Effectiveness and Quantification of Research Articles and Research authors through Indexes and Metrics

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Abstract: The word "Research" means 'searching again and again' is used in order to solve problem faced in day today activities as well as make world a better place to live. A number of research articles are submitted and published on day basis. The quality of research in the research article and to find most eminent researcher, certain indexes and evaluative metrics are used. These indexes not only help to evaluate research work and researcher, but also help naïve researcher to continue the regime of research. Citation, referencing and plagiarism are often used words with research. The article covers sources, ways and tools used for doing citation, referencing, checking plagiarism and issues and challenge faced in indexing. In this article SCI (Science Citation Index, SCIE (Science Citation Index Expanded) and H-index (Hirsch-Index) are discussed in detail. The article will also answer the top journal used in computer science and engineering discipline.

Keywords: SCI, SCIE, Indexing, Citation, Plagiarism, referencing, h-index.

1. INTRODUCTION

The evaluation of research paper is very long and tedious job. In order to simply the work naïve researcher, reviewers and eminent scientist look for certain metric to identify the quality of research work and researcher. These metrics includes indexes for identifying researcher background. Citation is used to check the popularity of the researcher Article. There are two kind of indexes. First one is used to identify eminent researcher and these indexes includes h-index, g-index, i10-index and e-index. Usually a single research article is contributed by many authors. So, In order to evaluate the quality or work presented in the research article is categorised into further three indexes. These indexes include google scholar, Scopus, SCI, SCIE, ESCI DBLP etc.

This paper basically shed a light for naïve researcher to differentiate between the indexes and What are the major term included in writing a good research paper. Section 1 contains H-index overview with comparative analysis with g-index i-index and e-index and drawback of H-index. Section 2 contains brief description on google scholar, Scopus, SCI, SCIE indexes with pointing out the drawbacks of SCI journals. Section 3 introduces the top 10 journals of Computer science engineering journals. Section 4 discuss the Issues and challenges involved in evaluating the research work of Scientist.

2. LITERATURE SURVEY

2.1. Author level Metric

2.1.1. H-Index (Hirsch index)**:** It was proposed by J.E. Hirsch.The impact of a particular scientist can be measured with the help of this index. The calculation of h-index involves number of publications of a scientist that received 'h' or more citations for each 'h' publication.This could be understood with a scenario in which a scholar with an h-index of 10 had published 10 papers, each of which has got cited at least 10 times.The h-index of an individual's may very from one database to another. This different lies as the databases index different journals and which covers different years from when they are originated. For Example, Scopus considers work from 1996 or later, while the WoS (Web of Science) calculates h-index using all years since 1965.

How to calculate H-indexbasic Metrics followed by Perish or Publish:

1) **Total number of papers published by author:** This involves the number of papers returned by Google Scholar in reply to a query.

2) **Total number of citations research paper achieved:** The sum of the citation of all the published paper of author.

3) **Calculation involves average number of citations per paper:** The total number of the all citation across all papersdivided by the total number of research papers published. The median and mode are also calculated.

4) **Research Paper having MultipleAuthors**: For such papers number of citations per author is calculated.To calculate this parametereach paper and its citation count is divided by the number of authors.This, will give normalized citation count per paper. The normalized citation counts are then summed for all papers and this

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will give the number of citations per author over the result set.

5) **Year-wise citations per author:** This is the number of citations per author divided by the number of years covered by the result set.

6) **Calculation Normalized author count:** For each and every paper, 1/author count is calculated to evaluate the normalized author count for the paper. The counts are summedfor all papers to give the number of papers per author.

7) **Need to calculate average number of authors per paper**: The sum of the author counts across all papers,

divided by the total number of papers. The median and mode are also calculated[1, 2, 7].

Tools available for finding H-Index-- Finding h-Index using Publish or Perish

1. With the help of Publish or Perish site which uses data of Google Scholar h-index can be calculated easily.Google Scholar contains citation metric.

2. Publish or Perish is available with Windows and Linux formats. This can be downloaded at free of cost from the Publish or Perishwebsite.

3. By simply entering author name h-index can be calculated.

TABLE 1: Comparison of H-index, g-index, i-index and e-index

Metric/Indexing Type	h-index	g-index	I-10 index	e-index
Author	Jorge Eduardo Hirsch [8]	Egghe, L. [6]	Google scholar	Chun-Ting Zhang
Year	2005	2006		2009
Evaluation of Researcher	combines an assessment of both quantity (number of papers) and an approximation of quality)	looks at overall record	i10-index indicates the number of academic publications an author has written that have been cited by at least ten sources	The aim of the e-index is to differentiate between scientists with similar h-inds but different citation patterns. Improvement on h-Index
Impact	favors academics that publish a continuous stream of papers with lasting and above-average impact.	g-index allows highly-cited papers to bolster low-cited papers	------	Cover the information Loss in H-Index
Tools	Google scholar & Web of Science, Publish or Perish	No tool	Google scholar	Publish or Perish

h-index rewards consistent stream of high-impact publicationsAn 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 in order to count for the h-index. Hence the h-index favours academics that publish a continuous stream of papers with lasting and above-average impact.

2.1.2. g-index
The g-index is calculated based on the distribution of citations received by a given researcher's publications. Articles are first arranged in a descending order and the number of citations are

calculated. The g-index is the unique largest number which top g-articles have received. It looks at overall record. A g-index of 20 means that the academician has published at least 20 articles that combined have received at least 400 citations.g-index allows highly-cited papers to bolster low-cited papers. Roughly, *h* is the number of papers of a certain "quality" of citations having a threshold and thisthreshold rises as h rise whereas*g* allows citations from higher-cited papers to be used to bolster lower-cited papers in meeting this threshold. Therefore, in all cases g is at least h, and is in most cases higher. However, unlike the h-index, the g-index saturates whenever the average number of citations for all published

papers exceeds the total number of published papers; the way it is defined, the g-index is not adapted to this situation[6].

2.1.3 e-index: It **is** for evaluating highly cited scientists for comparing precisely the scientific output of a group of scientists having an identical *h*-index.

2.1.4 i-index: i10 index was introduced by google in July 2011 for google scholar. The h-index is having strong discipline bias. The i10 index shows authors publication which are cited atleastby ten sources.

2.2. *Journal Level Metric*

2.2.1. SCI and SCIE: The Science Citation Index was firstly introduced by Malim in 1968 [6]. It was originally designed as retrieval tool, which was reported to be very effective.In 1972, first Science Indicator report is generated. The goal of this effort is to set indices which help in identifying strengths and weakness of U.S. Science and Technology.SCIE is the largest version of Science Citation index that covers over 8, 500 journals across 150disciplines.SCI Science Citation Index), SCIE (Science Citation Index-Expanded) and SSCI (Social Science Citation Index) are most cited databases. The assessment and evaluation of journals is done on the bases of journal impact factor(JIF) or shorter impact factor (IF) given by Garfield in 1955.*WoS*is the electronic version of SCI which links author publication by journal or by citation[7].

2.2.2. Impact factor: They are used to compare the popularity of journal by calculating the number of citations of last two year. The journal having larger the impact factor will be ranked higher. It is also one tool to compare journals in a subject category[7].

Calculation used for calculating Journal Impact Factor

$$IF_y = \frac{\text{Citations}_{y-1} + \text{Citations}_{y-2}}{\text{Publications}_{y-1} + \text{Publications}_{y-2}}$$

Pointers

1. Not all journals have impact factors. They must be indexed in *Web of Science* to have an impact factor

2. A journal has only one impact factor, but it may be listed in more than one category

3. A journal impact factor should not be looked at in isolation, but in comparison to other journals in the same category

4. Impact factors vary across disciplines

5. A five-year impact factor may also be used in some disciplines.

Impact factors can be used to:

- identify journals in which to publish

- identify journals relevant to your research

- confirm the status of journals in which you have published.

2.2.3. Difference between SCI, SCIE and ESCI
SCIand SCIE journals have equal importance as evaluation criteria and acceptance criteria of both the journal is same. One major difference between the SCI and SCIE is that all journals of SCI are available in SCIE but reverse is not true. Difference lies in storage media, Because of space constraint in SCI a few papers are stored. This SCI journals are available in CD/DVD Format only. In contrast with SCI, all SCIE journals are available online[4, 10].

ESCI (Emerging Sources Citation Index): It is also a citation index started in 2015 by Thomson Reuters and further accepted Clarivate Analytics. It supports peer-reviewed publications of regional field having scientific importance. ESCI as compare to SCI and SCIE has less popularity and weightage.

2.3 *List of some known databases[4]*

S. No	Databases
1	SCI (Science Citation Index)
2	SCI-E (Science Citation Index, Expanded)
3	SCI (Social Science Citation Index)
4	A&HCI (Arts & Humanities Citation Index)
5	Scopus (EU)
6	Google Scholar (GS)
7	ProQuest CSA (SAD)
8	Index-Copernicus (Poland)
9	IEEE Explore (USA)
10	ESCI (Emerging Sources Citation Index)-2015
11	Directory of Open Access journals (DOAJ)
12	SCIndeks (Serbia)

3. ISSUESAND CHALLENGES

3.1 *Issues Involved in Indexes which evaluate researcher impact*

3.1.1 The h-index is less responsive to low cited and highly cited papers of the researcher.

3.1.2. The indexing does not support researcher having one big contribution to the society. So, a scientist with low number of papers having high citation will be having less h-index value.

3.1.3 Naïve researcher having very good research will not get good H-index score[1].

3.2 *Issues Involved in indexes which evaluate research article Impact*

3.2.1 SCI (Science Citation Index) as a data source for indicators of International scientific activity limits its dimension to English-speaking Countries.

3.2.2 The coverage of SCIappears to be incomplete in case of journals for the countries with non-Roman alphabets and Soviet.

3.2.3 It covers only 10 %of the journals listed in BLLD (British Library Lending Division)This library does exhaustive coverage of world scientific literature[3].

4. RESEARCH DATABASE FOR COMPUTER SCIENCE AND ENGINEERING.

S.No	Journal/Database Name
1.	IEEE Xplore
2	Springer
3	Elsevier (Science-direct)
4	Taylor and Fransis
5	Wiley
6	World Scientific
7	Plos
8	ACM(Association of Computing)
9	IOS (Integrated Computer aided Engineering)
10	UCLA (Journal of Statically Software)

5. CONCLUSION

In order to differentiate between effective and commutable research and researcher we definitely need indexes. The library and the journals databases need to enlarge their scope in terms of countries participation and language. There should be a criterion in h-index which promote researcher having less papers with high citation value.

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