



Framework for Deciding Effective Impact of Publications

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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Short Communication

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ABSTRACT

In this specific study, a new procedure for computing the impact of articles / authors / journals is made. Identification of importance of impact evaluations in general is presented. The inadequacies of the methodologies presently used to evaluate impact of published research are also identified. Inadequacies of the present impact metrics is used as justification to develop new impact metrics which are citation based metric tools. The new metric tools are article level metrics. 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 new impact metrics is based on the opinion that not all citations made in an article should have a positive count in the computation of the impact of a cited publication.

Keywords: Impact factor; citation; evaluation; research assessment.

1. INTRODUCTION

The goal of evaluation is to provide information that can help in the assessment of effectiveness,

efficiency and impact for evidence-based decision making. As a management tool, evaluation is key, and should be regarded as an excellent means to judge and understand impact.

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Evaluation methodologies and the provided information should be credible. Also, they should be analytical, systematic, objective, valid, reliable, issue oriented and user driven.

One method that has been prominently employed to evaluate impact in a number of academic endeavour is the involvement of various forms of citation analytics. In citation analytics, computations can be made to deduce the Impact Factor (IF). The methodology to calculate the IF is well documented [1-3].

Whilst IF has continued to be used prominently as an evaluation tool of publications [4-8]; 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[8]; Rossner et al. [9]; Rossner et al. [10], Editorial, [11]; The PLoS Medicine Editors, [12]; Adler et al. [13]; Seglen, [14]; DoRA, [15]; Adedayo, [16]; Adedayo,(a) [17]. Even Thomson Reuters [8] identified that virtually every aspects of the journal IF has been criticized aside from how it is calculated. However, now, [16-20] Adedayo, [16]; Adedayo, (a,b,c,d) [17-20] identify a fundamental error in the calculation of IF. 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 [16-21]. Often times, articles / authors / journals are cited to point out important conflicting ideas, or to identify errors outrightly.

In the light of the foregoing, it is clear that IF has not adequately evaluate impact of publications, and as a result, there is the need to develop a new robust metric tool for evaluation of publications. Therefore, in this specific study, rational knowledge is presented to develop new impact metrics. These are citation based metrics, which are the complex impact / complex index (C_i) and the quotient impact / quotient index (Q_i) are developed.

2. METHODOLOGY

The new impact metrics are computed 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. For most articles that are reports of empirical studies, the practical of the work reported actually starts from the methodology. Any sections written before the methodology are just to set a premise for the research. The pertinence, and therefore, the impact of citations made in these sections to the research being reported can only be imagined. This idea was inspired from the works of Adedayo [16] and Adedayo, (a,b,c,d) [17-20].

2.1 Derivation of New Impact Metrics

The Imaginary IF (F_I) is defined as thus:

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

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 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 impact 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:

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

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 complex impact/complex index C_i notation is expressed in the format of points coordinates, and is given as thus:

$$\text{Complex Impact} = C_i = (F_R, F_I) \quad (3)$$

The quotient impact/quotient index Q_i is calculated as the ratio of the Real IF (F_R) to the Imaginary IF (F_I). i.e.:

$$\text{Quotient impact} = Q_i = \frac{F_R}{F_I} = \left(\frac{f_{Ri}}{\sum_{i=1}^{n_R} f_{Ri}} \right) \left(\frac{\sum_{i=1}^{n_I} f_{Ii}}{f_{Ii}} \right) \quad (4)$$

To calculate the impacts (C_i and Q_i) for an author based on total frequency of citations of all his cited publications, we calculate as thus:

$$C_i = \sum_{k=1}^P (F_R; F_I) \quad (5)$$

$$Q_i = \frac{\sum_{k=1}^P Q_{ik}}{N_I} N_R \quad (6)$$

Where Q_{ik} is the quotient/effective impact 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. $\sum_{k=1}^P Q_{ik}$ is summation of the quotient/effective impacts 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.:

$$N_R = \sum_{k=1}^P f_{Rk} \quad (7)$$

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:

$$N_I = \sum_{k=1}^P f_{Ik} \quad (8)$$

3. CONCLUSION

New citation based metric tools relevant in evaluation of impact of publication have been developed. The complex impact is way to make juxtapositional comparison of the real impacts and the imaginary impacts of citations, while the quotient impact expresses the effective impact of a cited source. The procedure for computing the new metrics is robust and eradicates the inadequacies of the other citation based metrics.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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