

Download plus citation counts – a useful indicator to measure research impact

Visibility of a scientist mainly depends on the impact of his/her research publications. If scientist A is more visible than scientist B, then the research impact of scientist A should, in principle, be better than that of scientist B. Research impact means the extent to which a research paper is read or consulted, used or compared, built upon and acknowledged or cited in subsequent research papers, reviews, monographs, treatises, etc. and rewarded in scholarships, research funding, academic employment and prizes. The research impact and, hence, visibility of a scientist is measurable in a number of ways.

In the print era, scientific publications could provide the best available basis for measuring research output. The simplest way to measure the visibility was by counting research papers, and, how frequently a scientist was publishing. One of the first authors to suggest it as a measure of research productivity was the Nobel laureate, William Shockley¹. He was interested in measuring the variations of research productivity among individuals on the basis of statistical studies of rates of publication.

The mere counting of papers does not reflect the research impact and quality of research work. The most widely used measure for impact of a research paper is citation counts. The more a paper is cited in subsequent papers, the higher is its research impact or influence and worth. However, mere citation counts also inherit a lot of problems. Apart from self- and team-citations, sometimes citations may be negative, where a paper is cited just for the reason of negating, reporting or criticizing (mainly in the case of reviews). Other times, many citations may just be apparent not having any real value.

Citation analysis has had a long history of nearly half a century in the study of scientific communication process. Until recently, the *Science Citation Index (SCI)* has served as the only data source for citation studies. The archaic and selective policy of the *SCI* database debarred scientometricians to arrive at any realistic conclusion on scientific achieve-

ments of developing countries, including India. The database is not exhaustive in coverage² (only 10 Indian and total of 3745 journals are covered in *SCI* print and CD-ROM versions and 51 Indian and a total of 5838 journals in *SCI* web version or *Web of Science (WoS)*) and biased in selection (with more American journals). It also has other limitations.

With the rapid development of ICTs and as a by-product of digitization of journal publishing, a number of citation databases are now being produced. Foremost among them are *Google scholar (BETA version)* and *Scopus*. *Google scholar* is an open access database, launched in November 2004, covering all types of documents, including portals and websites. *WoS* and *Scopus* are expensive commercial databases and their coverage is limited to research papers. The coverage of *Scopus* is larger than *WoS* in case of Indian journals (168 titles) as well as the total number of journals (13,890 titles)², and it covers open-access journals.

The newly formed consortium approach of subscription of e-resources has not only drastically reduced the access charge for Indian institutions, but has also provided reliable and useful download data (web usage statistics) of e-resources to its member institutions. By analysing these data, one can easily find a correlation between downloads and publications, research productivity among individuals within a laboratory, institution or among different institutions of the consortium. Again, using these data and with the help of any citation database, the research impact of a paper can easily be ascertained and thus the visibility of a scientist, and so on.

In the Internet era, download counts or web usage statistics (i.e. how often a paper is downloaded) is an important measure of research impact. Although the number of downloads received by a paper may normally be taken as an indicator of the impact of the paper, it has also its limitations. There is no surety that all downloaded papers are consulted or used. If a paper is first published in digital form (available on the web) and later in print

form, then the statistics of the combination of both (i.e. download counts of the digital version plus citation counts of the digital and print version) can be taken as an important indicator of the impact of the research paper, and thus visibility of a scientist or laboratory or institution and even of a country. Normally, download and citation counts of a particular paper separately reflect the same level of impact. Otherwise, there is some doubt about the real impact of the paper.

Interestingly, Brody and collaborators³ showed that downloads and citations have a relationship from which the future citations of a research paper can be predicted. Moed⁴ reported a statistical relationship between downloads and citations. His study also reveals that there is about one citation for every 100 downloads.

Recently, Prathap⁵ finds that *approximately 825 to 1000 downloads of Elsevier articles led to one SCI publication* and reported (as pointed out by one of the directors of a CSIR laboratory) that *downloads and publications are directly proportional to the number of research scholars [or full time researchers] in each laboratory*. Indeed, the initial result is encouraging. However, it should be compared with the large download database of a good number of institutions of different disciplines and vis-à-vis other aspects of scientific communication process have to be considered before arriving at any final conclusion.

1. Shockley, W., *Proc. Inst. Radio Eng.*, 1957, **45**, 279.
2. Jain, N. C., *Curr. Sci.*, 2005, **88**, 331.
3. Brody, T., Harnad, S. and Carr, L., *J. Am. Soc. Inf. Sci. Technol.*, 2006, **57**, 1060.
4. Moed, H. F., *J. Am. Soc. Inf. Sci. Technol.*, 2005, **56**, 1088.
5. Prathap, G., *Curr. Sci.*, 2006, **91**, 1593.

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