Viewpoint

n-index: A novel and easily-calculable parameter for comparison of researchers working in different scientific fields

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Journal article publishing, as a measure of faculty scholarship, has historically been tracked as number of publications of a scholar. Thereafter, differentiation of peer-reviewed and nonpeer reviewed publications; discrimination between research publications and other types of scholarship such as review articles, case reports and letters to editor; and counting the number of the papers on which the academic was the first or senior author led to refinement of this evaluation process. Later, citation analysis improved the evaluation of journal article publishing, by considering the impact or usefulness of an academic's work by gauging the surrogate marker of how many times an article has been cited by other authors. Since then, The Institute for Scientific Information (ISI) began publishing citation data and the number of times an academic's papers had been cited in the literature which is known as impact factor and is widely used as a part of the metrics of scholarship assessment.[1] Nowadays, citation analysis is being increasingly used to evaluate the performance of different authors in the academic and scientific arena. The outcome of such analysis often plays a crucial role in deciding which grants are awarded and how applicants for a position are ranked.[1,2]

In recent years, several parameters have been proposed to analyze and quantify an academic's impact and standing in a particular discipline; one of these parameters is 'h-index'. After its proposal by Hirsch in 2005, this metric has soon found its place and currently many authorities prefer it as a substitute for the journal impact factor for assessing the researchers and research centers or even journals. For example, the Iranian Ministry of Health has recently decided to evaluate the faculties of Iranian Universities of Medical Sciences by comparing their 'h-index'.[3]

DEFINITION OF h-INDEX

A scientist has index h - if h of his/her N_p papers have at least h citations each, and the other (N_p-h) papers have no more than h citations each. In other words, a scholar with an index of *h* has published *h* papers, each of which has been cited by others at least *h* times. For instance, if a faculty member has an h-index of 30, the faculty member has published 30 articles, each of which has 30 citations.[4]

The advantage of the h-index is that it combines an assessment of both quantity (number of papers) and quality (impact, or citations to these papers). An academic cannot have a high h-index without publishing a substantial number of papers. However, this is not enough. These papers need to be cited by other academics in order to count for the h-index.[1,4,5] As such, the h-index is said to be preferable over the total number of citations as it corrects for academics who might have authored (or co-authored) one or a limited number of highly-cited papers, but have not shown a sustained and durable academic performance. It is also preferable over the number of papers as it corrects for papers that are not cited. Hence, the h-index favors academics that publish a continuous stream of papers with lasting and above-average impact.[1,4,5]

The h-index has been found to have considerable face validity. Hirsch calculated the h-index of Nobel Prize winners and found 84% of them to have an

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h-index of at least 30.[4] It is shown that on average the h-index for successful applications for postdoctoral research fellowships was consistently higher than for non-successful applicants. Faculty rankings in information sciences based on raw citation counts and on the h-index showed a strong positive correlation, but it is claimed that the h-index provides additional discriminatory power. Both the h-index and more traditional bibliometric indices are also related in a quite comparable way with peer judgments.[5]

The strongest indication that the h-index is becoming a generally accepted measure of academic achievement is that ISI Thompson has now included it as part of its new "citation report" feature in the Web of Science.[1,5] There are however several disadvantages in using this index,[1,3-5] which has engendered the proposal of other indices.[1,4,5] Most of these new indices still use h-index as their basis, and can therefore be regarded as revisions of h-index. For example, since the h-index is a less appropriate measure of academic achievement for junior academics because their papers have not yet had the time to accumulate citations, the m-quotient is proposed by Hirsch himself as the product of dividing the h-index by the number of years the academic has been active (measured as the number of years since the first published paper).[4] Other examples include g-index which gives more weight to highly cited papers[6] and creativity index which claims to measure an academic's creativity.[7]

An important problem that hampers a fair evaluation of scientific performance is field variation. Publications in certain disciplines are typically cited much more or much less than in others. This may happen for several reasons, including uneven number of cited papers per article in different fields or unbalanced cross-discipline citations. A paradigmic example is that the highest h-index for journals in the field of immunology (J Exp Med) is 269, while for the field of dermatology it is 103 (J Am Acad Dermatol), which is around 2.5 times smaller! Therefore, a dermatologist with an h-index of 5 is undoubtedly doing better than an immunologist with the same h-index, and awarding them the same prize would be surely unfair.

To circumvent this problem, Radicchi *et al*,[2] have proposed the use of the relative indicator $cf = c/c0$, where $c0$ is the average number of citations per article for the discipline. However, calculation of this factor is not easy, making it a rather nominal rather than a pragmatic index. Below, we would like to suggest a hitherto unexplained, very simple and easily calculable index for comparison of researchers working in different fields:

n-index = Researcher's h-index divided by the highest h-index of the journals of his/her major field of study (n is the first letter of Namazi).

This novel index can surmount the problem of unequal citations in different fields and can be easily calculated. SCImago Journal and Country Rank website is a portal that includes the journals from the information contained in the Scopus® database (Elsevier B.V.). The highest h-index for journals of a discipline can be easily obtained through "Journal Indicators" section of this interesting website.[8] Evidently, researcher's h-index can also be obtained through Scopus® database. Therefore, in the example given above, the n-index of the immunologist is approximately 0.02 (5/269), while that of the dermatologist is about 0.05 (5/103), clearly demonstrating the superior performance of the dermatologist. Therefore, a better prize should be awarded to the dermatologist. This novel index can also replace h-index in all proposed indices based on it, which, as mentioned earlier, are in fact revisions of h-index.

REFERENCES

1. Thompson DF, Callen EC, Nahata MC. New indices in scholarship assessment. Am J Pharm Educ 2009;73:111.
2. Radicchi F, Fortunato S, Castellano C. Universality of citation distributions: Toward an objective measure of scientific impact. Proc Natl Acad Sci USA 2008;105:17268-72.
3. Habibzadeh F, Yadollahie M. Read the articles: Don't count them. Arch Iran Med 2009;12:302-3.
4. Hirsch JE. An index to quantify an individual's scientific research output. Proc Natl Acad Sci USA 2005;102:16569-72.
5. Harzing AW. Reflections on the h-index. Available from: http://www.harzing.com/pop_hindex.htm. [accessed on 2010 Jan 13].
6. Egghe L. Theory and practice of the g-index. Scientometrics 2006;69:131-52.
7. Solar JM. A rational indicator of scientific creativity. J Inform 2007;1:23-30.
8. SCImago 2007. SJR- SCImago Journal and Country Rank. Available from: http://www.scimagojr.com/journalrank.php. [accessed on 2010 Jan 26].