WHICH ALTERNATIVE TOOLS FOR BIBLIOMETRICS IN A RESEARCH INSTITUTE?

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Abstract
Nowadays, bibliometrics is a frequently used tool in scientific and technical information, it can be useful to quantify scientific production and for collective or individual evaluations. Web of Science (Thomson ISI) and impact factor calculated by JCR are the better known references. We will underline the limits and setbacks of these overused indicators, especially the bias factor h. Other tools are emerging today. Our presentation will focus on comparing all these products, and we will study their interests for librarians and researchers.

Keywords : bibliometrics, factor h, evaluation, indicators

Introduction

Bibliometrics is the generic term for data about publications. Originally, work was limited to collecting data on numbers of scientific articles and publications, classified by authors and/or by institutions, fields of science, country, etc., in order to construct simple "productivity" indicators for academic research. Subsequently, more sophisticated and multidimensional techniques based on citations in articles (and more recently also in patents) were developed. The resulting citation indexes and co-citation analyses are used both to obtain-more sensitive measures of research quality and to trace the development of fields of science and of networks.

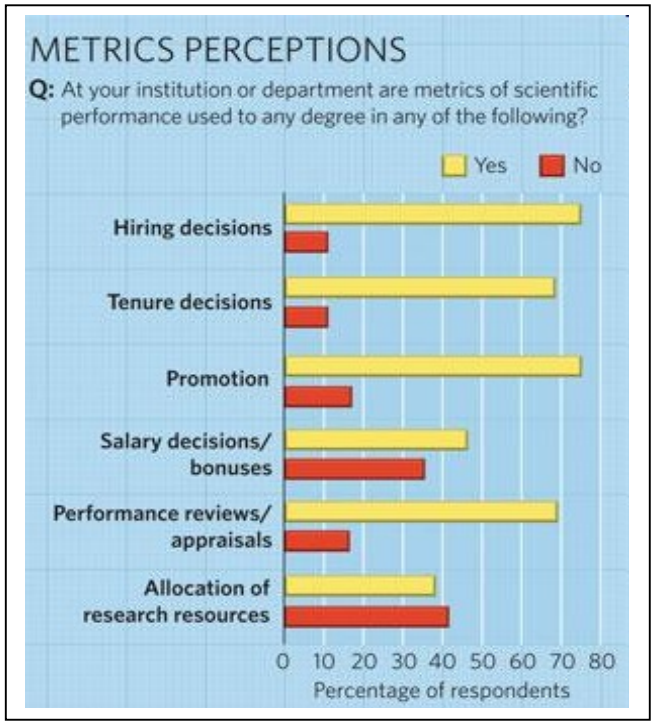
Bibliometric analyses use data on numbers and authors of scientific publications and on articles and the citations therein (and in patents) to measure the "output" of individuals/research teams, institutions, and countries, to identify national and international networks, and to map the development of new (multi-disciplinary) fields of science and technology.

Bibliometrics can be used to :

- Evaluate the journal's quality
- Follow up on the evolution of a research subject
- To have an idea of the principal actors of one theme
- Identify the article's impact
- Evaluate one researcher, their work, their research unit and their institute…

No research project that will contribute new or valuable information to the literature is complete until the findings have been written up, submitted to a recognized journal for consideration, and eventually published. Presumably, the person or persons chiefly involved in the work will be responsible for initiating the report for publication. Deciding who should or should not be an author or acknowledged can be a controversial issue, leading to unpleasant consequences, if it is not handled diplomatically and according to accepted standards. Basically, only those persons who have contributed intellectually and have participated in the work to the extent that they can and are prepared to take public responsibility for their part of the work should be authors. This would exclude gift authorship, which has been bestowed either as a tribute or as a ploy for recognition within the context of a reciprocal exchange, and guest authorship.
But in fact it's not so simple: metrics are often misunderstood, misinterpreted, or misused. No scientist's career can be summarized by a number. He or she spends countless hours troubleshooting experiments, guiding students and postdocs, writing or reviewing grants and papers, teaching, preparing for and organizing meetings, participating in collaborations, serving on editorial boards and more, none of which is easily quantified. But

when that scientist is seeking a job, promotion or even tenure, which of those duties will be rewarded? Many scientists are concerned that decision-makers put too much weight on the handful of things that can be measured easily – the number of papers they have published, for example, the impact factor of the journals they have published in, how often their papers have been cited, the amount of grant money they have earned, or measures of published output such as the h-index. 150 readers responded to a Nature poll designed to gauge how researchers and administrators believe such metrics are being used at their institutions, and whether they approve of the practice. The results suggest that there may be a disconnect between the way researchers and administrators see the value of metrics. Three quarters of those polled believe that metrics are being used in hiring decisions and promotion, and almost 70% believe that they are being used in tenure decisions and performance review.



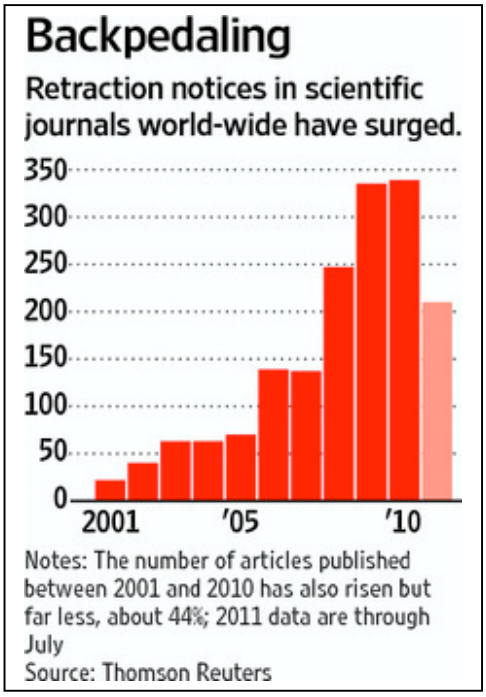
Poll respondents and administrators agree that metrics have potential pitfalls. For example, 71% of respondents said they were concerned that individuals at their institutions could manipulate the metrics, for example by publishing several papers on the same basic work. The challenge for administrators, it seems is not to reduce their reliance on metrics, but to apply them with more clarity, consistency and transparency.

Which measure with which tools?

Journals evaluation: Impact factor (JIF) and JCR
The impact factor, proposed by Eugene Garfield, is a ratio between citations and recent citable items published. A higher impact factor generally indicates that this journal's articles have been cited more. JCR is divided in 180 categories, it is linked to WOS, update each year and it is calculated on 2 years window.

When the 2 year impact factor was designed, it was intended to be an aid to librarians making decisions about which journals to purchase so that they could get a rough sense of a journal's influence in the field. In this context, the impact factor makes sense. Nonetheless, the use of the impact factor to judge individual scientists, departments and institutions is a remarkable case study in the law of unintended consequences.

Since 1960, worldwide researcher evaluations are run by a private society Thomson ISI.
However, placing too much emphasis on publication in high impact factor journals is a recipe for disaster. At the extreme, it creates temptation to falsify data.



Since 2001, while the number of papers published in research journals has risen 44%, the number retracted has leapt more than 15-fold, data compiled for The Wall Street Journal by Thomson Reuters reveal.

Why the backpedaling on more and more scientific research?

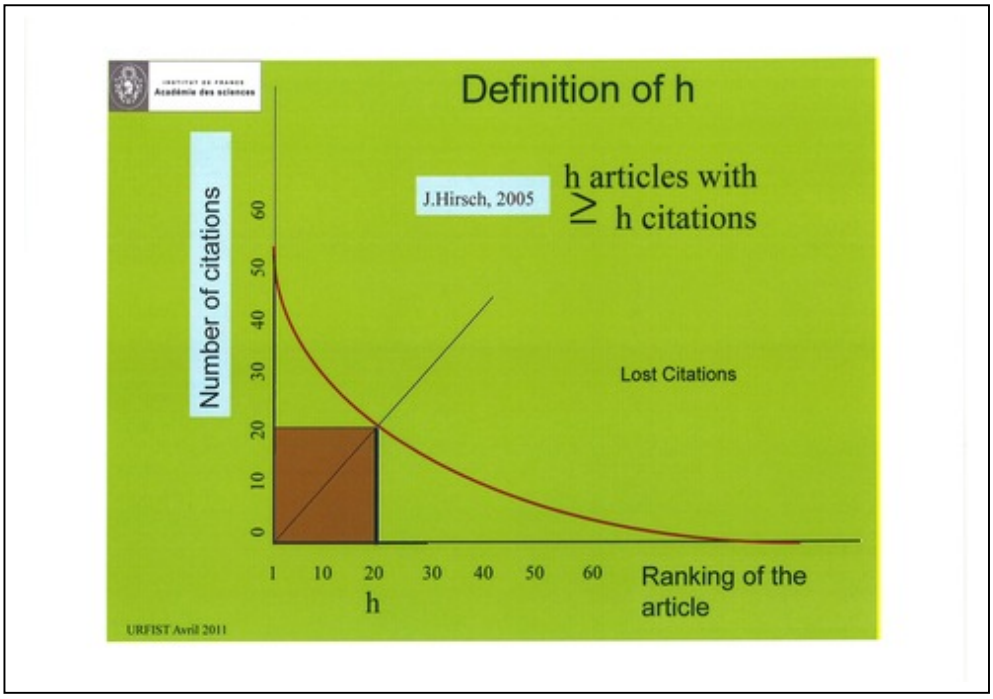
Some scientific journals argue that the increase could indicate the journals have become better at detecting errors. They point to how software has made it easier to uncover plagiarism. Others claim to find the cause in a more competitive landscape, both for the growing numbers of working scientific researchers who want to publish to advance their careers, and for research journals themselves.

"The stakes are so high," said the editor of *The Lancet*, Richard Horton. "A single paper in *Lancet* and you get your chair and you get your money. It's your passport to success."

Retractions related to fraud showed a more than sevenfold increase between 2004 and 2009.

In Australia, it's the end of an era. The journal ranking system got dumped after scholars complained. At Toronto University, the President, David Naylor, said "Maclean (Canadian universities ranking) is useful for one thing only: Marketing, none of us really believe that the ranking has much intellectual rigour. "The program had drawn attention from officials in the United States and Europe who are also testing new ways to measure quality

Researchers' Evaluation: h Index



To have a good h index, it's not enough to publish, it's necessary to be cited as long as possible. So the h index is most suitable for researchers who have at least 10 years of research behind them. As we see with Ike Antkare, it's possible to do hacking with h index, as he became one of the highly cited scientists of the modern world with an h index of 94, but most references are fake.

What are the trips and tricks to increase your h index?

- You must disseminate your publication in open archives (Google Scholar, Citebase…).
- You can practice autocitation.
- You can also be in a category uch as guest authorship, gift authorship, etc.
- You must increase collaborations, multiply international citations, get your name out through meetings, refereeing, etc.
- A good solution can be to publish controversial articles or reviews that will be more cited.
- Study the fate of publications to analyze which are cited longer (use WoS citation mapping)

Institution Evaluation: Shanghai Ranking

Shanghai academic ranking of world universities is the reference for almost all universities

Indicators and Weights for ARWU

Criteria	Indicator	Code	Weight
Quality of Education	Alumni of an institution winning Nobel Prizes and Fields Medals	Alumni	10%
Quality of Faculty	Staff of an institution winning Nobel Prizes and Fields Medals	Award	20%
	Highly cited researchers in 21 broad subject categories	HiCi	20%
Research Output	Papers published in Nature and Science*	N&S	20%
	Papers indexed in Science Citation Index-expanded and Social Science Citation Index	PUB	20%
Per Capita Performance	Per capita academic performance of an institution	PCP	10%
Total			100%

If we look closer at this ranking criterion, we see that this ranking is based to 50% on ISI, we have redundant criteria (Nobel, Fields Medals), and indicators are heterogeneous. In France, for example, research is carried out in institutes like CNRS or INSERM and not in universities, which explain France's poor rating.

Alternative Tools
It's necessary to promote qualitative alternative tools rather than dominative quantitative model.

Journal Evaluation: Eigen Factor: http://www.eigenfactor.org/index.php

It's a free tool that eliminates autocitations. The algorithm calculation includes more parameters, such as:

- Google's Pagerank algorithm.
- Citations from highly ranked journals weighted to make a larger contribution to the Eigen factor than those from poorly ranked journals.
- It differentiates citations coming from different disciplines.
- Journal prices.
- Calculation is for a 5 years window,

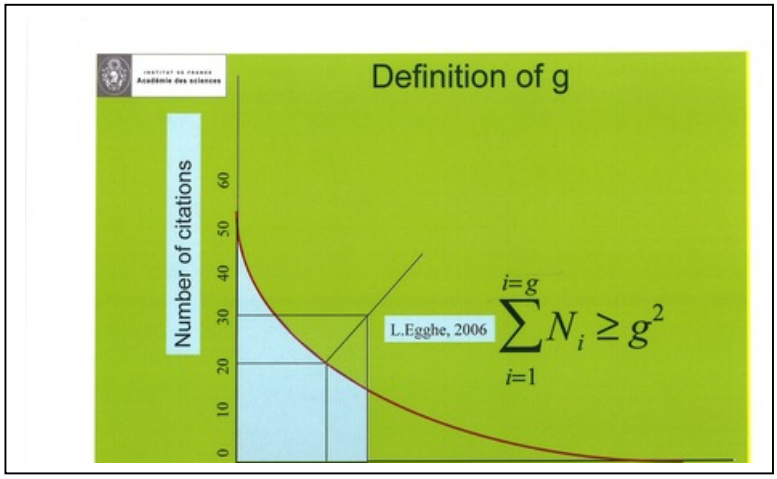
Eigen factor visualization - http://well-formed.eigenfactor.org/ is interesting to see interactions in different fields for a specific journal

SCImago or SJR indicator

The **SCImago Journal & Country Rank** (SJR) is a portal that includes the journals and country scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.) http://www.scimagojr.com/. It considers not only the number of citations received for a study, but also the importance or influence of the actors who issue those citations. The results showed that SJR indicator and JIF distributions fitted well to a power law distribution and that both metrics were strongly correlated, although there were also major changes in rank. There was an observable general trend that might indicate that SJR indicator values decreased certain JIF values whose citedness was greater than would correspond to their scientific influence. This new metric represents scientific impact as a function not of just the quantity of citations received but of a combination of the quantity and the quality. It is very useful to compare journals or countries in the same field, and the charts are very clear.

Researchers' Evaluation: g Index

This was suggested in 2006 by Leo Egghe.



G index increases faster than h index, as it takes into account articles that are highly cited, However, it is more complicated to calculate, which is why it doesn't replace the h index

The University of Southampton ranks 3rd in the UK and 25th in the world in the G-factor International University Ranking, a measure of "the importance or relevance of the university from the combined perspectives of all of the leading universities in the world... as a function of the number of links to their websites from the websites of other leading international universities" compiled by University Metrics. Why is its rank so remarkably high (second only to Cambridge and Oxford in the UK, and out-ranking the likes of Yale, Columbia and Brown in the US)? Long practise of what it has been preaching -- about maximising research impact through Open Access Self-Archiving -- is a likely factor.

Conclusion

Too often, ranking systems are used as a cheap and ineffective method of assessing the productivity of individual scientists. No one enjoys being measured –unless he or she comes out on top. That's human nature. So it's important to remind scientists that metrics can be a friend, not a foe. We need to stop misusing rankings and instead demonstrate how they can improve science. The publishers and grant givers in the game of science have the incentive and the power to implement such rules. What sort of behaviors should be encouraged, and how best to do that, remains very much an open question.

References

Abbott, A., Cyranoski, D., Jones, N., Maher, B., Schiermeier, Q. 2010. Do metrics matter ?, *Nature*, 465: 860-862

Benichoux B. 2010. Outils pour l'évaluation de la recherche scientifique, CNRS-INIST *Available from :* [PPT] *pistlr.lirmm.fr/IMG/ppt_montpellier.ppt*

Braun, T., Bergstrom C.T., Frey B.S., Osterloh M., West J.D., Pendlebury D., Rohn J. 2010. How to improve the use of metrics, *Nature*, 465: 870-872

Colquhoun, D. 2003. Challenging the tyranny of impact factors, *Nature* , 423: 479

Gonzalez- Pereira B., Guerrero- Bote V.P., Moya Anegon F.2009 , *Available from* *http://arxiv.org/abs/0912.4141*

Hare, D. 2001. Giving credit where credit is due : Authorship versus acknowledgment, *Can Vet J,* 42: 250-251

Howard J. 2011. Journal ranking system gets dumped after scholars complain, *The Chronicle of higher education,* June 1st 2011

Labbé, C. 2010. Ike Antkare, one of the great stars in the scientific firmament, ISSI newsletter,6(2):2,48-52

Lawrence, P.A. 2003. The politics of publication*, Nature*, 422: 259-261

Marder E., Kettenmann H., Grllner S. 2010. Impacting our young, *PNAS*, 107(50):21233

Molinié, A., Bodenhausen, G. 2010. Bibliometrics as weapons of mass citation, *Chimia*,64(1/2):,78-89

Naik,G. 2011 Mistakes in scientific studies surge, *The Wall Street journal*, August, 10, 2011. *http://online.wsj.com/article/SB10001424052702303627104576411850666582080.html*

Stern, D. 2010. Author as object: disambiguation and enhanced links, *Online*, Nov-Dec 2010: 29-31

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