ALTMETRICS AND CITATION METRICS AS COMPLEMENTARY INDICATORS FOR RESEARCH MANAGEMENT

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Abstract

The quality and impact of scholarly articles are traditionally evaluated using metrics that put citation counts at the center. In the era of digitization, advanced online platforms and social media have transformed the dissemination of scientific information results and introduced new metrics for evaluating the influence of scholarly outputs and planning research studies. Alternative metrics (altmetrics) have emerged as tools for immediate measuring of scholarly outputs upon their online publication and dissemination through numerous online platforms, including social media channels. The Altmetric Attention Score by Altmetric.com has gained its global importance as an integral indicator for evaluation of constantly changing societal influence of individual articles. To a large extent, this and other social media metrics complement established citation metrics, allowing to visualize and predict implications at early stages of post-publication promotion. This article overviews characteristics of various altmetric tools and their growing roles for planning and evaluating scientific research.

Keywords: Research, Bibliographies as topic, Social media, Altmetrics, Altmetric attention score, Twitter, Mendeley

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INTRODUCTION

The modern-day scholarly publishing activities prioritize strategies for analyzing large volumes of scientific literature and visualizing trends and directions in research. It is becoming increasingly important to weigh the global influence of articles while bookmarking and archiving in individual researcher libraries.

Pre- and post-publication peer reviews are currently the main quality evaluation mechanisms that influence the overall post-publication promotion and citation aggregation [1]. The established research evaluation strategies are largely based on citations, which are

viewed as 'hard currencies' of individual researchers and related institutions. Citation-based evaluations are compounded by lengthy time periods which are required to disseminate publications and incorporate related references in traditional hubs of knowledge accumulation – subsequent scholarly articles. In other words, published articles become references and influence bibliographies over a relatively long period.

Over the past decade, advances in online dissemination of information through various public channels and scholarly networks have substantially accelerated data sharing and researcher engagement in the global post-

publication communication [2]. As a result, new metrics have emerged to quantify 'societal influence' of scholarly publications and supply the publishing enterprise with new dimensions for research evaluation. The term alternative metrics (altmetrics) has been proposed to complement established citation metrics and to diversify research evaluation [3].

Altmetric analyses allow mapping societal attention and distinguishing popular online channels for information dissemination [4, 5]. The weight (prestige) and popularity of such online channels differ across countries [6].

The Altmetric.com platform tracks records and feeds from diverse social media platforms, blogs, news outlets, scholarly networking and bookmarking sites, public policy documents, and other online sources, all of which are deemed important for an alternative view on scholarly reuse and influence on post-publication communication [7, 8]. Altmetric.com owns a proprietary algorithm for quantifying an integral score based on an assumption that online channels have differing powers to reflect public attention to publicized articles [9]. Compared with citation metrics, the main advantage of altmetrics is its immediacy effect and real-life monitoring of public attention to scholarly articles. The immediacy effect is due to the ease of public attention aggregation, reflecting almost all changes in the use and dissemination of scientific information by scholars and other public representatives.

The aim of this article is to overview popular altmetric tools and distinguish their main differences from established research evaluation methods. The results of this overview may contribute to increasing the awareness of altmetric tools and their uses for researchers and editors.

ALTMETRIC ATTENTION SCORE

To visualize the Altmetric Attention Score (AAS) of individual articles, 'altmetric it' tool can be downloaded from <https://www.altmetric.com/products/free-tools/bookmarklet/>. This tool allows free monitoring of AAS. The altmetric multicolor donut displays all contributing social-media components of AAS in its ring and an aggregate score at the center. The AAS is an indicator of public attention to an article across various online platforms [10]. Although the platforms contributing to the AAS calculation are publicly listed, and this list is continuously expanding (<https://www.altmetric.com/about-our-data/our-sources/>; Box 1), the proprietary calculation algorithm is unavailable to the public [11].

Box 1. Altmetric Attention Score Sources

Sources

- Public policy documents
- Online reference managers
- Post-publication peer review platforms
- News
- Wikipedia
- Social media (Facebook, Twitter, LinkedIn, Google+, Sin Weibo and Pinterest)
- Multimedia and other online platforms (YouTube, Reddit, Q&A)
- Citations
- Blogs
- Patents
- Post-publication peer review platforms (Pubpeer and Publons)
- Research highlights

Each color in the altmetric donut indicates attention from a separate platform: light blue refers to Twitter, red to news outlets, yellow to blogs, etc. (<https://www.altmetric.com/about-our-data/the-donut-and-score/>). The 'weight' of each color in the altmetric donut varies depending on attention quantitative values. The AAS is calculated based on three factors: volume, sources, and authors (<https://www.altmetric.com/about-our-data/the-donut-and-score/>). The AAS increases as more people mention it; only 1 attention point from a single person on a platform is acceptable. For example, if a user tweets about the same article more than once, Altmetric.com counts the initial activity only. Attention arising from different platforms variably contributes to the AAS. Altmetric.com takes into account whether there is a bias against a particular journal or publisher. It evaluates how often the referring user mentions the promoted articles.

PlumX METRICS

PlumX is an online tool that helps to obtain information on the use and influence of various scientific products. PlumX obtains data from web sources. PlumX processes alternative parameters such as download counts, abstract views, comments on online platforms, social-media activities, as well as citations. It provides an insight into the public discussion of scholarly and other items [12, 13]. Scientific products in PlumX are named as artifacts. All data obtained by PlumX are processed and presented as "Plum Print", an infographic with separate circles for five categories (usage, captures, mentions, social media, and citations) [14]. The 'usage'

category covers article-level statistics such as abstract views, text downloads, clicks, figure and PDF views, and video acts. The "captures" category includes bookmarkings, adding to favourites lists, and exports. The 'mentions' category covers evaluations in Amazon, comments in Facebook and Slideshare, Forum subjects, Wikipedia links, and mentions in blogs. The 'social media' category takes into account likes, shares and tweets associated with artifacts. The 'citations' category analyzes artifacts using traditional metrics (<https://plumanalytics.com/learn/about-metrics/>). Plum Print provides an integrated view of alternative and traditional metrics. The visualization is available in green for 'usage', purple for 'captures' category, yellow for 'mentions', light blue for 'social media', and orange for 'citations'. In addition to artifact-based data, PlumX also generates researcher and institute-level data. PlumX dashboard helps to customize graphs while generating institutional and researcher metrics.

TWITTER

Twitter has become a globally popular communication platform. Numerous special interest groups create their Twitter accounts for scholarly purposes. Twitter account holders discuss their scientific ideas, disseminate research results, and expand networks with professionals [15]. Twitter is well equipped for commenting on and disseminating research outputs [16].

Journals and editors actively use Twitter. Their aim is to keep scholars abreast of latest developments in their field of interest [17]. Twitter-sourced altmetrics reflect public's interest surrounding scholarly articles and other products. Non-professional tweets are less likely to predict citations than academic tweets [18]. Although Twitter provides useful altmetrics for evaluating scientific communications, there is uncertainty over the accuracy of the content. The inability of professionals to actively use Twitter owing to the high intensity of their workloads may limit the spread of scientific information. In addition, bots and trolls can indiscriminately generate tweets, some of which contain misinformation and distorted altmetric analyses [16, 19, 20].

MENDELEY BOOKMARKINGS

Mendeley is one of the most frequently used online reference managers that allows to combine bookmarking with reference management on a single platform [21]. It also offers scholarly networking and collaboration. Article PDFs are exported to the Mendeley interface, with metadata being automatically exposed. The Mendeley reader counts reflect article bookmarkings by online users [22]. The reader counts varies according to the frequency of adding articles to individual libraries.

Researchers who add articles to their Mendeley libraries are likely to cite these items in their future research outputs [23].

COMPLEMENTING ALTMETRICS WITH CITATION METRICS

Citations are taken into account for calculation of traditional impact metrics. In the digitized world, not just citations, but all other post-publication promotion and other activities can be monitored and analyzed. The resultant metrics reflect attention surrounding articles, not necessarily their quality.

Altmetrics and citation metrics are variably associated across disciplines [24, 25]. However, altmetrics provide early post-publication information, well in advance of citation aggregation. Altmetrics should not be considered as a substitute for traditional citations. These should be viewed as complementary parameters.

SAN FRANCISCO DECLARATION ON RESEARCH ASSESSMENT

San Francisco Declaration on Research Assessment (DORA; <https://sfdora.org/read/>) was issued by scientists and editors at the American Cell Biology Association meeting in San Francisco in December 2012. The journal editors voiced their concerns over the misuses of the Journal Impact Factor that became a proxy of journal and article quality. The DORA highlighted some action points for moving away from the JIF uses as a single metric and switching to a combination of reliable metrics, including altmetrics. As a result, academics, funding agencies, and scientific institutions have stepped up their work to develop more effective tools and faster and more efficient ways to assess the quality of researcher contributions, rather than focusing on JIF and related metrics [26, 27].

SCHOLARLY IMPLICATIONS OF SOCIAL MEDIA AND ALTMETRICS IN CENTRAL ASIA

Central Asian researchers are mostly optimistic over the uses of Internet platforms and social media for scholarly purposes. However, they are also concerned over the privacy issues and local restrictive regulations [6, 28]. The active scholarly use of online platforms and social media may not only boost altmetrics, but also improve Central Asian users' online presence and influence.

The use of various web-based platforms facilitates access to various sources of scientific information, networks of scholars, and hypothesis-generating ideas [6]. Online communications and networking in Central Asia and beyond may help create a basis for future research studies.

Altmetrics and social media may improve hypothesis generation, research planning, and post-publication analyses. New directions of research can be planned in view of altmetric analyses and ranking trending articles.

Social media platforms display online comments, including positive and negative remarks which may help generate testable hypotheses and plan new studies. Identifying areas of great importance for social media users may also prompt funding agencies to relocate their grants to certain research projects.

It should also be noted that social media and altmetrics are confounded by some inherent negative aspects such as data manipulation. In fact, number of views, downloads, and mentions can be increased using trolls, mechanistic (robotics) and bot accounts. To correct for all these negative confounders, altmetric analyses should be more accurate and detailed. At times, analysing separate components of the AAS brings more valuable information than blindly relying on the integral value of this score. Social media metrics should always be accompanied with citations and expert evaluations [16].

CONCLUSION

Altmetric tools have emerged to advance scientific communications, networking, and research planning. With unprecedented popularity of various social media platforms, altmetric analyses have become more objective reflections of the societal impact of scholarly outputs. Unsurprisingly, more and more altmetric tools are being employed by journals, publishers, and

databases to visualize new dimensions of impact measurement.

Altmetrics are complementary to established bibliometrics such as citation counts and JIF. Their combination is believed to be a better reflection of research productivity and impact. As with bibliometrics, altmetric analyses should be corrected for time periods and patterns of certain disciplines and countries. Limitations and manipulation risks should be also taken into account. Therefore, any quantitative bibliometric and altmetric analyses should be accompanied with context analyses and expert evaluations.

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CONFLICTS OF INTEREST

Both authors have completed the ICMJE Disclosure Form (<http://www.icmje.org/disclosure-of-interest/>; available on request from the corresponding author). Both authors declare that there are no potential conflicts of interest.

DISCLAIMER

No part of this article is copied or published elsewhere in whole or in part.

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ҒЫЛЫМИ БАСҚАРУ ҮШІН КӨРСЕТКІШТЕР РЕТІНДЕ ДӘЙЕКСӨЗДЕРГЕ НЕГІЗДЕЛГЕН АЛМЕТРИКА ЖӘНЕ МЕТРИКА

Түйіндеме

Ғылыми мақалалардың сапасы мен әсері дәстүрлі индикаторлардың көмегімен бағаланып, олардың арасында дәйексөз саны негізгі болып табылады. Сандық дәуірде желілік платформалар мен әлеуметтік желілер ғылыми ақпаратты таратудың жетекші арналарының біріне айналды, сондықтан зерттеуді жоспарлау мен алынған ғылыми нәтижелерді бағалау үшін жаңа өлшемдер пайда болды. Альтернативті метрика (альтметрика) ғылыми жұмыстарды жедел бағалау құралдары болып саналады олар: Интернетте жарияланғаннан кейін қалай пайдаланылатындығы және әлеуметтік желілер каналдарымен қоса олардың көптеген әлеуметтік платформалар арқылы таралатындығы. Altmetric.com сайтының Altmetric Attention Score бағалаудың жаһандық маңыздылығы бар, себебі бұл жеке мақалалардың үнемі өзгертін әлеуметтік әсерін бағалаудың интегралдық индикаторы болып табылады. Әлеуметтік желілердің осы және басқа да көрсеткіштері белгіленген дәйексөз көрсеткіштерін едәуір толықтырып, бұл алғашқы сатысында жарияланғаннан кейін жарнамалық нәтижелерді көрсетуге және болжамдауға мүмкіндік береді. Бұл мақалада әртүрлі алытметриялық құралдардың сипаттамалары және олардың ғылыми зерттеулерді жоспарлау мен бағалауда олардың рөлінің артуы қарастырылады.

Түйінді сөздер: зерттеу, библиография тақырып ретінде, әлеуметтік медиа, алытметрия, зейінді алытметриялық бағалау, Twitter, Mendeley

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АЛТМЕТРИКИ И МЕТРИКИ НА ОСНОВЕ ЦИТИРОВАНИЙ КАК КОМПЛЕМЕНТАРНЫЕ ИНДИКАТОРЫ ДЛЯ НАУЧНОГО МЕНЕДЖМЕНТА

Резюме

Качество и оказываемый эффект научных статей оценивается с помощью традиционных показателей, среди которых во главе угла стоит количество цитирований. В эпоху цифровых технологий онлайн-платформы и социальные сети стали одними из ведущих каналов распространения результатов научной информации, поэтому появились новые метрики для оценки планирования исследований и полученных научных результатов. Альтернативные метрики (альтметрики) являются инструментами для оперативной оценки научных работ: как они используются после публикации в Интернете и как распространяются через многочисленные онлайн-платформы, включая каналы социальных сетей. Оценка Altmetric Attention Score от Altmetric.com имеет глобальное значение, так как является интегральным индикатором для оценки постоянно меняющегося социального эффекта отдельных статей. Эти и другие показатели социальных сетей существенно дополняют установленные показатели цитируемости, позволяя визуализировать и прогнозировать результаты продвижения после публикации уже на ранних этапах. В этой статье рассматриваются характеристики различных алытметрических инструментов, их растущая роль в планировании и оценке научных исследований.

Ключевые слова: исследования, библиографии как тема, социальные сети, алытметрики, алытметрическая оценка внимания, Twitter, Mendeley

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