

Insights on Research Metrics for Novice Researchers

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Abstract: *Impact and metrics are the most widely and interchangeably used terms in research utilization. The impact of research is unlimited in terms of generation of knowledge, promotion of health, upliftment of economy and empowerment of nation. Metrics in research indicates the number of research outputs namely journal, author and article level metrics.¹*

Key Words: *altmetrics, bibliometrics, novice researchers, research impact, research metrics.*

1. INTRODUCTION:

Research metrics are measures that indicate quantitative impact of a research through scholarly outputs. A scholarly output determines the productivity of an organization in terms of scholarly work including publications in a specified time period. Multiple databases could be utilized to access data on scholarly outputs such as journal publications, book series, monographs, artefacts, exhibitions, graduate or advanced research books and internet publications.^{2,3}

2. TYPES OF RESEARCH METRICS:

Metrics are available at different levels and therefore, a single metrics should not be taken in isolation as it may not provide the complete impact of research output. Research metrics such as bibliometrics and altmetrics are used to gauge impact of journal, article or author. Bibliometrics are based on citations whereas altmetrics are based on online or web based impact of a scholarly work.⁴

Bibliometrics

It is a quantitative analysis of publication by numbers of citations followed by a qualitative peer review and personal statement on impact of a scholarly work. Bibliometrics is further classified as journal level, article level and author level metrics.³

(a) Journal or publication level metrics

These metrics assess the source of publication including a journal or a book and indicate the level of impact on the readers and. Examples include impact factor, citation level metrics such as Eigen factor, SCImago Journal Rank (SJR), Source Normalized Impact per Paper (SNIP), Cite Score, h5 index, Impact Per Publication (IPP), Journal Citation Report, and Immediacy Index.

- **Impact factor**

It is an index of overall ranking and quality of a journal developed by Eugene Garfield. It is also known as Thomson and Reuters Journal Impact Factor and could be retrieved from Web of Science (WoS) database. Average number of citations of an article in a journal each year is measured and possibility of an article to be cited if published in a specific journal is determined by impact factor. It is calculated by dividing the number of citations received in previous two years by total number of citable items in the journal during the same time period. Higher the impact factor of a journal, higher the number of manuscript submissions.^{5,6}

- **Eigen factor**

It measures number of citations received by a journal over past five years and determines people's opinion about a journal in terms of published articles. A journal with high Eigen Factor is considered to have maximum number of valuable, readable and citable article and is useful in tracking articles cited in Journal Citation Reports (JCR) and removing self-citations of journals.^{6,7}

- **SCImago Journal Rank (SJR)**

It was designed by Consejo Superior de Investigaciones Cientificas (CSIC), Carlos III and Alcala de Henares using Scopus database citation data (Elsvier). As per SJR, all citations are not created equal and therefore, the value of a citation is directly proportional to field of subject, reputation and quality of a journal. ⁸

- **Source Normalized Impact Per Paper (SNIP)**

It is a journal level metrics of Scopus database citation other than SJR and Cite Score. SNIP is calculated as ratio of raw impact per paper (RIP) and relative database citation potential (RDCP) of a journal in a specific subject field. RIP or impact per publication (IPP) measures number of citations to paper published in a journal in past three years divided by total number of papers published in journal during same time period. Citations of peer reviewed articles are only counted in RIP. In RIP, time frame calculated is three years instead of two years in Thomson Reuter's impact factor. RDCP is citation potential of a specific subject field journal divided by citation potential of median journal in database. In RDCP, median journal has a value of one in terms of database citation potential. ⁹

- **Cite Score**

It is one among many journal metrics in Scopus including SNIP and SJR that tracks average number of citations received for each article over a period of three years. Data on citation impact of Scopus indexed journals is provided by cite score on an annual basis. The formula to calculate cite score is to divide the number of citations received by the journal for articles published in preceding three years by articles indexed in Scopus for the past three years. ^{10,11}

- **Journal Citation Report (JCR)**

Journal citation report is a database tool that provides bibliometric analysis of significance of journals in fields of science, technology and social sciences. According to JCR, an author should consider evaluating a journal in terms of changes in title and formatting, impact factor and journal's citations other than Thomson Reuter's Institute for Scientific Information. ¹²

- **h5 index**

h5 index is a Google Scholar based journal level metrics that indicates the highest number of citations received with a minimum of h citation for each article in five calendar years. For instance, a journal's h5 index is 20 if it has 20 articles with at least 20 or more citations received for each articles in past five years. ¹³

- **Immediacy Index**

This index is published in Journal Citation Reports by Thomson Reuters and tracks average number of article citations of a journal in specific subject category. It indicates how fast a journal's articles are cited and aggregate immediacy index indicates how fast articles in a subject area are cited. ¹⁴

(b) Article level metrics

It determines the sharing and discussion of impact of published article among the readers and assess the impact of a research article or document. Some of the examples include ALMs dataset, Web of Science, Google Scholar and Scopus.

- **PLoS ALMs datasets**

Article level metrics (ALM) dataset is provided by Public Library of Science (PLoS). It tracks data usage including views and downloads mentioned in various websites such as ORCID, CiteULike, Reddit, Figshare, Mendeley and Pubmed Central and social media such as Twitter and Facebook. The major limitation is that it only tracks articles published by PLoS. Sometimes, data harvesting results in missing of certain article mentions. ¹⁵

- **Web of Science (WoS)**

It provides statistics of citations with or without self-citations and tracks average number of citations for each article for subject areas such as Arts, Humanities, Social Sciences and Science received by journals indexed in WoS. Authors may set up notifications for citation information for their articles. ¹⁶

- **Google Scholar**

It is a citation resource free of cost and counts citations from wide variety of sources including thesis, books and articles that tracks author level metrics including h-index and i10-index. ¹⁷

- **Scopus**

Data on citations of articles in Scopus indexed journals viewed by readers in reference management software such as Mendeley are provided. Authors may set up alerts on citations received for their published work. Citations of articles in Scopus indexed journals belonging to arts, mathematics and sociology are covered. ¹⁸

(c) Author level metrics

It is the evaluation of a researcher's impact on the scientific community.

- **Hirsch's h-index**

H index is developed by Hirsh to report the research output in terms of research publication and citation counts. It measures the impact of a researcher rather than a journal or an article and is calculated as the maximum number of publications that received h or more citations for each article. For instance, if each of the articles published by an author receives at least six or more citations, h-index would be six. Google scholar metrics, Harzing's publish or perish and web of science are used to access h-index of an author. ^{5,19}

- **Egghe's g index**

It was designed by Leo Egghe to measure the overall record of citations for articles. In g index, more weightage is given for articles with highest citations. Articles are arranged in the descending order as per highest number of citations. It is more updated than h index. Egghe's g index gives more significance to self-citations than h index. ²⁰

- **i10 index**

It is an author level metrics developed by Google Scholar that calculates number of articles received at least 10 citation and tracks citations of articles of journals indexed in Google Scholar. i10 index is free of cost, easy to use and available in Google's My Citation features. ²¹

Altmetrics

It is alternative to traditional metrics that reports influence of a research and its changes reflected over time outside the world of academia using social metrics. The most searched altmetrics based websites include plum analytics and impactstory that provide metric data that uncover impact of a research output. Moreover, applications such as Altmetric book market aids in accessing data on altmetrics. In altmetrics, a researcher's impact is assessed in terms of number of article downloads, citations in online sources and reference manager bookmarks such as Mendeley and Zotero. ^{22,23}

3. CONCLUSION:

To sum up, impact of a research is influenced by counts of downloads, citations, peer review and online filtering systems such as altmetrics. Research metrics play crucial role in making informed decisions on bench marking of research output at institutional and individual levels.

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