

Scientific information resources and bibliometric indicators for the research performance assessment

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Abstract - The purpose of this paper is to introduce users of scientific information resources into the bibliometric indicators used into the research performance assessment. These metric tools usually focus on the use of citation counts and number of publications to evaluate the interest, visibility and impact of research performance, and the researchers themselves. The exposed resources are models of platforms that provide added value to authors improving their knowledge about research trends, collaborations between scientists and also where to submit their manuscripts.

Keywords - Bibliometric indicators, Citation analysis, Research performance measurement (RPM), Publication and citation data sources, Research impact.

I. INTRODUCTION

This paper pretends to introduce the researchers and users of bibliographical databases to the bibliometric information resources and the indicators measuring scientific production.

Academic, institutional and corporate scientific production and research is in constant evolution; the Research Centers are so competitive than ever, the research paths are more diverse and often requiring multidisciplinary collaboration between authors who furthermore, must be up to date in the scientific actuality sphere within their own field of study.

The companies providing information resources collecting the scientific production published in journals, congresses and other sources, are aware of this dynamic situation and offer products integrating several added-value databases and customization of all services.

II. EXPOSED RESOURCES

Companies like *Elsevier* with its database named *Scopus*, or *Thomson Reuters* supporting *Web of Knowledge* are leading competitors, regarding the management and commercialization of main research scientific information sources.

The following is a brief description of the previously mentioned databases pointing out the options and main features. In addition, comes a definition about their own metric tools.

ISI Web of Knowledge [1]:

Platform that integrate several databases like *Web of Science* (retrieving journal articles and conference proceedings), *Current Contents Connect* (providing tables of contents from journals and books), *Derwent Innovations Index* (retrieving patent information), besides the well known database *Medline*, and also additional resources with analytical tools like *Journal Citation Reports (JCR)* and *Essential Science Indicators (ESI)*.

Focusing on *Web of Science*, this bibliographical database gives access to the references of 10.000 multidisciplinary journal articles, as well as 110.000 conference proceedings, covering retrospective publications from 1900 to nowadays. It's updated weekly.

Users can make research queries within quick, advanced and expert search method, retrieving results that can be analyzed, refined, saved and exported to reference software. The main features are the citation reports on every record, the information about author's h-index, which are the cited references, links to related records and additional data about the journal which published the record .

Scopus [2]:

Produced by *Elsevier*, is the direct rival of *ISI (Institute for Scientific Information)*. This resource provides users articles from nearly 18.000 multidisciplinary peer-reviewed journals, results from 435 million scientific web pages, and 23 millions of patent records. It's updated daily.

Scopus contains several searching options like in *ISI Web of Science*, it includes basic search, advanced search, browsing journal titles and results managing.

Users can look up the number of citations, references and related documents received in any item. The difference is that most of the records have full linked text.

Other added-value services are *My Profile* and *My Alerts*, where user can manage his bibliographic and citation alerts and personalize his settings and preferences.

Using the analytics options, users can check Journal Analyzer to compare the total number of published articles, number of received citations and the trend lines of every journal.

Journal Citation Reports [3]:

It's the most important ISI's analytical resource, using different metric tools like *Impact Factor*, *Immediacy Index* and *Eigenfactor*. Updated every year and covering data source since 1997, JCR provides reports about almost 8.000 scientific journals previously indexed by *ISI Web of Knowledge*.



Fig. 1: Thomson Reuters JCR's logo

Research community members can evaluate and compare the impact and influence of these leading journals with different metric tools to decide, for instance where to publish their works and confirm the preferred journals status. JCR can show the most frequently cited journals, highest impact and largest journals in a certain field. In sum, it serves to evaluate research output.

SCImago [4, 5]:

Open access resource retrieving data source contained in the already mentioned *Scopus* database. It's a result of the collaboration between *Scimago Research Group* and *Elsevier* and using the *Google PageRank* algorithm analyzes rank and compares scientific journals and country status.



Fig. 2: SCimago's logo

Provides users indicators like *Scimago Journal Rank (SJR)* and author's h-index calculated with the *PageRank* of the journals indexed by *Scopus*.

Like JCR it's updated yearly but covers information from 1999 until the year before the current one, due to its open access condition. To look out for updated indicators, users have to consult *Scopus* database.

III. BIBLIOMETRIC INDICATORS [6]

These platforms use their own metric tools to analyze and assess the scientific production hosted in their databases. Users can get information about, amongst others, number of quotes pointing to a specific article, the *Impact Factor* of a publication during a certain period, the position of a publication according to its thematic field, the *Immediacy Index* in which an article is quoted, the influence of a journal and/or an article within its field.

Furthermore, it's necessary to contribute with some core definitions about the commented bibliometric indicators to know the principal characteristics of its metrics.

Impact Factor (IF):

Measures the frequency with which the average article in a journal has been cited en a concrete year. It's obtained dividing the number of citation counts in the current year by the published items in the two previous years.

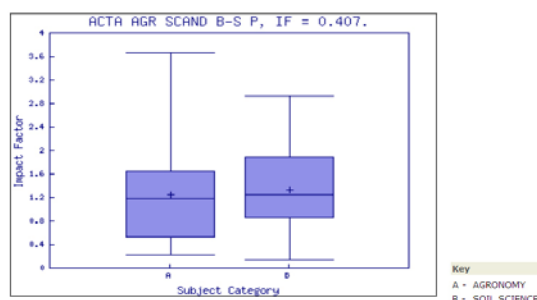


Fig. 3: Box plot of a journal subject category based on the IF data. Shows the journal's ranking in every category as well as the quartile position (source from JCR).

Immediacy Index:

Indicates how quickly are cited the items published in a specific journal. Dividing de number of citations to articles published in a year by the total number of articles published in the same year.

Immediacy Index is useful to compare journals specialized in cutting-edge research but tends to favor new journals over veteran ones. Consequently is better to contrast this indicator with IF giving a wide vision to the journal analysis

Eigenfactor [7, 8]:

Eigenfactor measures the global journal's influence. Like IF, it uses citation data to track the impact of a journal calculated basing on the citations received every five year period and excluding self-cites.

Using a specific algorithm, it values the contribution of every citation depending on its own influence which is determined at the same time by the citations received in these citing articles

H-index [9]:

Proposed by Joe Hirsch in 2005 to measure and quantify the researcher's scientific output and productivity. Observes the number of articles published by an author and the number of cites received in the same articles.

This means for example, that an author with an h-index of 21 has published 21 articles and every one of these published articles have been cited for at least 21 times.

Besides the function to assess researcher's productivity, it's possible to calculate the h-index for a single publication, for institutions and countries. For instance, *ISI Web of Science* uses h-index only for authors while SCImago calculates h-index for journals and countries.

SCImago Journal Rank (SJR) [10]:

SJR Indicator expresses the number of citations received in a journal related with the quantity of documents published by this journal in the same current year.

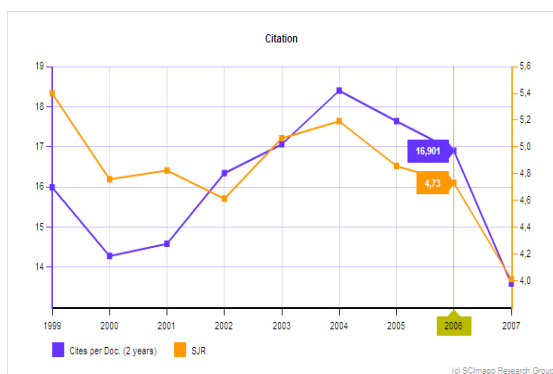


Fig. 4: Graphic that compares SJR indicator with the average of the citations per item in two years of a specific journal.

The citations weight depends on the received references in the citing publication. This metric tool integrates different calculation systems giving as a result, indicators that could be able to compete with both IF and Eigenfactor. In fact, it's the alternative indicator to IF.

IV. CONCLUSIONS

Bibliometric indicators can provide data about the impact, interest and visibility of the publications, show collaborations between authors and their individual productivity, and also establish what are the trends in a scientific research.

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