Metrics 2.0 for Science 2.0

Isidro F. Aguillo

isidro.aguillo@csic.es
Cybermetrics Lab. IPP-CSIC. Albasanz, 26-28. Despacho 3E14. Madrid 28037 (Spain)

Science 2.0

The concept Science 2.0 is a recent development designed to take advantage of the new sharing technologies and social networks of the Web 2.0 and that it is now strongly linked to the current and future research policies of the European Commission.

According to ideas developed by Ben Shneiderman this Science in Transition can be described according to two groups of actions,

Integrating the whole research cycle and its stakeholders, including all and both activities and people involved in them, far beyond that focusing only on the authors of papers, and

Opening the whole set of data; tools, results and metrics derived from the cited research (and communication) cycle from the very first moment the information is generated.

The urgent need to adapt the current set of quantitative indicators to this new concept is the reason for this poster. We intend to provide a critical analysis of the current status of the bibliometrics y related quantitative techniques for science evaluation and to introduce a new umbrella term, Metrics 2.0, for describing future scenarios for the discipline.

Current Metrics situation

A SWOT analysis is introduced for describing major issues related to bibliometrics and the attitude of bibliometricians and the rest of scientists' attitude regarding the discipline.
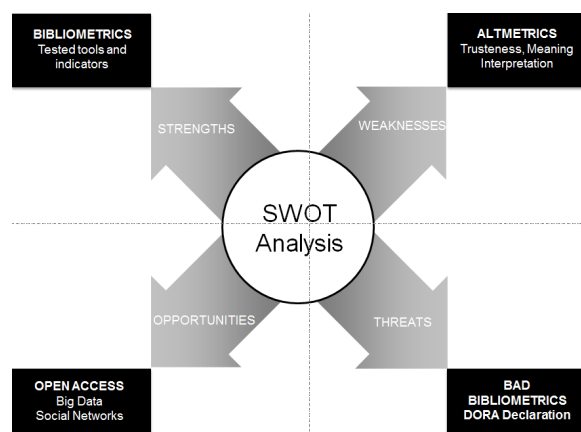

Figure 1. SWOT analysis of bibliometrics.

In recent years the term Informetrics become popular for describing an extended set of disciplines that are closely related to bibliometrics, including patentometrics or webometrics. However the fast development of the Internet, especially regarding the social networks, make this term become obsolete for describing a increasingly complex situation.

Specifically, there are two current developments that are having an impact on the discipline:

Altmetrics 'revolution'. The Web 2.0 tools have used as sources for extracting quantitative data when they are proxies for scholarly communication. Thousands of papers are exploring the capabilities of the different social networks using citation analysis for comparative purposes with mentions, readings or visits to bibliographic units.

Moving beyond Journal-level Metrics. After decades of criticism, and with the recent publication of the Declaration of San Francisco (DORA) the level of analysis is moving from Journal-level to Article-level metrics.

Proposals for Metrics 2.0

Regarding bibliometrics

The most serious problem is related to the way the contribution of each author (and the institution/s to whom is affiliated) is measured in a co-authored document. Traditionally two options were used: Full count (100% of merit for each author) and fractional counting (dividing full merit by the number of authors equally). As the number of authors per paper is growing exponentially, the last option is being discarded in most of the cases. Other alternatives, like identifying in the signature the relative contribution of each author, are still not a feasible option.

Traditionally full count is supported as it favours collaboration, especially international one. But this option is masking relevant phenomena for policy decisions. For example asymmetric collaboration with developing countries provides to their scientists and institutions with output/impact values that are not correlated with their low R&D investment prompting funders to not increase their budgets. Even with symmetric collaboration the full count based results are not able to discover the impact of the current economic crises that reduced

considerably the money invested in scientific research.

Taking into account that is a temporary proposal that intends not to reduce the level of scientific collaboration we suggest using a variant of the full count giving 50% of the merit instead of 100% to each author in papers with two or more authors.

In the case of organizations (and countries) where it is possible to identify the leading institutional author this should be granted the 100% authorship.

Although not a perfect or definitive solution this proposal should be especially useful for solving the problem of 'bad bibliometrics' that spoiled the major university rankings.

Regarding altmetrics

Apart of an ugly name, altmetrics is a confusing tangled set of mixed value tools. A first proposal could be to segregate the field in different subfields according to the tool that is involved. So, twittermetrics is different in both methodology and results interpretation to wikimetrics, for example. But there are two actions that are perhaps far more justified. It is highly recommended to set up a new discipline called Usagemetrics for the analysis of visits, visitors and their behaviour to academic and scientific websites. This is a very rich environment with dozens of candidate variables to build indicators independent from the standard citation motivations. The second moving is related to the tools where mention motivations are close to the citation ones, the most obvious one is Mendeley. In similar cases the proposal is to transfer these tools from altmetrics to the traditional bibliometrics arena.

Regarding Open Data y Big Data

The scientific community is strongly pushing for making openly available the data obtained from the experiments that is used later for preparing papers. Beyond the usefulness of this Open Data for replicating the results or for comparative purposes, the success of the initiative can make available huge amounts of information that could be considered, regarding the size-related challenges they pose, at the same level of the Big Data produced by the so-called Big Science. This is call for the scientific authorities for considering offering Big Data facilities and services for an extended group of scientists.

$$\text{Big Data} = \sum \text{Open Data}$$

Regarding Author Profiles

Until very recently the author-level metrics were technically a complex work when huge numbers of researchers were involved. Now the profiling services offered by several services (ResearcherID,

Google Scholar Citations) or the major interests by the own research organizations (CRIS) and supported by disambiguation identifiers (ORCID) are changing completely the situation. In this new scenario, inspired by the results of the EU Project ACUMEN, we propose to set up author profiles with the following characteristics:

Bibliometric indicators from several sources, Non-bibliometric indicators, like those from altmetrics sources; context information like academic age, academic status, gender, levels of funding, networks membership and role, geographical or discipline biases, among others.

Rankings are a valuable tool if context is appropriately included in their elaboration. Relative indicators (percentages, quartiles) are being shown as far more trusted for this kind of classifications. However the use of composite indicators is still an open unresolved question that is still strongly criticised by the experts.

Conclusion

Metrics 2.0 should open and transparent, with data and indicators provided in a rich metadata environment.

Multiple sources and indicators are required, reflecting the diversity of the research activities, counting correctly and exhaustively the results and evaluating the different levels and magnitudes of the visibility and impacts of these results for all the communities, academic or not.

Presentation of the indicators, including friendly visualization of data is also relevant, but it is probably secondary to offer to end-users unrestricted customisation (including exporting in several formats) capabilities.

Summarising, bibliometricians can no longer been accountants able to extract, standardize, group and visualize the records from the Web of Science, but experts in several fields, with strong knowledge of different information sources and professionals capable of understanding specific needs and contexts ready to customise procedures according to the specific situation. Data, methodology, results and reports should be open to third parties in a mandatory way.