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Altmetrics: alternative metrics for scientific, technological and innovation evaluation

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Abstract

Altmetrics or alternative metrics arise in response to the need to complement traditional metrics in the evaluation of scientific research. A new way of measuring the impact of scientific research, based on new indicators that try to quantify the presence and dissemination of academic activity on the social web. Its goal is to measure web-driven academic interactions, such as how often research is tweeted, blogged, or bookmarked. Therefore, altmetrics is an instrument capable of providing information invisible to traditional metrics, in addition to collaborating in the science dissemination process. The objective of this paper is to offer a brief analysis of the need for these new metrics in the evaluation of science, based on the main applications of their indicators, advantages, disadvantages and data providers.

Need of alternative metrics for the scientific research evaluation

The technological changes of the 1990s and mid-2000s, characterized by the development of the social web and Internet-based social networks, made it possible for many academic papers to be more open and accessible to researchers and communities in general.

The emergence of the Internet and social networks (Web 2.0) is exerting a powerful influence on the ways in which researchers and academics discover, access, process and communicate information. Now the works are disseminated through social networks, blogs, institutional repositories, open access journals, platforms, among others; and in addition, data is shared, collaborates and comments on ongoing or completed investigations online.

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In this new interconnected world, it is already insufficient to base the impact of an academic publication solely on citations in scientific journals, since they do not provide information on all the interactions that occur in the new social media (Williams, 2017). In line with the above, the San Francisco Declaration of Research Evaluation (DORA, 2012) is of special importance, since it highlights the need to eliminate the use of journal-based metrics, such as journal impact index, in financing, appointments and promotion considerations; as well as the need to evaluate the research on its own merits and not based on the journal in which it is published.

In this context, altmetrics emerge as a response to the need to complement traditional metrics in the evaluation of scientific research. Some authors consider that altmetrics date back to the 1990s with the Webmetrics (or Cybermetrics) metric field based on the quantitative study of web characteristics (Bornmann, 2014; Torres-Salinas et al, 2013). There are two interconnected factors that contributed to its birth: social networks and paradigmatic shifts in scientific communication.

One of its initial milestones, the manifesto signed by Priem et al (2010), leaves a clear critical position for the hegemony of the impact factor and for the traditional peer review process. Proponents of altmetrics in general are aligned with the movement for open access to scientific information and the search for viable alternatives to the current model in scientific publishing.

Altmetrics are a new way of measuring the impact of scientific research, based on new indicators that try to quantify the presence and dissemination of academic activity on the social web. They are measures of how people interact with a given academic job. Its goal is to measure web-driven academic interactions, such as how often research is tweeted, blogged, or bookmarked. Therefore, altmetrics is an instrument capable of providing information invisible to traditional metrics, in addition to collaborating in the science dissemination process.

Main applications of altmetrics

Although altmetrics do not replace traditional measures to discern the impact of research, they do complement them. With the support of digital science, altmetrics aggregate information from different sources. These include peer reviews, Wikipedia references, public policy documents, research blog discussions, media coverage, bookmarking from reference managers such as Mendeley, and social media.

According to Melero (2015), altmetrics collect data from three main sources: social networks, traditional media, and online referral managers such as Mendeley. While they don't collect data from all online platforms, they do so from a wide range of sources, including

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Blogs, News, Reddit, Facebook, Google Plus, Pinterest, Twitter, Stack Exchange, CiteULike, Connotea, Mendeley, F1000, YouTube, LinkedIn groups, Research Highlights and many others.

Symetrics assign scores to an article by calculating how often the job is mentioned on different platforms. The popularity of the article is therefore based on how often it is referenced in these sources. In addition to the frequency of mentions, altmetrics include a record of attention, a measure of dissemination, and an indicator of influence and impact. As a record of care, it provides information about the scope of an academic work, that is, how many people discuss the research.

As a measure of dissemination, map the location of the mention (where) and the reason (why) an article has been shared and discussed. As an indicator of influence and impact, it also provides a vehicle for capturing how research can influence society at large. In this way, altmetrics have unique capabilities to measure the impact of different research results, in terms of usage (downloads and views), peer review (expert opinion), citations, storage, links, bookmarks, and conversations.

In addition, its application allows to know the influence of the investigation from the day of its publication. This aspect is very interesting in disciplines and geographical areas that are not normally represented in databases such as Web of Science or Scopus, or where the behavior of citations is slow and it takes months or years to generate the first appointment, such as the case of social sciences or humanities.

They can also be applied to non-traditional formats, beyond books and journal articles, such as data, software, presentations and other online academic results.

Advantages of alternative metrics

- Speed: they allow users and researchers to track almost immediately the attention a scientific work receives on social and scientific networks.
- Diversity: show data on other types of research results, such as data sets, presentations, software, patents, monographs, and so on.
- Other impacts: they not only offer information on the academic and scientific impact, but also on other audiences and types of impact: social, economic, environmental, cultural, etc.
- Metrics at the article level: they measure the impact of the article or research result, not only of the journal that contains it.

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- Context: they allow to visualize the reception of a research product and the immediate response of the author.
- Visibility: they allow you to track the dissemination of research results and make decisions to obtain greater visibility and impact.

Disadvantages of alternative metrics

- They are not regulated: they can be compromised by subversive means or games, that is, as they are poorly controlled tools, they can lead to manipulation and falsification. This concern arises in environments where data can be artificially manipulated. For example, you can get a "Like" on Facebook from close friends, family, etc. to promote a job, which may reflect a form of personal or public impact, but may not be a valid measure of academic impact.
- Lack of standardization: Lack of clarity in the definition and interpretation of what the metrics mean and what they do. For example, it is difficult to claim that mentions, expert recommendations, reader counts, likes, and citations on Twitter, F1000, Mendeley, Facebook, and blog posts have a common and universally understood meaning (Haustein, 2016).
- Context: the use of social web applications may vary according to discipline, geographic location or over time, making them difficult to interpret.
- Lack of correlation: it has not been possible to demonstrate that there is a clear correlation between the citations received by a work and the accumulated altmetrics, although this varies according to the sources. The social impact can vary greatly from the academic impact of a publication. However, being of a different nature from the traditional ones and when assessing other impacts, this correlation should not be decisive.

Main providers of altmetric data

In the context of big data and its technological revolution, altmetric data providers or aggregators are platforms that capture, collect and quantify in a single place different events on academic publications produced in distant places on the Web. The theoretical and empirical development of altmetrics is accompanied by the development of tools that allow researchers, editors, development agencies and other institutions to monitor and disseminate the attention

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that research products receive on the Social Web, adding a variety of altmetric indicators. Here are some of these tools:

- Mendeley (https://www.mendeley.com) considered the most important reference manager on the Web. It is a special case because it is not strictly a data provider, but an online referral manager. Many studies have used this platform as the main source to count the number of readers, therefore, it is also considered a social network in which users "read" the publications.

- Altmetric.com (https://www.altmetric.com) shows the impact of the research to its authors and readers in a very visual way through "donut almetrics" (each color represents a source of altmetric data). Collect mentions of scholarly articles from all over the web by collecting mentions in news, blogs, social media, and other websites.

- ImpactStory (https://profiles.impactstory.org) Unlike other providers, focuses on the creation of personal profiles that illustrate the altmetric impact of a researcher. Using ORCID and a Twitter account, this tool allows the creation of a profile with the list of publications mentioned on the Web.

- PlumX (https://plu.mx/plum/g/samples) is a provider of alternative metrics for Plum Analytics (Editorial Elsevier). Track the online presence of any article indexed in the Scopus database. It allows to categorize, visualize and analyze the academic social impact of researchers and institutions according to a series of indicators that are collected in 5 categories: use, captures, mentions, social networks and citations.

- Crossref Event Data-CED (https://www.crossref.org/services/event-data) Shows information about each altmetric event linked to a DOI identifier. For example, it shows information about the mention of an article on Twitter (date, user, tweet, etc.), but does not show a count of the number of tweets. For that reason, the CED data would have to be processed to be comparable with the other services.

- Bookmetrix (https://www.bookmetrix.com) is a platform launched by Springer and Altmetric that measures the impact of more than 18,000 books contained in SpringerLink. It shows the citations, the usage data, the mentions in social networks or the number of users who have saved both the book and each of the chapters in Mendeley.

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