Bibliometric Parameters for Evaluating Researchers

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Abstract.
Bibliometrics has emerged from complete obscurity and become recognized as an independent scientific field since 1958. Nowadays, bibliometrics is taught extensively in library and information science programs. Around the world, research groups actively use bibliometric methodologies in their numerous scientific evaluations. This article provides a brief information of bibliometrics' theory and history. The article gives a quick overview of the primary metrics that are used to assess scientists' scientific research activities. The main objective is to examine the H-index, the most often used author-level indicator, and to offer readers with details on its benefits and drawbacks. H-index is one of the primary metrics used to assess an author's impact in the scientific community, according to the research. This is a widely used and highly significant measure that is supported by all major research platforms, including Google Scholar, Web of Science, and Scopus. As a result, the article offers a broad summary of the H-index. The term "bibliometric indicators" refers to the quantity of publications in scientific journals, the frequency of citations to these publications, the impact factor of the journal in which they are published, the quantity of highly cited articles, the H-index, and different SNIPs. Professionals claim that the 21st century is the century of bibliometrics. A new branch of science known as Scientometrics was founded in 1964, fifty years ago, on the basis of an analysis of bibliographic arrays in the Science Citation Index, which was Eugene Garfield's first globally published work. These days, this field is frequently referred to as bibliometrics.

Since the early 1900s, academic research has utilized quantitative analysis of literature, a practice known as "bibliometrics," which was initially coined by English scholar Alan Pritchard. Alan Pritchard conducted a study titled "Statistical Bibliography or Bibliometrics" in 1969, which introduced the field of bibliometrics analysis. Bibliometric analysis is a very useful and popular method for examining large amounts of scientific data. One very useful and common technique for looking through a lot of scientific data is bibliometric analysis. Over time, bibliometric analysis has gained popularity in the field of cross-cultural domain research.

Keywords: bibliometrics, author-level metrics, h-index, researcher, scientific paper.

Бібліометричні параметри для оцінювання дослідників

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Анотація.
Бібліометрія вийшла з повної невідомості та стала визнаною самостійною науковою галуззю з 1958 року. Нині бібліометрія широко викладається в програмах бібліотечної та інформаційної науки. У всьому світі дослідницькі групи активно використовують бібліометричні методології у своїх численних наукових оцінках. У цій статті подано короткі відомості про теорію та історію бібліометрії. У статті подано короткий огляд основних показників, які використовуються для оцінки науково-дослідної діяльності вчених. Основна мета – вивчити H-індекс, найбільш часто використовуваний індикатор рівня автора, і запропонувати читачам детальну інформацію про його переваги та недоліки. Відповідно до дослідження, H-індекс є одним із основних показників, який використовується для оцінки впливу автора на наукове співтовариство. Це широко використовуваний і дуже важливий показник, який підтримується всіма основними дослідницькими платформами, включаючи Google Scholar, Web of Science і Scopus. Як наслідок, стаття пропонує широке резюме H-індексу. Під «бібліометричними показниками» розуміють кількість публікацій у наукових журналах, частоту цитувань цих публікацій, імпакт-фактор журналу, в якому вони опубліковані, кількість високоцитованих статей, H-індекс та інші SNIPs. Фахівці стверджують, що XXI століття – це століття бібліометрії. Нова галузь науки, відома як наукометрія, була заснована в 1964 році, п'ятдесят років тому, на основі аналізу бібліографічних масивів в Індексі наукового цитування, який став першою глобально опублікованою роботою Юджина Гарфілда. Сьогодні цю галузь часто називають бібліометрією.

З початку 1900-х років в академічних дослідженнях використовувався кількісний аналіз літератури, практика, відома як «бібліометрія», яку вперше запровадив англійський вчений Алан Прітчард. У 1969 році Алан Прітчард провів дослідження під назвою «Статистична бібліографія або бібліометрика», яке започаткувало сферу аналізу бібліометрії. Бібліометричний аналіз є дуже корисним і популярним методом для вивчення великої кількості наукових даних. Одним із дуже корисних і поширених методів перегляду багатьох наукових даних є бібліометричний аналіз. З часом бібліометричний аналіз набув популярності в галузі міжкультурних досліджень.

Ключові слова: бібліометрія, авторська метрика, h-індекс, дослідник, наукова праця

Introduction.

An effective informational tool that promotes scientific advancement is the primary indicators of research activity in science. As a result, they are now required components in all scientific reports from universities, research groups, and individual scientists across the globe. (Nadir, & Vazufa, 2022).

Bibliometrics is an application of both mathematical and statistical methods that attempt to quantify written document processes. (Ismayilov, 2022). Bibliometric methods use data from databases to visualize any scientific field from an objective perspective.

According to scholarly perspectives, scientometrics, along with related terms like infometrics and bibliometrics, are useful instruments for researchers to comprehend the development of scholarly publications and the process by which scholarly knowledge is generated and amassed over time. (Kazimi, Abdullayeva, & Ismayilov, 2020).

The purpose of the research.

The primary aim of this paper is to analyze and interpret the author-level metrics, specifically the H-index, that are used to assess researchers' scholarly performance.

Research methods.

A thorough investigation was conducted into the bibliometric indicators that are crucial for assessing each researcher individually for the study. Relevant data were gathered for this purpose, and the data were then assessed to ascertain their value, relevance, and capacity to meet the goals of the study. The acquired data and figures were visualized using a variety of tables and formulas. Based on the general methodology and the particular research problem, a quantitative approach was adopted.

Scientific novelty.

The most widely used and trustworthy metric for assessing a scientist's influence is the H-index. The article presents both the advantages and disadvantages of the H-index and argues that it is a quantitative indicator as opposed to a qualitative one.

Main part.

Finding out how productive scientists are is one of the most significant measures of the activity of scientific research (Ismayilov, & Khudiyeva, 2023). Research ranking is often measured using quantitative methods such as citation count, h-index, and journal impact factors. There isn't a mechanism or technology available right now that can fully measure ranks. There are many criteria for evaluating. (Ismayilov, & Khudiyeva, 2023). Every database and tool make use of unique data, reputation files, metrics, and indexes. It is challenging to compare fields with disparate research and publication procedures using these instruments. Furthermore, the shortcomings of the measures and tools that are currently available are becoming more and more obvious as scholarly communication develops.

The ideal or "correct" research rating for a researcher or group of researchers cannot be quantified in a single figure. Scholarly papers referenced by other scholars are a conventional way of evaluating authors in their field. This rating is based on how many times an author has published. While compiling a list of publications and their citation counts is the most straightforward approach to illustrate ranking, a variety of algorithms derived from publication data have also been developed.

Author influence can be measured using a variety of metrics, also referred to as author-level metrics. Author-level metrics facilitate the monitoring of a researcher's assessment in a scholarly setting. This is commonly calculated using the number of citations made by other researchers to their scientific publications. It can benefit researchers in terms of grants, more financing, and promotion and tenure.

Author-level metrics include I10-index, G-index, M-index, O-index, I-index, H-index, w-index, s-index, l-index, RA-index, c-index, h2, Normalized h index, Author impact factor, Individual h-index, Area-sized citation effect, Author-level Eigenfactor, Erdős number, read-10 index, rig-index, tori-index, additional versions of h-index, etc.

The H-index is the most often used of them. Scholars in bibliometrics have also suggested a number of methods for determining its shortcomings (excellent examples of these are the g-index, m-index, and 1i 10 index).

G-index.

The g-index, an author-level metric that assigns greater weight to highly cited publications, was developed by Leo Egge as a reaction to the h-index.

***g*-index (Example)**

Citations for each paper	The rank of the paper	Sum of citations	The square rank of the paper
20	1	20	1
15	2	35	4
7	3	42	9
5	4	47	16
5	**5**	52	25
5	6	57	36
4	**7**	**61**	**49**
2	8	63	64
2	9	65	81

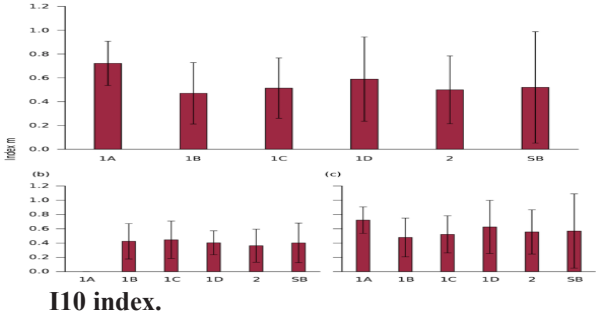
h-core

g-core

***h* = 5, *g* = 7**

M-index.

The M-index, also known as m-quantity, is defined as h/n, where n is the number of years from the scientist's first published paper and h is the Hirsh-index.



I10 index.

The I10 index, created by Google Scholar in 2011, is one index used to gauge the caliber of an author's output. This Google Scholar feature counts the number of papers that include ten or more references. This really basic indicator, which is exclusive to Google Scholar, provides one additional tool for gauging scholar output. It is free and simple to use to access this Google Scholar function.

Paper number	Citations
1	100
2	50
3	15
4	35
6	25
7	10
8	5
9	2
10	1

The following are the I10 index's missing elements:

• Only used in Google Scholar

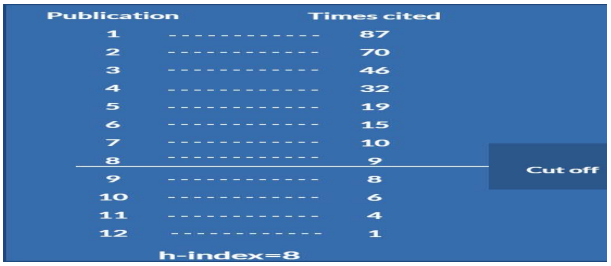
• Limited to works indexed by Google Scholar

• Only measures published works

The h-index is one of—if not the most popular—author-level metrics. The main metric used to assess an individual's success is the H-index. Simply put, the h-index is a number that gives an idea of the individual productivity and impact of a researcher. The number is based on the articles the researcher has published and the citations those articles have received.

The Hirsch index, often called the h-index or the Hirsch factor, was developed in 2005 at the University of California, USA by renowned physicist Jorge Eduardo Hirsch. It measures author productivity and ranking in order to quantify research output. H-index is one of the bibliometric data in the world of science. It is a global numerical standard designed to track scientists' activities and assess them according to their productivity to science. In the Proceedings of the National Academy of Sciences of the United States of America, the H-index was initially published under the title "An index for quantifying an individual's scientific research output." Hirsch elucidated the meaning and computation of the h-index in that document. By figuring out how many publications and citations each author has, it shows how productive the researcher is.

The h-index is a highly important and influential measure in many countries when evaluating researchers. The number of citations a scientist has received in other publications as well as their most frequently referenced articles are used to calculate their H-index. To give an example: A researcher with an h-index of 10 is one whose publications have at least 10 citations. A researcher needs to have a particular number of publications (h) with at least h citations in order to have an index of h. A researcher with an h-index of 15, for instance, has at least 15 publications with at least 15 citations.



Using Hirsch's calculation method given above, we can see that the h index in this example would be 8. Why? Because 8 articles of this researcher received 8 or more references.

When Hirsch introduced the definition of the h-index to measure the scientific productivity of scientists in 2005, there were two main variables based on the content of the definition; One of them was the number of articles in which the scientist participated as an author, and the other was the number of references to his articles.

The advantages of the Hirsch index are:

• The number of citations and the H index indicate that the article is of high quality and of interest to the world scientific community.

• In order to give a good reference to the scientist's work, the article should be written clearly, qualitatively and interestingly, and the research topic should be relevant and interesting at the global level.

• Thus, evaluating the quality of work using the H-index stimulates the scientist to improve the level of work and the quality of his publications.

• The H-index's strength is unquestionably its greatest benefit. It cannot be manipulated as easily as other dimensions. Unlike the impact factor, for example, individual, highly cited publications do not have a large impact on the index. To boost the H-index, as many articles as possible should be cited as often as possible.

The Hirsch index has some drawbacks.

• First, a scientist's publication activity varies depending on the type of research they do in different fields. For example, one scientist may publish research findings monthly while another may only do so once a year, meaning the first scientist will have more publications.

• The indexes for scientific publications are calculated by each resource using its own system; for example, a scientist using Scopus, Web of Science, Google Scholar, etc. may have an H-index, which may differ based on the scientist's primary publication location. Therefore, it is challenging to compute a single, objective indicator.

• The called "citation cartels," or scientists quoting one another without considering the article's objective worth, are another drawback. The Hirsch index is thereby increased artificially.

• The H-index cannot be used to compare researchers from different scientific domains, nor can it be used to make interdisciplinary comparisons. Additionally, they

could be unfairly tricked. because a group of scholars frequently cites one another's research in an effort to raise the h-index.

• This could give the researcher's uncited papers a bad reputation.

• Errors may occur when evaluations are conducted just using the H-Index as a criterion without accounting for the overall amount of citations.

• Whether a researcher is an author of a publication alone or part of a bigger group is not shown by the H-index. This implies that performing unrelated tasks can increase one's H-index.

It gives us no information regarding the theories or science underlying the researcher's findings.

Academics will, regrettably, stop being knowledge producers and become H-index entrepreneurs as this study methodology spreads. Universities will then be populated by people looking to maximize their metric value rather than knowledge providers.

In actuality, as can be seen, the h-index is merely one bibliometric signal to be used in conjunction with other metrics for a thorough evaluation of authors and scientific communities, not a magic bullet.

When a researcher has ten publications on Web of Science and each article has ten or more citations, the H-index value in this case is 10. Its H-index is 20 in this case if it has 20 articles in Scopus and each of those 20 articles has 20 or more citations. The value of the H index in this case is 50 if Google Scholar contains 50 articles and each of those 50 articles has 50 or more citations.

What should be the H-index?

Generally speaking, it is critical that the H-index remain above 25. An H index of higher than 25 indicates a person is thought to be more informed and productive. It follows that scientists should have a H index greater than 25.

How may the H-index be raised?

The H-index can be raised in a variety of ways. A few of them are unethical or illegal. For instance, self-references that are improper or frequent raise the H-index, yet they are not worthwhile.

One can increase the h-index by writing a lot of self-referencing articles. Writing a lot of articles can raise the chance that someone will find the author's writings and, thus, the chances of being mentioned, even if it is not self-cited.

1) The first author is the most famous

Research shows that articles with prominent first authors are more cited. Therefore, it makes sense for beginners to work with the most experienced and reputable researchers in the field.

2) Choose the magazine with care.

Well-known, prestigious journals attract more readers, which leads to more citations. The publication to target should be decided upon early in the study process by researchers.

3) Publishing articles in open access journals.

Journals with open access are referenced more frequently. Open access does, however, draw some inspiration from science. For instance, highly esteemed open access publications are available in the biological sciences and medicine.

4) Considering the audience.

Scholars should research a magazine's readership before selecting one. Is the magazine's focus wide or narrow? More specialized journals are used more by the same strong researchers.

5) Networking.

It can be beneficial to attend as many conferences and meetings as possible. This allows researchers to promote their work and find like-minded people in their research fields.

6) Using services to find like-minded people to quote.

Surprisingly, there was no platform for increasing citations until recently.

SciCite is a convenient and secure P2P platform for citing scientific articles. The platform is completely free. Here, scientists can find like-minded people in their research fields and agree on cooperation.

According to the AD Scientific Index, the top three scientists globally in terms of h-index are: (Highly Cited Researchers, 2023).

All scientific databases and platforms worldwide, including Scopus, Web of Science, Google Scholar, and others, employ the H-index since it has grown to be so significant. The "classic" version of the h-index has been the most often used for nearly 20 years, despite the fact that there are hundreds of variations available nowadays.

Library and information institutions operating in our country have an indispensable role in the comprehensive study of the library and information provision of tourism activities in the Republic of Azerbaijan. As a result of the socio-economic policy strategy formed by our great leader on a solid foundation, the year-by-year improvement of Azerbaijan's tourism opportunities has created a wide opportunity for successful reforms in the field of tourism, as a result of this, it showed its positive effect on the increase of normative-legal documents and scientific-artistic publications related to this field in the library and information institutions of the Republic of Azerbaijan (Gasimli, 2023). The first Tourism Information Center, created on the basis of a joint project of the Government of Azerbaijan and the United Nations, and later included in the structure of the Ministry of Culture and Tourism (now the Ministry of Culture), has been operating in Khachmaz district since 2005 for the purpose of informing tourists and local citizens who come to our country (Ismayilov, & Gasimli, 2022). Although the H-index was created to evaluate researchers

in the field of theoretical physics, its influence has spread to all fields of science. The index is routinely used by a wide range of researchers to assess both themselves and others in their fields. It is increasingly recognized as a personal indicator in science because, compared to the Journal Impact Factor (JIF), it has the advantage of assessing one's own performance rather than the influence of the journal in which it is published. There are steps taken to protect the ethnic and cultural heritage, the polyethnic evolution of Azerbaijan and its traditions of tolerance. It is no coincidence that at the beginning of the 20th century, well-known ethnographic scientists valued Azerbaijan as an 'ethnographic museum' where all nations live in friendly neighborliness. Currently, more than eighty minority peoples are living in the territories of the Republic of Azerbaijan (Ismayilov, Mahammadli, Gasimli, 2023).

Several shortcomings of the Hirsch index were noted in Hirsch's original paper. It is not difficult to imagine a situation where the H-index gives a completely wrong estimate of the researcher's productivity. In particular, the scientist's short career leads to an underestimation of the importance of his work. Therefore, numerous proposals have been made to change the H-index, and alternative indexes have been proposed. However, the H-index is the most popular international numerical criterion created to track the activities of scientists and to measure and evaluate them in terms of scientific productivity.

Conclusions.

Ultimately, High H index scores have an impact on individuals and how well research and educational institutions are ranked in terms of science and education quality. It comes first in the evaluation process for scientific work. The importance of the researcher is indicated by a high H index, which also greatly improves the researcher's chances of career progression. The Hirsch index is one of the criteria developed for monitoring the activities of scientists, measuring and evaluating them in terms of scientific productivity/effectiveness.

The H-index is still dependent on the views of other authors, despite being a more accurate measure than citation impact factor. Therefore, it should not be used in isolation. Performance in the research environment is more intricate than just publication history. When evaluating candidates for grants, honors, or promotions, additional factors need to be considered. These consist of a scientist's age, stage in their career, and field. Self-citations should also be mentioned. Overall, the "popularity" issue that other scientific metrics are criticized for is not resolved by the H-Index. There are disadvantages to any rating, so it is possible that scientists should not be ranked solely on the basis of mathematics.

It is important to remember that while the h-index is a widely used metric and can benefit scholars in their academic endeavors, an individual's total academic achievement is never summed up in a single statistic. Still, it's critical to comprehend the h-index to avoid becoming lost in the academic maze.

Particularly interesting are bibliometric measures of individual scientific accomplishment, which are employed to forecast future accomplishment. The findings of an empirical investigation into the h index's predictive ability in relation to other indicators are presented here. Despite its shortcomings, the h index outperforms other indicators when it comes to forecasting future scientific success, according to our findings.

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