Qeios

Peer Review

Review of: "Measuring researchers' success more fairly: going beyond the H-index"

Farid O. Farid[1]

1. Independent researcher

Referee Report on the paper "Measuring researchers success more fairly: going beyond the H-index" by **G. Formoso**.

The report is written by **Farid O. Farid**

Please see the supplementary report (formoso-report.pdf).

1. **Title:** Please notice that the phrase "h-index" is more commonly used than the "H-index". The referee suggests the use of the first phrase throughout the paper.

2. **Abstract:** The author states in the second paragraph: "In order to show that fairer criteria to assess researchers' scientific impact can be achieved, ...".

Comment from the referee: There are already several measures, which are considered fairer than the h-index, they include, for example, the g-index put forward by L. Egghe [1][2], and the relatively new measure, the research excellence index, simply known as the RE-index, introduced by Farid O. Farid in [3]. (Note that the g-index appeared first in the reference [1], while some Internet sources mistakenly and unfairly identifies the reference [2] as the reference where the g-index appeared.) The paper [3] contains a detailed description about the flaws of the four research performance indicators: publication counts, citation counts, and the h and g indices. Therefore, the sentence by the author needs to change; something like: We introduce an example to show the need for a fairer research performance indicator than the h-index. Fairer research assessment measures than the h-index were introduced by some

researchers, they include the g-index [1][2], and the research excellence index, simply known as the RE-index, introduced by Farid in [3].

3. **The third paragraph in the Abstract:** The referee suggests replacing the phrase "easy math" by "relatively simple math". The same suggestion applies to any use of the phrase "easy math" throughout the paper.

4. **The First paragraph on page 2:** The author presents a somehow vague definition of the h-index. Also, the phrase "published in indexed journals" in the definition is ambiguous. The referee does not believe that the original definition introduced by Hirsch included the word "indexed". Also, "indexed" here needs to be defined in relation to what database used in recording the citation. Well-known database sources for recording research and citations include Scopus, Clarivate Analytics, and Google Scholar (the most unreliable among the 3 database sources). The referee suggests to drop the phrase "indexed journals". In fact, citing sources of articles in journals are, in general, academic publications. An academic publication could be either a book, a book chapter or a paper, please see the definition of an academic publication in subsection 1.2 of [3] (the 3rd page in [3]). Also, please notice that a very accurate mathematical definition of the h-index is given in the 3rd page of [3]. The author may like to copy the definition of the h-index as given in [3]. Furthermore, in the numerical example to explain the h-index, the author states: "For example, a researcher with H-index =20 means he/she published 20 articles having at least 20 citations" **needs to slightly change to** "For example, a researcher with h-index of 20 means that he/she published 20 articles with each having at least 20 citations."

5. **The second paragraph on page 2:** The author gets into a very contentious issue about "researcher's success" and "research funding". The issue of research funding could be political and decided by incompetent individuals or dark forces linked to academia. The author could still keep most of the contents of this paragraph as is, **except there is a need to clarify the phrase between the parenthesis.**

6. **The third paragraph on page 2:** In regard to the contribution of the authors, it is NOT usually the case that the position of the author in the authors' list is an indication of the author's contribution. In some journals, the corresponding author could be the leading author, but no information could be deduced about the roles of the other authors. This issue could be quite complex to accurately determine who the leading author is (if it is only one) and what the roles of the other authors are. For example, an author in a more privileged position may want to be listed as the leading author using

the methodology recognized by his/her institution, while the roles of the other authors, including the "*real*" leading author are not determined. There are also the issues of "*guest*" and "*ghost*" authors. Some journals require the authors to state clearly the role of each author in a joint paper. But who could guarantee that such information are credible? If the author would like to rank the authors in a joint paper, the referee suggests a somehow vague statement on ranking the authors like: We assume that a consensus has been reached on a methodology to rank the authors of a joint paper; such methodology could be based on the "declared roles" of each author of the joint paper.

7. **Another flaw of the h-index (the third paragraph on page 2):** The h-index also fails to distinguish between **positive citations** and **negative citations**. Negative citations are ones, where the citing source finds flaws in the cited source.

8. **Another flaw of the h-index (the third paragraph on page 2):** The h-index fails to consider the number of pages a paper has. Is it fair to rank equally two citing (or cited) papers A and B in the same field, where the papers share the same number of authors and were published in the same journal with the same impact factor, but paper A is 3 pages long while paper B is 30 pages long?

9. **The first paragraph on page 3:** The author talks about using Clarivate Analytics and its impact factor score for journals as the database source and journal score, respectively. The referee thinks that there is a need to clarify whether the 2-year or 5-year impact factors are used. Also, please notice that the database source Scopus and the corresponding Scimago Journal Rank score, simply known as the SJR score, are usually considered as superior alternatives, please see Section 2 in [3]. The referee derived in [3] a complex database source that is made up of data in (i) Scopus, (ii) the Library of Congress (in the US) and (iii) data in venues, which are indexed by Clarivate Analytics and became indexed by Scopus at later dates. Feature (iii) was adopted to deal with the main drawback of Scopus, the depth of stored data. Here is a web page about the SJR score for Math journals:

   ○ https://www.scimagojr.com/journalrank.php?area=2600

10. **Nature of ranking researchers:** After reading the paper carefully, the referee believes that the author focuses mainly in ranking research on the following aspects:

    • Number of citations and (possibly) their quality.

    • The only type of publications the author considers is papers.

Comments from the referee:

i. One philosophy in accessing research is to depend on the notion: "Research has a value when it is cited". However, this notion has deep flaws. It is not necessarily true that outstanding research

receives citations. In the pure sciences, like pure mathematics, a small percentage of published papers in a highly prestigious journal could attract most citations in the journal, others papers could be highly valued in regard to their sophistication or their contribution to a particular area. To explain the latter point, a research paper may completely solve a problem and this would close any other prospect for further research done on the problem. Such a paper may not attract many, or any, citations because there is no more to discuss. But the paper itself could be regarded from the academic point of view as significant. So, to provide a fairer research performance indicator, a score needs to be given to the output of a researcher, including the quality of such output (with an appropriate definition of "quality"). On the other hand, the consideration of this aspect could make the research performance indicator harder to calculate.

ii. There are other types of citing academic publications, please see item (4) in this report. Books, as citing academic publications, could cite many academic publications and they (themselves) could attract a huge number of citations.

iii. There are different types of papers; research papers, case studies, methods, survey papers and letters. Furthermore, the venues where papers appear are different as well. There are papers published in scholarly journals; papers published in book series; papers presented in conferences or similar gatherings related to computer science; and papers presented in conferences or similar gatherings that are not related to computer science. The distinction between Computer Science and Non–Computer Science conferences is essential as the former group is valued highly in a topic progressing at a very high rate. The quantitative and qualitative aspects of all these factors need to be considered. But, again, the calculation of the research performance indicator could be an immense task.

11. **Methodology (Contents of the paper under the heading "Some (simple) math" in pages 3–5 of the paper):** With n being the number of authors in a paper, the referee, who is a mathematician, had initially a hard time understanding what the equation $ny - \frac{(n-1)n}{2}x = z \qquad (1)$
meant. **After reading carefully the methodology of assigning the score for (each) author of a paper, the referee is convinced that the methodology should NOT start with setting equation (1) in this report.** Furthermore, the methodology used by the author for ranking the authors in a joint paper may not be accurate, please see item (6) in this report. But, this could be dealt with in the case of a joint paper as explained in the contents that follow in Case 2.

The referee strongly suggests that the author changes the contents of this part of the paper (including removing what the author called boxes) to something like what is stated next:

Let z be the citation score of the paper ($z > 0$). (It is either the number of citations or through a more qualitative score taking into account the prestige of the citing journal; the author needs to determine this before writing the final version of the paper, the author should not show uncertainty as clearly evident in the copy of the paper the referee is reading.) The score of the author depends on whether the paper is a joint paper or a 1-author paper. We consider each case separately.

Case 1: Joint Paper. Assume the joint paper has n authors and that a consensus has been established on ranking all the authors and each author has been assigned a distinctive ranking, that is, no tie among the authors. For $i = 1, \ldots, n$, the score S_i of the ith ranked author is given by

$$S_i = \frac{bz}{n} - (i-1)x \qquad (2)$$

where b is a positive constant to be determined, and x is another positive constant to be determined from the conditions:

$$bz - \frac{n(n-1)x}{2} = z \qquad (3)$$

and

$$(n-1)x < \frac{bz}{n} \qquad (4)$$

(The last condition is equivalent to stating that the score S_n of the last ranked author is positive.) Equation (3) is equivalent to

$$x = \frac{2z(b-1)}{n(n-1)} \qquad (5)$$

Then from x, z and b being positive real numbers, we deduce that

$$b > 1 \qquad (6)$$

From (4), (5) and $z > 0$, we infer that $b < 2$. So, from (6), we see that the condition on b is:

$$1 < b < 2 \qquad (7)$$

(Note that there are some inaccuracies in the author's calculations.)

Case 2: 1-author Paper. The score of the author is given by

$$S_1 = bz \qquad (8)$$

where b is a positive constant. (Again, the author needs to determine what value b should be in this case. But it should be consistent with the value of b chosen through the upper and lower bounds in the case of a joint paper, see (7) in this report.)

Remarks on the Previous Analysis and Other General Remarks:

- The separate classification of joint papers from 1-author papers avoid some unpleasant situations, like making mistakes that stem from dividing by zero.

- With $y = \frac{bz}{n}$, equation (3) is equivalent to

  $$y + y - x + \cdots + y - (n-1)x = z$$

  This follows by observing that

  $$\sum_{i=1}^{n-1} i = \frac{(n-1)n}{2}$$

- The case where there is a tie among some authors in different positions of the ranking in a joint paper could also be considered. But the formulas for the scores will be considerably more complex than the case when there is no tie in the ranking of the authors.

- The author seems to mix the number of authors n with the number of citations, see the last line on page 3 and box 1 in the paper. Also, the last formula in Box 1 is poorly written from the mathematical aspect as it could lead to confusion, and the previous formula is not coming right in the PDF document.

Final brief Comments:

i. The author should look at two extremes: The h-index is a very simple measure to calculate, but it has immense flaws and has profound negative consequences on academia. It is quite troubling that it is used to allocate research funding and to rank researchers. On the other hand, the RE-index [3] is a much fairer research performance indicator than the h-index, but its evaluation is an immense task, see the appendix in the online copy of [3]. The author should aim for a research performance measure that is somewhere between these two extreme research performance indicators. It is quite troubling that the popularity of the g-index is nowhere near the h-index, despite the fact that the g-index is relatively simple to calculate and is considerably fairer research assessment measure than the h-index.

ii. The author should acknowledge the limits of the measure they introduce in relation to the RE-index. This report sheds some light on the limits of the research performance indicator introduced in the

paper, see, mainly, items (4) and (10) in this report.

iii. The paper is publishable if some of the items of this report are taken into serious consideration in the modified version of the paper, especially items (4), (6)–(9), (10) and (11).

References

1. a, b, c *Egghe, L. (2006). An improvement of the h-index: The g-index. ISSI Newsletter, 2(1), 8-9.*

2. a, b, c *Egghe, L. (2006) Theory and practise of the g-index. Scientometrics 69, 131-152.*

3. a, b, c, d, e, f, g, h, i, j, k *Farid O. Farid (2021). On a New Index for Research Assessment. J Inf Sci Theory Pract 9 (3): 56-75.*

Attachments: available at https://doi.org/10.32388/WFGRQQ

Declarations

Potential competing interests: No potential competing interests to declare.