregators, including for documents published in a language other than English, but also very expensive.

PlumX: A commercial aggregator bought off by the scientific publishing giant Elsevier. A very popular and well-performing option, but also expensive.

Paperbuzz: An open-source software, developed by the Canadian non-profit initiative Public Knowledge Project (PKP), which aggregates the data harvested by Crossref Event Data. Coverage is still limited for languages other than English and it does not go further back than 2017. Paperbuzz is good at identifying mentions on Wikipedia.

Cobaltmetrics: A new player among altmetrics data aggregators. It follows URIs (which identify any Internet resource), not just DOIs (that identify journal articles and other scientific research results). A low-cost commercial initiative, but performance is still lacking.

Impactstory: One of the tools of the Canadian non-profit Our Research, Impactstory allows researchers to create a free profile that presents the online impact of their research under the guise of “achievements,” including in relation to the geographic reach of their research (by geolocating downloads).

Some digital platforms for scholarly journals show altmetrics on each article in various forms.

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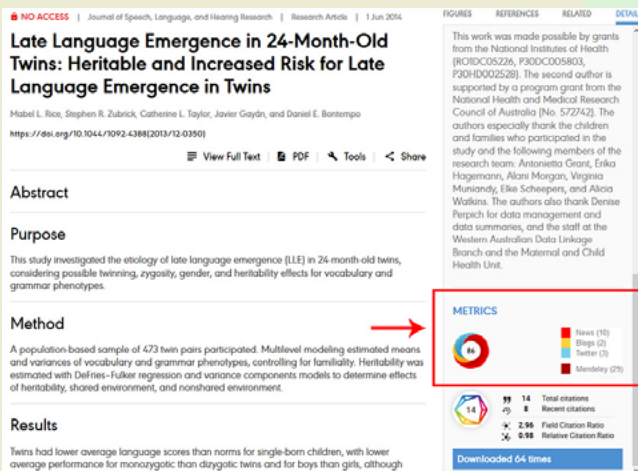


Figure 2: How the data from the Altmetric tool is presented on the ASHA Journals platform.

Source : ASHA Journals Academy. “Maximizing Impact With Altmetric”. Author Resource Center. Accessed January 18, 2020.

<https://academy.pubs.asha.org/asha-journals-author-resource-center/maximizing-impact/altmetric/>.

Beware of oversimplification!

As is the case for traditional impact metrics based on citation frequency, bibliometrics experts warn against aggregating altmetrics into a single indicator (such as the Altmetric Attention Score). Heeding this warning is particularly important for altmetrics because they bring together a very heterogeneous set of “reading” practices regarding scholarly output.¹³ Indeed, Kim Holmberg, tasked by the European Commission’s Directorate-General for Research and Innovation to present the lay of the land, observes, “altmetrics can be identified and aggregated from a vast number of different data sources with different users with different motivations to interact with research products.” Given this, he argues, “different altmetrics should not be aggregated into a single number.”¹⁴

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JOURNAL BEST PRACTICES

If they are not already in English, translate the titles and abstracts of the articles that you publish to be eligible to be indexed in Web of Science and in Scopus;

Make sure your journal has a social media presence;

Work in tandem with the press relations team at your university to generate buzz with your journal’s special issues;

Ask your authors to share their articles on social media and keep you posted on the impact it generated;

Make sure your metadata is top quality and that it is distributed “openly” for indexation purposes;

Encourage the authors to use a unique identifier (e.g. ORCID iD) to help with disambiguation and to better credit scientific contributions.

¹³ Haustein, Stefanie. “Readership Metrics”. In *Beyond Bibliometrics: Harnessing Multidimensional Indicators of Scholarly Impact*, edited by Blaise Cronin and Cassidy R. Sugimoto, 327–344. Cambridge, Mass: The MIT Press, 2014. mitpress.mit.edu/books/beyond-bibliometrics

¹⁴ Holmberg, Kim. “How to Use Altmetrics in the Context of Open Science”. Thematic Report. Mutual Learning Exercise: Open Science - Altmetrics and Rewards. Brussels: Directorate-General for Research and Innovation, August 2017. rio.jrc.ec.europa.eu/en/library/mle-open-science-thematic-report-no-1-different-types-altmetrics