Research Impact Evaluation

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What are we talking about when we talk about Impact?

Extent to which publications are:
• Read
• Discussed/Reviewed
• Utilized

....And
• Disseminated

Inside and outside academia
• Bibliometrics are quantitative methods of studying scientific research using publications as a proxy for research
• It can be used to study the impact of a publication, an author or an institution based on the number of times scholarship and/or authors have been cited by others
• Bibliometric indicators, like *Journal Impact Factor, h-index*, are used to measure research impact and publication activity
• Three known citation analysis databases are Web of Science, Scopus and Google Scholar
What is research impact used for?

- Uses of Research Impact and Citations
- Research assessment
- Institutional Rankings
- Recruitment
- Tenure track
- Research funders
- CV
- Benchmarking
- Performance Assessment
- Scholarly Management
- Impact of scientific publications
What are we evaluating?

- **Journal Quality** – Journal Rank in a particular field
- **Article impact/Influence** – Publications and citation trends over time
- **Article reach** – Number of downloads, reads
- **Dissemination/Funding** – Which agencies/foundations have funded my research topic?
- **Researcher Impact** – What is my altmetric score? H-index?
Metrics

• Article-Level Metrics
  • Citation counts

• Journal-Level Metrics
  • Measure quality of Journal using Journal Impact Factors

• Author-Level Metrics
  • Measure bibliographic impact of individual authors (h-index)

• Other advanced indicators: RCR, Normalized metric scores, Percentiles
Citation Counts

Useful for

- Measuring a component of impact of an individual's work or a set of publications

Not useful for

- Understanding context of the impact

Possible Examples of use

- Individual
- Institution
- Promotion and Tenure,
- Research Funding
- Applications
**Author Level Metrics**

**H-Index**: A scholar with an index of n has published n papers each of which has been cited in other papers at least n times. So if you have a h index of 10 you have 10 papers each with 10 or more citations.

Created by Hirsch in 2005

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Prof. Jorge E Hirsch, Dept of Physics, University of California, San Diego

Image: © Regents of the University of California.
H-Index Advantages

• It is simple to compute and does not require data processing
• It produces a single number that combines both the quality and quantity of the scholar’s publications
• It can be easily obtained from any publication indexing databases such as Web of Science, Google Scholar
H-Index Limitations

- Affected by discipline, stage of career, etc. - It favors senior researchers and older publications
- Sensitive to authors with a small number of highly cited papers; it does not give extra credit to highly cited papers
- It provides little or no context for comparison, as h-index will only increase
- Includes self-citations

Alonso et al., Journal of Informetrics Vol3; Issue 4, 2009
Journal Impact Factor

\[ \text{JIF (2015)} = \frac{\text{Total citations received in all items (2015)}}{\text{Citable items (2013 and 2014)}} \]

Where “Total citations received in all items (2015)” is the number of times that all items published in 2013 and 2014 were cited in 2015.

Citable:
- Research article, proceeding paper, reviews

Not citable:
- Editorial materials (commentary, perspective, letter, etc.)
Journal Impact Factor Manipulation

Strategic Publication
- Increase journal self-citation
  - Publish more editorials

Editorial Practice
- Suggest citation to a journal

Agreements
- Journals cite each other

Lu et al., Bibliometric Research Symposium NIH 2018
**Journal Impact Factor**

**Useful For**
- Good predictor of journal quality

**Not Useful For**
- Comparing journals across different subject categories

**JIF Ranking**
- JIF can be better understood in the context of Journal Ranking in a field
- Example: All my papers are published in the Top 10% Ranked journals in Neuroscience
Other Advanced Indicators: RCR

Relative Citation Ratio (RCR)
- Article-level Citation Metric
- Developed by the NIH Office of Portfolio Analysis (OPA).
- Implemented by the NIH as an evaluation tool
- Compares the influence of articles from different fields more fairly
- Online tool for RCR calculations: https://icite.od.nih.gov

\[
RCR = \frac{\text{Article Citation Rate}}{\text{Expected Citation Rate}}
\]

Hutchins, B. J. et al. (2016) PLOS Biology, 14. DOI: 10.1371/journal.pbio.1002541
Other Advanced Indicators: RCR

Advantages
• Freely accessible metric
• Transparent
• Developed and evaluated by the NIH Office of Portfolio Analysis (OPA).
• Compares the influence of articles from different fields more fairly

Disadvantages
• Algorithm is complex
• Restricted to PubMed indexed articles
• Sensitive to interdisciplinary citations and multidisciplinary journals
Other Advanced Indicators: Percentiles

- Particularly useful for normalisation
- The percentile of a published article gives an impression of the impact it has achieved when compared to similar items in the same publication year and subject category
- Not affected by skewed distributions, so that highly cited items do not receive excessively high weight
- Publications are sorted by citation numbers and are allocated to percentile ranks ranging between 0 and 100
Rethinking impact factors: better ways to judge a journal

We need a broader, more-transparent suite of metrics to improve science publishing, say Paul Wouters, colleagues and co-signatories.
Initiatives

The Leiden Manifesto for Research Metrics

The San Francisco Declaration on Research Assessment (DORA)
Summary

• Bibliometric data has limitations
• Bibliometric data should be used in combination with qualitative assessment
• Best not to rely on one metric but a suite of metrics to tell a story