



# Detailed Analysis of Bibliometrics and its Features: A Study

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## Abstract :

Bibliometrics and scientometrics are novel closely related scientific fields measuring and analysing scientific publications in a certain area. In this paper describes some of the challenges for bibliometrics methods, characteristics and limitations of citation indicators, publication indicators, citation indicators, Journal indicators. Bibliometrics can provide important insights into the research directions by providing summarized information for several end users.

**Keywords :** Bibliometric analysis Research trend Systematic review Scientometric analysis

## Introduction

Bibliometrics, a term coined by Pritchard in 1969, may be a degree utilized to get it the yield and affect of logical communication. Distributions and Citations are the two vital factors regularly utilized in bibliometrics. Bibliometrics has ostensibly given ways and implies of benchmarking and assessment of academic work. In later a long time bibliometrics has been a developing field of intrigued in Library and Data Science, yielding to different resultant variables in rankings and choice making handle in library administration and data administrations to the users. For illustration the quotation investigation is additionally utilized as one of the strategies utilized in client thinks about.

Bibliometrics – as a strategy and as a teach - has gotten a more noteworthy bargain of importance since its germination or beginning. One of the critical angles of the expanding intrigued in bibliometrics, within the libraries as well as in the scholarly world in common is the increasing utilize of bibliometric markers to assess inquire about execution of workforce and analysts, “especially within the college and government research facilities, additionally by policymakers, inquire about chiefs and chairmen, data masters and curators and analysts by themselves” (Pendlebury, 2009). The objectivity with which the evaluations can be made and repeatability of the investigations are fundamental reasons for its ubiquity. Other reasons, for tolerating bibliometrics as a estimation instrument, is its being relatively inexpensive in terms of time,

cash and exertion in its ponder, and given a great information source is made accessible. Adaptability is one of the most preferences of bibliometrics as a apparatus. In other words, it can be connected from a smaller scale level, i.e., an person analyst or an established, to a large scale level, i.e., nation or worldwide level. Capacity for comparative investigations – worldly, geographic, etymological, biographic, etc. – in bibliometrics has drawn the consideration of numerous researchers. It has been all around acknowledged as an perfect strategy for assessing the research efficiency.

The utilize in library organization and administration is one of the early applications of bibliometrics. Utilize of bibliometrics in collection development and administration in libraries could be a well known hone, not the least in connection to advanced library administration. As a understudy of Library and Data Science (LIS), you'd be interested to know that bibliometrics could be a well-established portion of LIS inquire about. There has been an increment within the number of inquire about exercises by the LIS calling in later a long time (Naseer and Mahmood, 2009).

Not everything is green for bibliometrics. It has gotten a few reactions as well. Whereas bibliometric information bring valuable data, the usage regularly appears to emerge from a misfortune of basic and judicious intellect and application. In this Unit an endeavor is made to recognize and to get it the impediments of bibliometrics considers.

### **Publication Indicators**

**Number of Publications:** It is the number of publications published either by an author, institute, country or so on. The time span is also taken in many situations to suit the temporal scope. The data is collected either directly from the original publications from databases. It is relatively easy to collect data. Although this count is a very straightforward indicator that can be easily calculated by the authors themselves, one must be very careful when using it to compare authors or research groups. The disadvantages of this indicator are: when used does not take the size of the analysed unit; and does not speak of the impact of the publications counted.

**Number of ISI Publications:** It is the number of publications indexed by Thomson ISI indices. Temporal and geographic filters are applied many a times in many studies.

Quite easy to collect data as it can be directly collected from the databases. The disadvantages are: when used does not take the size of the analysed unit; has inherent problem of scope and coverage as that of ISI indices; and does not count non-ISI publications.

**Number of Publications in Top Journals:** It is the number of publications the analyzed unit has published in a selected number of journals during the analyzed time span. The selection of journals is usually made on some criteria. The advantage is that as the data is collected from top journals (which show their relative importance among others in the group); it is a better count than a mere publication count. The disadvantages are: does not take the size of the analyzed unit into account; and has the limitations of the selection criteria. Although this approach may look like a performance indicator, it was designed to address the shortcoming of the above-mentioned quantity indicator.

## Citation Indicators

**Number of citations:** It is the total number of references received from other works, i.e., number of citations to articles published by an analyzed unit during the analyzed

time span. The citation of one article by another is characteristic of scientific publications, and it is generally accepted that the number of citations of a particular article receives is a reflection of its impact in the scientific community (Rhen, 2006). The data has to be collected

from the citation databases such as Thomson Reuters Web of Knowledge, Scopus, Google Scholar, CiteseerX and so on. As collected from databases, data and results are verifiable. Limitations of this indicator include: it does not take into account older articles as usually are more cited and that citation rates vary between document types and subject areas; and does not compensate for size of the unit.

**Citations per publication:** It is the average number of citations to articles published by an analyzed unit during the analyzed time span. It is calculated by the ratio of total publications and dividing by the total number of publications considered. The limitations are: Does not take into account that older articles usually are more cited if a variable, cumulative citation time window is used, and that citation rates vary between document types and subject areas.

**Field Normalized Score:** This indicator corresponds to the relative number of citations to publications from a specific unit, compared to the world average of citations to publications of the same document type, age and subject area. It is calculated as follows: The number of citations to each of the unit's publications is normalized by dividing it with the world average of citations to publications of the same document type, publication year and subject area, which is called the field reference value ( $\mu_f$ ). If an article is classified as belonging to several subject areas, a mean value of the areas is used. The limitations include if the normalization is done on an article level, a few highly cited articles in a moderately cited research area may contribute un-proportionately to the value of the field normalized citation score.

**Total field normalized citation score:** This indicator gives an indication of both the impact and the production volume of the analyzed unit. The score is got by adding together the item oriented field normalized citation scores for all the publications of the analyzed unit. The disadvantage is that it does not compensate for the size of the analyzed unit.

**Journal normalized citation score:** This indicator corresponds to the number of citations to publications from a specific unit during an analyzed time span, compared to the world average of citations to publications of the same document types, ages and in the same journals. The calculation is as follows: the number of citations to each of the unit's publications is normalized by dividing it with the world average of citations to publications of the same document type, published in the same year in the same journal. The indicator is the mean value of all the normalized citation counts for the unit's publications.

**Crown indicator:** It is developed by Center for Science and Technologies Studies at Leiden University. It intends to measure the scientific impact of a researcher or a research group. This indicator is calculated by dividing the

average number of received citations (from a researcher or a research group) by the average number that could be expected for publications of the same type, during the same year, and published in journals within the same field (Lundberg, 2007). It has a few flaws also.

First, its dependence on categories published by Thomson Reuters leads to a problem that it does not take into account that publications from a particular field are often published in journals categorized in another field. Second, the size of a research group influences its productivity — quite simply, the more researchers in a group, the larger the number of published articles. It is therefore recommended to compare research groups with the crown indicator only if the groups are of similar sizes (Lundberg, 2007).

**h-index:** The h-index is an index that attempts to measure both the scientific productivity and the apparent scientific impact of a scientist. J.E. Hirsch introduced it in 2005 and defined it in the following way: “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 at most h citations each”. The ‘Web of Science’ now gives direct access to the H index in a few mouse clicks. It is calculated as follows: find the

unit’s published articles in a citation index and sort them in descending order by number of citations. Count articles from the top of the list and downwards, and when the number of an article rises above the citation count for that very article, the number of the preceding article is to be counted as the h-index. H-index is criticized as it gives positive bias to senior researchers with older articles, since these have had more time to be cited, though the demand that new articles with comparable citation levels has to be added has a certain damping effect on that bias.

**Uncitedness:** It is the share of a unit’s publications that that remain uncited after a certain time period. Self-citations should be removed from the citation count. It requires data from a comprehensive citation database such as the Thomson citation indices and validation of the unit’s publications.

**Self-citation:** occurs in an article when an author references another of their own publications. This can be a legitimate way to reference earlier findings; but self-citations can sometimes be unduly made in attempt to inflate an individual's citation count. count the total number of citations to the unit’s publications during the analyzed time span. Check where citations are coming from and count the number coming from the unit itself. Divide the second number with the first to get share of self citedness. The requirement for getting self-citation is that it requires data from a comprehensive citation database such as the Thomson citation indices, validation of publications and analysis of citing articles, which can be done in the ISI Web of Science.

## Journal Indicators

**Impact factor:** The impact factor (IF) or journal impact factor (JIF) of an academic journal is a scientometric index calculated by Clarivate that reflects the yearly measure reflecting the average number of citations to recent articles published in the journal and intended to gauge the importance of a journal in its given field. It is perceived that higher impact factor of a journal more important it is in that field than those with lower ones. The impact factor was devised by Eugene Garfield, the founder of the Institute for Scientific Information. Impact factor is calculated yearly for those journals that are indexed in the Journal Citation Reports. IFs are available in the SCI

(Science Citation Index) Journal Citation Reports and on the Web of Knowledge for more than 8000 selected scientific journals. The IF does have several limitations (Durieux & Gevenois, 2010). First, although a higher IF can suggest a greater impact of a journal, it does not reflect the quality of each particular article published by that journal. Consequently, it is not clear whether a high IF is due to a moderate degree of citation of all of the articles published or to a high degree of citation of only some articles. Second, multidisciplinary journals usually have a higher IF than specialized journals. Third, there are differences between research fields, including in research intensity. The highest ranking journal in each specialized field may have a very different IF from specialty to specialty. Fourth, the types of articles published by a journal also influence its IF. Review articles and technical reports are more frequently quoted than are original research articles, case reports, and pictorial essays.

**Normalized Journal Impact Factor:** This indicator corresponds to the relative number of citations to publications in one specific journal, The Journal Normalized Citation Impact of a single publication is the ratio of the actual number of citing items to the average citation rate of publications in the same journal in the same year and with the same document type. The JNCI for a set of publications is the average of the JNCI for each publication. compared to the world average of citations to publications of the same document type, age and subject area. The indicator is stated as a decimal number that shows the relation of the number of citations to the world average. As an example, 0.9 means that publications in this journal are cited 10% below average and 1.2 that they are cited 20% above average.

**Immediacy Index:** The Immediacy Index is the average number of times an article is cited in the year it is published. It indicates how quickly articles in a journal are cited. It is published annually by Thomson Reuters in Journal Citation Reports. It is an indicator which measures the current importance of the work published by a journal by calculating the average number of times articles published during a particular year by a specific journal is cited over the course of that same year. The immediacy index is useful for identifying the journals publishing the articles in the emerging areas. It is said that immediacy index has an unintended bias towards articles published in the earlier part of the year as they would have better and more chance to get cited than those articles published later in the year.

**Journal-to-field impact score:** The journal-to-field impact score has been proposed by the Center for Science and Technologies Studies of Leiden University (Leiden, the Netherlands) as an alternative to the IF. It measures the average number of cited articles in a specific journal and compares this number with that of other journals in the same research field category. The field categorization of journals is based on the journal subject categories, which are defined by Thomson Reuters. By ranking journals in a given subject category, this score overcomes the limitations of IF related to research field characteristics such as productivity, citation habits, and citation dynamics

## Conclusion

Bibliometric and Scientometric investigation are based on numerous pointers. These pointers look for to degree the amount and affect of investigate distributions. The pointers are utilized progressively in assessment forms in colleges, and open and private inquire about establishing. Each of these pointers has its possess merits and restrictions. Translated as thorough measures of scientific/research yield, the markers would display a one-sided

story. In any case, when utilized with caution, they can uncover a few bits of knowledge through patterns with respect to perspectives of scientific/research generation at worldwide level.

As a conclusion, let us bear in intellect the taking after words-of-caution given by Durieux and Gevenois (2010) whereas utilizing the bibliometric and scientometric pointers for examination:

- Performance markers are based on the presumption that the quality of a specific article is reflected by the recurrence of its citations in other articles.
- Given contrasts between areas of inquire about in terms of efficiency, quotation propensities, and quotation elements, bibliometric pointers ought to not be utilized for comparing analysts, investigate bunches, or diaries from diverse areas.
- It is suggested to degree the quality and the affect of logical diaries, investigate bunches, or specific analysts through a few markers instead of as it were one.

## Summary

Bibliometrics could be a set of numerical and factual instrument utilized to degree amount and quality of books, articles, and other genera of distributions. Ponders demonstrate that bibliometrics, as a metric, is objective, quantitative and un-obstructive strategy utilized for. In any case, it isn't without any confinements. The confinements in quotation investigation is talked about within the Unit Pundits have moreover appeared the flaws in most of the markers utilized in bibliometric thinks about. Each of these markers in conjunction with their preferences and restrictions has been clarified. The bibliometric examination and the utilize of pointers would serve the reason when utilized with care. This unit gives an outline of the as of now utilized bibliometric pointers and summarizes the confinements and characteristics one ought to be mindful of when assessing the amount and quality of logical yield.

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