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Altmetrics: an overview and evaluation

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Abstract

Purpose – The purpose of this paper is to provide an overview and critique of altmetrics, an understudied yet increasingly important arena of study for scholars, academics, and professional researchers.
Design/methodology/approach – The paper is organized into six parts: the first defines altmetrics; the second examines how altmetrics work; the third presents multiple typologies under which altmetrics can be classified and studied; the fourth details the technological capabilities of altmetrics; the fifth presents a critical evaluation of the "pros and cons" of altmetrics; and, the sixth outlines some directions for future and ongoing research.
Findings – The conclusions detail the strengths and limitations of altmetrics and point toward avenues for continued research and development.
Originality/value – This paper is among the first to provide a substantive review and evaluation of altmetrics for academics to consider when adopting, utilizing, and researching these tools.
Keywords Altmetrics, Research impact, Academic networks
Paper type Research paper

Altmetrics: an overview

The primary purpose of this paper is to provide a description, overview, and evaluation of altmetrics, an understudied yet increasingly important arena of study for scholars, academics, and professional researchers. The paper is organized into six parts: the first defines altmetrics and clarifies the concept of altmetrics in its various forms; the second examines how altmetrics work; the third presents multiple typologies under which altmetrics can be classified and studied; the fourth details the technological capabilities of altmetrics; the fifth presents a critical evaluation of the "pros and cons" of altmetrics; and, the sixth outlines some directions for future and ongoing research.

What are altmetrics?

Altmetrics are measurements of how people interact with a given scholarly work. They aim to measure web-driven scholarly interactions, such as how often research is tweeted, blogged about, or bookmarked (Howard, 2012; Robinson-García *et al.*, 2014). Altmetrics.org and Altmetric.com are web-based sites that promote the use of altmetrics.

Altmetrics.org is a site created, developed, and maintained by scholars and app designers who share a commitment to "the creation and study of new metrics based on the social web for analyzing, and informing scholarship" (Priem *et al.*, 2010; http://altmetrics.org/about). Altmetrics.org is concerned with the promotion of altmetric apps (i.e. ImpactStory, ReaderMeter, ScienceCard, PLoS Impact Explorer, PaperCritic, and Crowdometer).

Altmeric.com is a commercial website, partnered with major publishers, which functions as an open tool and data provider to supply qualitative and quantitative data that complements traditional, citation-based measurements. Altmetric.com is concerned with the promotion and circulation of its products in connection with major academic publishers, institutions, and funders (e.g. Taylor & Francis, Wiley, The London School of Economics, and the Smithsonian).

The rise of altmetrics
Technological changes of the 1990s and mid-2000s, characterized by the development of the social web and internet-based social networking, enabled librarians to make many scholarly works more openly and widely accessible to researchers and higher education communities (Dutta, 2016). The creation and popularization of altmetrics – both the measures and the websites – is a result of the growth of communication technology, especially social networking sites such as Facebook and Twitter. As social networking provided new opportunities for scholars to disseminate their research, new methods for capturing and calculating the networked impact of scholarly publications became increasingly important (Dutta, 2016).

Proponents of altmetrics identify several factors that necessitated their emergence and will precipitate their continued use. According to Galligan and Dyas-Correia (2013), one factor is the limitation of existing measures of social, public, and/or "real-world" impact of research. For example, traditional measures such as bibliometrics that measure peer-review, citation count, and journal impact factors measure only the most academically significant and theoretically relevant material from the huge volume of scholarly literature produced (Galligan and Dyas-Correia, 2013, p. 56). A primary factor underlying the creation and continuance of altmetrics is that traditional citation-based measures focus solely on journals and articles, but do not account for other work outputs such as blogs and datasets. Altmetrics, in contrast, fill this void by measuring the impact of journal articles through social media activity, while also accounting for other forms of significant research output that fall outside the parameters of traditional peer-reviewed publications. In this way, altmetrics enable the discovery of new information about research impact that was previously difficult to obtain; and, they allow researchers to discern the impact of their work at a faster rate than traditional metrics, such as citation counts and journal impact factors that accrue more slowly. Some even suggest that the benefits of altmetrics may be far greater than the benefits of other metrics. Most notably, altmetrics allow for valuable forms of crowdsourcing that tap the immediate value of research within networked environments. Galligan and Dyas-Correia (2013) note this trend, suggesting that through crowdsourcing an article's impact can "almost immediately be assessed by multiple bookmarks and conversations" (p. 57).

How do altmetrics work?
Supported by digital science, altmetrics aggregate information from different sources. Via Altmetric.com, these include peer reviews, references on Wikipedia, public policy documents, discussions on research blogs, mainstream media coverage, bookmarks on reference managers like Mendeley, and social media. According to Melero (2015), Altmetric.com gathers data from three main sources: social media, traditional media, and online reference managers such as Mendeley. While Altmetric.com does not collect data from all online platforms, they do draw from a wide array of sources, including blogs, news, Reddit, Facebook, Google Plus, Pinterest, Twitter, Stack Exchange, CiteULike, Connotea, Mendeley, F1000, YouTube, LinkedIn Groups, Research Highlights, and miscellaneous others (Robinson-García *et al.*, 2014).

Typologies/classifications of altmetrics
As measurement tools, altmetrics are classified based on the function they provide and the type of engagement users have with a given research output. For example, Robinson-García *et al.* (2014) categorize different types of altmetrics by their primary functions: discussions, mentions, readers, reviews, video, and citations. Sources that host discussions include blogs, news, Reddit, and Stack Exchange. Sites such as Facebook, Twitter, Google Plus, Pinterest, and LinkedIn Groups categorize mentions. Outlets such as CiteUlike, Connotea, and F1000 provide reviews. YouTube illustrates impact through videos. And, Research Highlights provides full citations.

In extension of typologies based on functionality, others have conceptualized altmetrics in terms of use (Wouters and Costa, 2012) and engagement (Lin and Fenner, 2013). The following two tables summarize classifications by Lin and Fenner (2013) and Wouters and Costas (2012), respectively (Tables I and II).

Type of engagement	Description
Viewed	Accessing the article online
Saved	Saving articles in online bibliography managers which helps researchers to organize papers
Discussed	Discussion of the research described in an article, ranging from a short comment shared on Twitter to more in-depth comments on blog postings
Recommended	Endorsing the research article via a platform such as an online recommendation channel
Cited	Formation of a citation to an article published in a scientific journal

Source: Lin and Fenner (2013)

Table I.
Lin and Fenner's engagement-based classification

Uses	Descriptions
Diversity of channel analyzed	Altmetrics enable the user to analyze different types of materials such as books, blogs, Facebook postings, or tweets
Speed of acquiring/retrieving data	Unlike traditional citation-based metrics, altmerics are instantly available for analysis
Openness of method	Altmetric data is open to download and free to use
The ability to measure impact beyond the scholarly realm	Altmetric's accessibility to different groups of readers such as researchers, professionals, students, and interested publics helps research escape the judgment of the scientific readers

Source: Wouters and Costas (2012)

Table II.
Wouters and Costa's use-based classification

What are the technological capabilities of altmetrics?

Almetric.com assigns scores to an article by calculating how often the work is mentioned on different media platforms. The popularity of the article is, therefore, based on how often it is referenced in these sources. In addition to frequency of mentions, the altmetrics projected via Altmetric.com include a record of attention, a measure of dissemination, and an indicator of influence and impact. As a record of attention, Altmetric.com provides information on the reach of a scholarly work, i.e., how many people discuss the piece of research. As a measure of dissemination, Altmetric.com maps the location of the mention (*where*), and the reason (*why*) an article has been shared and discussed. As an indicator of influence and impact, Altmetric.com also provides a vehicle to capture *how* research can influence society-at-large. In these ways, Altmetric.com has unique capabilities to measure the impact of different research outputs, in terms of usage (downloads and views), peer-review (expert opinion), citations, storage, links, bookmarks, and conversations.

Key functionalities

In order to track and collate the amount of attention a scholarly output receives, Altmetric.com examines three essential components: an output (journal article, dataset, etc.); an identifier attached to the output (DOI, RePEc, etc.); and mentions in a source. Once the algorithm collects mentions of an article, the site displays the information on its display page.

The display page also has several functionalities that provide information about an article. The following are descriptions of the key functionalities that appear on the display page:

(1) The donut and attention score: this provides information on the types and the amount of attention the research output has received.

(2) Summary counts: this shows how many people from each source type, e.g., Facebook, Twitter, F1000, etc., are mentioned or shared the work.

(3) Bibliographic details: this provides information on the names of authors, titles, dates of publication, and other identifiers.

(4) Browse the original mentions: this function enables users to get access to sources that mention the primary research, i.e., links to news stories, blogs, etc.

(5) Signup for alerts: this asks users to register in order to receive e-mail alerts regarding the articles they select.

(6) Access the published research: this function enables users to get access to the research output.

The details page also provides demographics and rankings as well as a map of the geographical locations of users that illustrates the amount of attention a research article receives in comparison with other research outputs published within a similar time period and topical domain. The following screenshot of the display page shows how Altmetric.com summarizes the attention a piece of research receives from audiences (Figure 1).
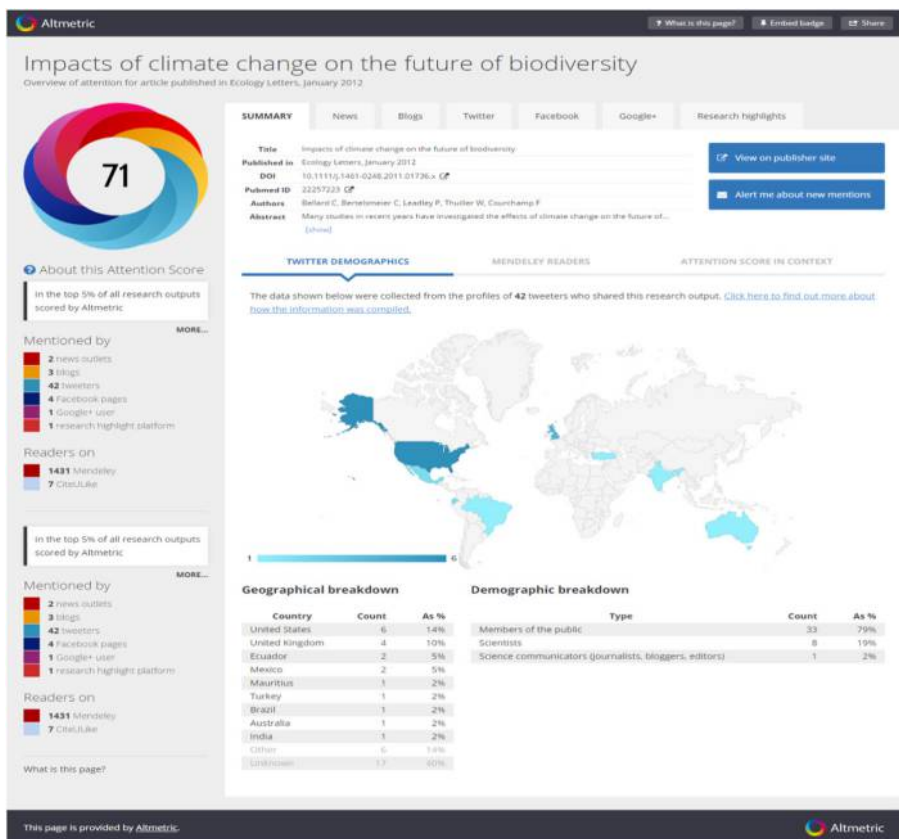

Figure 1.
Altmetric.com
data map

The pros and cons of altmetrics

Pros

Although altmetrics are not a replacement for traditional measures in discerning the impact of research, they do complement traditional measures. Speed is an asset of altmetrics that traditional measures lack. Altmetrics enable users to have a quick view of the impact of a research output (Melero, 2015). They allow users to get fast information about how many times an article is mentioned or discussed by people in different sources. In addition to the quick view of a research output's impact, altmetrics also enable the swift dissemination of an article. Due the speed at which people use social media, such as Twitter, it is easier to follow and organize references of scholarly work right after they are published (Melero, 2015). Altmetrics are also advantageous in that they have a wide-range of applications that help track researchers' scholarly outputs, including data sharing, software, and presentations. Furthermore, altmerics provide opportunities that researchers cannot get through other measures, including discussion of works in progress and unpublished articles.

Cons

Although altmetrics are a useful data source, there are some limitations as well.

First, they are only complementary to, not a replacement for, traditional data such as citation-based measurements.

Second, altmetrics can be compromised by subversive means or gaming, i.e., "the practice of unscrupulously exploiting a system or set of data in order to produce results that fit a user's desired outcome" (Roemer and Borchardt, 2015, p. 20). This concern arises in environments where data can be artificially manipulated. For example, one can get a "Like" on Facebook from close friends, family members, etc. to promote his/her work, which may reflect a form of personal or public impact but may not be a valid measure of scholarly impact.

The third limitation of altmetrics concerns the lack of a correlation between bibliometric and altmetrics data (Roemer and Borchardt, 2015). Unlike biblometrics, there is no conclusive research evidence that indicates a correlation between altmetric indicators and citation indicators.

Fourth, Altmetric.com's inclusion of data from public social media like Facebook and Twitter is a potential problem. According to Roemer and Borchardt (2015):

> This concern leads to what is perhaps an even more relevant criticism of the inclusion of metrics from non-academic-peer networks – that networks primarily populated by members of the general public are much less likely to be interested in esoteric fields of research than in research that connects to popular topics of discussion like climate change.

A fifth limitation is that Altmetric.com does not currently includes all possible sources in which a scholarly work is mentioned and may omit or misidentify scientific research (Robinson-García *et al.*, 2014). For example, while Altmetric.com gathers data from Twitter, it does not include mentions in Tumblr.

A sixth limitation is that Altmetric.com's circulation data only includes impact scores for articles published in English. For example, while Altmetric.com gathers mentions on Facebook, it does not collect mentions on Spanish *Tuneti* (Robinson-García *et al.*, 2014).

The seventh issue with Altmetic.com is related to its representativeness. For instance, Robinson-García *et al.* observed that almost 95.5 percent of data gathered are derived from only five sources, namely, Twitter, Mendeley, Facebook, CiteULike, and blogs.

The eighth limitation of Altmeric.com is a lack of clarity in the definition and interpretation of what the metrics mean and what they do. For instance, it is difficult to claim that mentions, recommendations by experts, reader counts, likes, and citations on Twitter, F1000, Mendeley, Facebook, and blog posts have a common and universally understood meaning (Haustein, 2016).

Table III summarizes some of the limitations, i.e., "Cons," of altmetrics.

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Cons	Description
Not citation-based	Altmetrics are only complementary to traditional citation metrics and do not replace citation-based data such as bibliometrics
Gaming	Data can be manipulated to fit a user's desired outcome
Lack of significant correlation with bibliometric data	There is no conclusive research evidence that documents a correlation between altmetric indicators and citation-based indicators
Inclusion of public social media	General publics may be less interested in academic research outputs and more interested in popular topics
Lack of common definitions	It is difficult to define activities such as mentions on Twitter, "likes" on Facebook, and recommendations by experts on F1000 as sharing similar meaning
Heterogeneity of social media platforms and users' motivations	The nature of social media platforms such as Facebook, Twitter, and F1000, etc., host a wide array of users, with different motivations and use behaviors, that may not be directly comparable and/or uniformly impactful
Lack of conceptual frameworks and theories	Scholars have yet to fully theorize and conceptualize altmetrics
Data quality	Unlike other measures such as bibliometrics, where data can be triangulated, the data in altmetrics are dynamic, in that they can be deleted or altered, and may therefore lack consistency, accuracy, and replicability
Lack of inclusiveness	Altmetrics do not include data from all digital media platforms
Language bias	Altmetrics.org only collects data on research that is written in English. For example, while they collect data on Facebook, they don't collect mentions on Spanish *Tuneti*

Table III.
The limitations
of altmetrics

Directions for future research

This research report provides fundamental conceptualizations and critiques of altmetrics that open the door for continued exploration and research in this domain. Two areas that are of particular and immediate importance include:

(1) *Technical issues*. Altmetric.com, and the apps available via Altmetrics.org, do not currently have the capability of collecting data on scholarly outputs produced in languages other than English. In the future, design elements of these sites could be enhanced by the inclusion of data from a broader range of sources and the creation of apps that gather data from multilingual texts.

(2) *Theoretical issues*. Since the study of altmetrics is a new field, with development ongoing, there is not a definitive theory-based explanation as to the mechanisms underlying their emergence and continued growth. In the future, theory-driven approaches to studying altmetrics will be of value to academic and scholarly communities.

In connection with the foundational conceptualizations of altmetrics presented in this study, research that explores academics' adoption and use of altmetrics over-time will be essential to uncovering the long-term impact and value that alt-measurements bring to scholarly communities. From a user perspective, the advantages of altmetrics identified in this report can be leveraged to heighten the dissemination and reach of academic research, particularly in domains that provide research to the general public. From a design perspective, the current limitations of altmetrics should be considered as new and improved tools are developed and unveiled. The future of altmetrics is a fruitful area of study for designers, academics, and researchers to continue to explore.

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