Available online at www.elixirpublishers.com (Elixir International Journal)

Library Science

Elixir Library Sci. 80 (2015) 30860-30862

ISSN: 2229-712X

Normalized impact factor – nif (I_F)

Adedayo, A.V[1,2]

[1]Department of Materials Science and Engineering, Obafemi Awolowo University, Ile-Ife, Nigeria,

[2]Department of Metallurgical Engineering, Kwara State Polytechnic, Ilorin, Nigeria.

ARTICLE INFO

Article history:

Received: 24 January 2015;

Received in revised form:

10 February 2015;

Accepted: 2 March 2015;

Keywords

Inadequacies,

Citation,

Opinion.

ABSTRACT

This study developed a new framework for evaluating the impact of an article/author/journal. The importance of research evaluation is identified. The inadequacies of the methodologies presently used to evaluate impact of published research are also identified. A normalized impact factor which is a citation based metric tool is developed. The frequencies of citation of a reference within an article were used to determine the imaginary and the real impacts of the cited reference. The development of the normalized impact factor is based on the opinion that not all citations made in an article should count in the computation of the impact of a publication.

Introduction

Research evaluation and evaluations in general are very important activities used in deciding the performance of a number of human endeavours. The significance of research evaluation is paramount because of the increasing widespread roles it plays in very vital management decisions. Evaluation provides the management a systematic way of prioritizing, planning, managing, conducting and reviewing the outcomes of previous management decisions (NSW, 2012a; NSW, 2012b). Particularly, research evaluation helps in making good decision about what research to fund, by providing useful information about their effectiveness, efficiency, appropriateness and value (NSW, 2012a; Rossi and Freeman, 1993; Rossi, 2004). In the US and UK, promotion and grants receptions are now mostly based on impact ratings (Saha et al. 2003; Seglen, 1997; Lowy, 1997).

The prominent methodology used in research evaluation is the involvement of various types of citation analysis. Citation index can be used to compute the Impact Factor (IF), which is a measure of the frequency with which an article has been cited. There is Journal IF, Aggregate IF, Median IF, and Author IF (University of Alberta Library Guides, 2012).

Whilst IF has continued to be used prominently as an evaluation tool of publications (Sharma et al., 2013, Academia Publishing, 2013, Garfield, 1994, Garfield, 1972, Thomson Reuters, 2014), however, enormous inadequacies have been identified with the use of this tool, and the validity of evaluations carried out with this tool has been significantly queried persistently. Some of the inadequacies identified can be found in the following references: (Thomson Reuters, 2014; Rossner et al., 2007; Rossner et al., 2008, Editorial, 2005; The PLoS Medicine Editors, 2006; Adler et al., 2008, Seglen, 1997, Adedayo, 2013, Adedayo, 2014a, DoRA, 2013).

Specifically, the core principle of the IF methodology is the assumption that citation of an author/article/journal is an express indication of the approval of the cited source. This opinion in the general is not correct (Adedayo, 2013; Adedayo, 2014a,b,c; Neophytou, 2014). Often times, articles/authors/journals are cited to point out important conflicting ideas, or to identify errors outrightly.

Going by the aforementioned reasons, IF cannot adequately evaluate publications, and as a result, there is the need to develop a new robust metric tool to evaluate publications. Therefore, in this study, a Normalized Impact Factor – NIF (I_F) which is a citation based metric is developed.

Methodology

The NIF (I_F) is evaluated based on the impact of the cited reference in the article where the citation was made. The frequency of citation of a reference within the article is used. For example, an article which has been cited thrice is adjudged to have more impact than an article cited once. The impacts of the cited reference were classified as imaginary and real. Only citations made in sections consisting of the methodology, results, and discussion of results are considered real, since only these truly establish pertinence and approval of the cited source. The impact of citations made in other sections apart from the methodology, results, and discussion of results are considered imaginary. This idea was inspired from the works of Adedayo, (2013); Adedayo, (2014a,b,c,d). The NIF (I_F) is calculated by summation of the effective IF in all articles where the author/article/journal has been cited.

Derivation of NIF (I_F)

The Imaginary IF (F_I) is defined as thus:

$$\text{Imaginary IF} = F_I = \frac{f_{Ii}}{\sum_{i=1}^{n_I} f_{Ii}} \qquad (1)$$

Where f_{Ii} is the frequency with which author *i* has been cited in sections of the publication other than the methodology, results and discussion of result. $\sum_{i=1}^{n_I} f_{Ii}$ is the summation of the frequencies of citation of n_I authors cited in sections of the

Tele:

E-mail addresses: a.v.adedayo@outlook.com

publication other than the methodology, results and discussion of result. n_I is the total number of authors cited in sections of the publication other than the methodology, results and discussion of result. In the event where the NIF of an author is to be calculated from citation of an article of multiple authors, then a count of individual author is made.

The Real IF (F_R) is defined as thus:

Real IF = $$F_R = \frac{f_{Ri}}{\sum_{i=1}^{n_R} f_{Ri}} \quad (2)$$

Where f_{Ri} is the frequency with which author *i* has been cited in the sections which consist of methodology, results, and discussion of results. $\sum_{i=1}^{n_R} f_{Ri}$ is the summation of the frequencies of citation of n_R authors cited in the sections which consist of methodology, results, and discussion of results. n_R is the total number of authors cited in the sections which consist of methodology, results, and discussion of results.

The Effective IF (F_e) is calculated as the ratio of the Real IF (F_R) to the Imaginary IF (F_I). i.e.:

Effective IF = $$F_e = \frac{F_R}{F_I} = \left(\frac{f_{Ri}}{\sum_{i=1}^{n_R} f_{Ri}} \right) \left(\frac{\sum_{i=1}^{n_I} f_{Ii}}{f_{Ii}} \right) \quad (3)$$

To calculate the NIF (I_F) for an author based on total frequency of citations of all his cited publications, we calculate as thus:

NIF= $$I_F = \left(\frac{\sum_{k=1}^{P} F_{ek}}{N_I} \right) N_R \quad (4)$$

Where F_{ek} is the Effective IF of publication *k* of an author. *k* is an index to distinguish a specific publication of an author from the rest publications. *P* is the total number of publications of the author which have been cited. $\sum_{k=1}^{P} F_{ek}$ is summation of the Effective IF of all publications of the author which have been cited. N_R is the total sum of the frequency of citations of each publication of the author cited in sections which consist of methodology, results, and discussion of result. i.e.:

$$N_R = \sum_{k=1}^{P} f_{Rk} \quad (5)$$

Similarly, N_I is the total sum of the frequency of citations of each publication of the author cited in sections other than methodology, results, and discussion of results. i.e:

$$N_I = \sum_{k=1}^{P} f_{Ik} \quad (6)$$

Conclusion

A new citation based metric tool relevant in evaluation of research publication has been developed. The procedure for computing the new metric is robust and eradicates the inadequacies of the other citation based metrics.

References

Academia Publishing, 2013 'Impact Factor: Publishing Quality Articles in an Impact Factor Journals'. Available at: http://academiapublishing.org/pdf/impact%20factor%20and%20index%20copernicus.pdf

Adedayo, A.V; 2013 Downsides of Impact Factor as a Valid Criterion of Quality Publications, Poster presented at the 5th Qualitative and Quantitative Methods in Libraries International Conference, 4 – 7 June, 2013; "La Sapienza" University, Rome Italy

Adedayo, A.V., 2014a Downsides of Impact Factor as a Valid Criterion of Quality Publications, Elixir International Journal of Library and Information Science, **67**, pp. 21918 – 21920,

Adedayo, A.V. 2014b Proper Psychology for Performance of Publications, Research Journal in Organizational Psychology and Educational Studies, Vol. 3, No 4, pp. 327-329

Adedayo, V; 2014c Analogies between Football and Impact Factor in Academic Publishing, Available at: http://www.thesatirist.com/essays/Impact_Factor_Academic_Citations_Football.html

Adedayo, A V; 2014d Pricing de Solla Price's Circumvent, Advances in Research, Available at: http://www.sciencedomain.org/abstract.php?iid=757&id=31&aid=7079

Adler, R., Ewing, J., Taylor, P. 2008; Citation statistics. A report from the international Mathematical Union, Available at: www.mathunion.org/publications/report/citationstatistics0

DoRA, 2013 Declaration on Research Assessment. Available at: http://www.ascb.org/SFdeclaration.html

Editorial, 2005 Not so Deep Impact. Nature **435** pp.1003-1004

Garfield, E. 1994 Thomson Reuters Impact Factor,Available at: http://wokinfo.com/essays/impact-factor/#

Garfield, E. 1972 Citation analysis as a tool in journal evaluation, Science, **178** (4060), pp. 471- 479

Lowy, C. 1997 Impact Factor Limits Funding, *Lancet.* **350**(9083), pp.1035-1042

Neophytou, J. 2014 ; How to Navigate the World of Citation Metrics, Available at:http://exchanges.wiley.com/blog/2014/05/15/how-to-navigate-the-world-of-citation-metrics/

NSW, 2012a Programme Evaluation Guidelines, Notice to readers, Available at: NSW, 2012b Evaluation Policy, Notice to readers, available at:

Rossi, P.H. 2004, My Views of Evaluation and their Origins, Evaluation Roots: Tracing theorists views and influences, edited by Alkin, M.C., Sage Publications

Rossi, P.H.; Freeman, H.E. 1993 Evaluation: A systematic approach, Sage publications

Rossner, M., Van Epps, H., Hill, E. 2008 Irreproducible results: A response to Thomson Scientific, Journal of Cell Biology, **180**, pp. 254-255

Rossner, M., Van Epps, H., Hill, E., 2007 Show Me the Data, Journal of Cell Biology, **179**, pp. 156-159

Saha, S.; Saint, S.; Christakis, D. A., 2003 Impact factor: a valid measure of journal quality?, Journal of Medical Library Association; 91 (1), pp. 42–46,

Seglen, P.O., 1997 Why the Impact Factor of Journals Should not be Used for Evaluating Research. BMJ. **314** (7079), pp. 498–502

Sharma, A., Singh, H. P., Kaur, P., Gupta, I., 2013 Impact Factor: A Tool to Measure Quality of Research Articles. International Journal of Applied Research and Studies, **2**(6), pp. 1-4

The PLoS Medicine Editors, 2006 The Impact Factor Game. PLoS Medicine, **3** (6): e291, doi:10.1371/journal.pmed.0030291

Thomson Reuters, 2014 Thomson Reuters Statement Regarding the San Francisco Declaration on Research Assessment. Available at: http://researchanalytics.thomsonreuters.com/statement_re_sfdra/

University of Alberta Library Guides 2012 Available at:http://guides.library.ualberta.ca/content.php?pid=94850&sid=710345