

Social Media and Citation Metrics

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Quantifying scholarly output via traditional citation metrics is the time-honored method to gauge academic success. Assessing the impact of a scholar's work can be measured by evaluating several factors including the number of peer-reviewed publications, citations to these publications, and the influence of the publications. These metrics take a relatively long time to accumulate; some are available only via subscription resources, and often these data measure influence only on a specific scientific community. Although these accepted tools provide a means to weigh scholarly output, they do not tell the entire story.

While the metrics described above capture a work's influence in a particular discipline, this narrow approach to gauging impact discounts the many new ways in which users engage with scholarly information. Interacting with published works in social media can take the form of article downloads or saves, tweets, analysis and review, or simply article views. As scholars communicate more frequently and more meaningfully with social media tools, the importance of quantifying these interactions is evident.

This paper will begin by reviewing the traditional methods to gauge academic success. The social media tools scholars' use (or should use) will be described, along with methods to quantify these interactions. An analysis of the best resources to help gauge impact over a wide range of outlets will follow. Finally, some advice to help engage reluctant researchers with these emerging forms of scholarly communication will be provided.

Traditional Tools

There are a number of traditional methods that the scientific community uses to measure academic success. These assessments are tied to the scholarly publishing process and the peer review procedure. This process begins when a researcher first targets a journal for publication and adapts a manuscript to the journal's requirements. The journal's editor then sends the paper out for peer review, a process whereby other researchers with similar expertise evaluate the paper to verify the credibility of the work. Upon successful review and acceptance, the paper goes through a series of edits and is included in an issue of the journal for publication.

Some of the traditional methods to gauge academic success are tied to the journal title itself. Researchers consider these metrics when targeting a journal in which to publish. The first, and most well-known of these metrics, is the Impact Factor. The Impact Factor “is a measure of the frequency with which the “average article” in a journal has been cited in a particular year or period” (Thomson Reuters 2013). To calculate the Impact Factor (IF), Thomson Reuters averages the number of times articles from the journal in the past two years have been cited in the past year. This information is available through their Journal Citation Reports (Thomson Reuters 2012). Because it is a standard metric, it is frequently discussed as the only metric to evaluate journal quality. It is important to recognize that the only titles that are included in the Journal Citation Reports and given an IF are titles indexed by the Web of Knowledge database. Not only does this exclude some journal titles, it also excludes book chapters and conference proceedings, which are important scholarly output in some disciplines (Cameron 2005).

Another title level metric is the SCImago Journal & Country Rank. The SCImago Journal rank differs from the Impact Factor because it is based on data from the Scopus database instead of Web of Knowledge (SCImago 2007). According to a study, the SCImago metric is “calculated with the largest and most nearly complete bibliographic database and using a citation window of 3 years that is wide enough to include most of the citations, and dynamic enough to measure the evolution of scientific journals” (Gonzalez-Pereira, Guerrero-Bote, and Moya-Anegon 2009). This study compared the datasets of both Web of Knowledge and Scopus, and the metric tools derived from the data (the Impact Factor and SCImago Journal Rank). In addition to counting the number of citations a journal receives, SCImago also takes into account the prestige of the citing journal in its algorithm.

Additional methods of gauging academic success focus on individual articles rather than the journal in which an article is published. Simply counting the number of later articles that cite the original article is one of those metrics. While the metric is not complicated, gathering the data to count the citations is. Both Scopus and Web of Knowledge databases include citation linking, and with that linked data one can create reports of the number of times an article, or all articles by an author, have been cited. As discussed earlier, neither set of data is complete. Google Scholar also includes a “cited by” count in its display of an individual article. That information can be collected for a single author by using Google Scholar Citations, which allows an author to create a profile displaying various citation indices. There are a number of criticisms of Google Scholar’s citation counting. The numbers may be inflated if citations to articles are counted twice; for example, if the citing paper is published in a journal and also posted to a researcher’s website. Google Scholar does cover many more conference papers and book chapters than either Scopus or Web of Knowledge (Jacso 2006).

The h-index is another method for evaluating the scholarly output of a researcher. This metric does not just evaluate one journal or one article but tries to give a broader view of the impact of a researcher’s work. The h-index is the number of a scholar’s papers, h , that have been cited at least h times by other publications (Hirsch 2005). The h-index is frequently represented on a graph with the number of papers along the x axis and the number of citations along the y axis. H is found where the papers equal the number of citations.

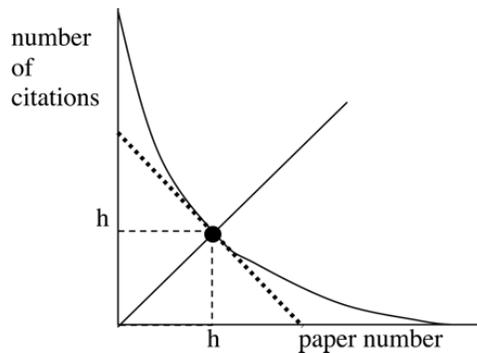


Figure 1. From Hirsch 2005

The h-index is calculated in all of the above mentioned tools and is subject to the limitations mentioned above due to incomplete or over reported data.

Scholars' Engagement with Social Media

For as long as scholarly output has been measured, scholars have thought about ways to increase their impact. One way to do so is by maintaining an online presence and by active involvement in social media. These forms of engagement offer scholars a method to disseminate their research, increase their professional profile, and communicate their findings with the public (Bik and Goldstein 2013). A study of materials posted to ArXiv concluded that Twitter mentions of articles led to article downloads (Shuai, Pepe, and Bollen 2012). Scholars are also encouraged to maintain their online profiles as to not run “the risk that undesirable search results appear before desirable ones” (Bik and Goldstein 2013). Additionally, outreach to the public through social media is one strategy for meeting broader impacts criteria required by the National Science Foundation (Bik and Goldstein 2013).

How do individuals decide which medium is relevant in the cloud of ephemeral electronic communication? “Likes” on Facebook? “Saves” in a Mendeley group? It is dependent on the context, purpose, and intended use of the communication. In one academic environment, relevant communication may take the form of a tweet to a very specific, highly interested, follower group. In another discipline, a LinkedIn news story may be a targeted method to reach the intended audience. To successfully mount a social media campaign, researchers must be aware of the available tools and familiar with the current practices in a discipline

Some of the most obvious social media interactions are described below, including why they might be important to track. There is some very interesting work being done on alternative scholarly metrics, or altmetrics (Priem et al. 2010). Some of the more mature tools will be discussed, along with current research that connects social networks with citation metrics (Eysenbach 2011). In addition, methods that information professionals can use to help facilitate their use will be addressed. This is a fast-moving and dynamic area, so it is important to keep abreast of recent developments before advising constituents.

Connecting Social Media with Scholarly Metrics

One of the premier tools to learn about connecting social media interactions with scholars' productivity is the impact aggregator, [ImpactStory](#). Funded by the Alfred P. Sloan Foundation, "ImpactStory aggregates [altmetrics](#): diverse impacts from your articles, datasets, blog posts, and more." (Priem and Piwowar 2013) This impact aggregator is free and open source with embeddable code. A user creates a collection and adds articles and other research products from sources including Google Scholar, or by inserting DOI's or PubMed IDs. Next, other products are collected including datasets, slides, and other products available via DOI or URL identifiers.

Some of the social media tools for which metrics are collected in an ImpactStory profile include:

- [CiteULike](#), a service that permits users to store, organize and share scholarly papers (CiteULike 2013). Participants can post articles of interest to their libraries that can be organized by tags.
- [Delicious](#), the social bookmarking service that focuses on "curation and discovery" (Delicious 2013) allows users to save and share bookmarks on the web.
- [F1000](#) is a subscription-based recommendation service for curated articles in biology and medicine. This publisher offers four different services that include an open access journal, F1000Research; and an open access poster and presentation repository, F1000Posters (Faculty of 1000 2013).
- [GitHub](#) is a social, online repository for open source code which allows developers to collaborate, review, and rate software (GitHub 2013).
- [Mendeley](#) is a free reference manager and social network that was recently acquired by Elsevier. Mendeley is described as "one of the world's largest crowd-sourced research catalogs" (Mendeley Ltd. 2012). Users create a free account to store and annotate articles, join interest groups to share references, and browse papers.
- [SlideShare](#), a tool for posting and sharing slide presentations, videos, documents and webinars, is one of the top 200 most visited websites in the world (SlideShare 2013).
- [Twitter](#), the information network that allows users to microblog in real time and follow the Tweets of others, is increasingly used in academia and business (Twitter 2013).
- [Zotero](#) is a robust and growing citation management and sharing resource. It is likely that in the near future it will begin incorporating more of the readership tools that Mendeley and F1000 offer. Zotero is a free, open source, and open access citation management tool (Roy Rosenzweig Center for History and New Media 2012).

The metrics collected by ImpactStory are directly related to the content and application of the information accessed. For example, in the [sample Impact Profile](#), data collected from a study on scholars' use of Twitter, and posted in the open source data and code repository, GitHub, includes:

- **discussed** by public (on Twitter): this metric reports the number of influential and non-influential tweets about the referenced GitHub collection.
- **saved** by public: includes the number of bookmarks in Delicious.

- **cited** by public: in the example given, the repository was “forked” or copied to another user’s GitHub account.
- **recommended** by public: number of users who have given this GitHub repository a star.

Alternatively, data collected on articles in the sample profile include the more familiar, but uniquely interpreted metrics:

- **downloaded** by scholars: from PubMed Central, the Public Library of Science, etc.
- **saved** by scholars: bookmarks in CiteULike, saves in Mendeley and/or Zotero libraries.
- **cited** by scholars: in PubMed Central and Scopus in this example.
- **recommended** by scholars: using F1000 or other tools

And the less familiar, social-media metrics:

- **discussed** by public: on Twitter, Facebook or on other web platforms
- **saved** by public: web bookmarks
- **cited** by public: in this example, cited by Wikipedia articles.

The authors urge readers to view the latest version of [ImpactStory’s website](#) for the most up-to-date and exhaustive list of social media tools tracked. ImpactStory also can help one visualize the connections between familiar citation metrics and social media interactions.

Another platform that helps connect social media metrics with cites is [Altmetric](#). This company “identifies, tracks, and collects article-level metrics on behalf of publishers” (Adie and Roe 2013). This platform is a paid business solution that collects data about an individual article and supplies this data to publishers. The publishers, who can subscribe to various Altmetric products, store and present article-level metrics to their readers and authors. The data Altmetric collects include reference manager counts, Tweets, and discussions in social networking sites such as Facebook, Reddit and blogs. Subscribing publishers can drive traffic to their own websites and publishing platforms by displaying altmetric data alongside traditional article level metrics.

[Plum Analytics](#) is commercial platform that is marketed to libraries. It collects data similar to ImpactStory, but it is a closed source and data system, as is Altmetric.com. This system measures influence using five categories; usage, captures, mentions, social media, and citations (Bushman and Michalek 2013). This aggregator seems both very ambitious and promising for institutional subscribers.

First and foremost, it is important to recognize that only properly attributed artifacts are counted. Altmetric.com uses an article’s Digital Object Identifier (DOI) or PubMed ID to disambiguate and collect data about articles (Adie and Roe 2013). In her recent article, Heather Piwowar describes various research products that ImpactStory tracks including data sets, software, posters and patents (Piwowar 2013). Correctly attributing all the mentions in social media requires sophisticated algorithms and perhaps monitoring by authors. Just as unscrupulous authors can inflate citation counts, altmetrics can also be exaggerated. A combination of sophisticated data gathering and author attention can insure that accurate, reliable data is collected about an article, research product, or scholar.

Information professionals and the scholars they work with need to understand the importance of unifying their professional personas in order to correctly track and attribute their scholarly output. Obtaining an Open Researcher Identifier (ORCID) is a simple first step (ORCID Inc. 2012). This service assigns a unique number to each researcher and this number can be tied to an author's Scopus Author Identifier, their Web of Knowledge ResearcherID or other identification schemes. It is also a good practice to use consistent naming conventions in the various scholarly and social media platforms. For example, adopting the same username in SlideShare, Twitter and other social media platforms will help connect one's various research outputs. A strong, unified web presence is attractive to potential employers, funders and collaborators.

Once scholars understand what altmetrics are, and how they can contribute to increased visibility and use of research products, encouraging adoption of these tools should be fairly easy. One can begin by demonstrating a cited author search in Web of Science, where one document may be cited several different ways in the database and the difficulty of precise attribution. ORCID can help by disambiguating authors and their research products. Viewing a Mendeley Group, which is a loosely curated collection of articles in a subject area, can demonstrate the utility of this tool in keeping abreast of new literature. From following Tweets of influential authors, to viewing the research catalogs of prolific researchers, there are many interesting and innovative ways to engage scholars with alternative methods of tracking scholarly influence.

Looking Forward

Paying attention to and collecting alternative metrics about research products will vary according to one's field and scholarly community. Authors should be encouraged to explore and engage with social media tools already in use in their disciplines and be mindful of emerging tools. Scholars are beginning to go "beyond the paper" and engage with their colleagues via Twitter, blogs and reference managers (Priem 2013). These types of interactions will continue to increase and those who remain unengaged will be left out of important discussions. Increasingly, it is important to not only read the newest journal article, but to follow the chatter about the research in social media platforms such as blogs and Twitter. Reluctant social media adopters can be encouraged to engage by understanding that it is perfectly acceptable to simply read or observe, rather than post or Tweet.

More scholars are engaging with social media in a professional capacity. From following tweets of fellow conference attendees to hearing about newly published papers, researchers are becoming more reliant upon crowdsourced peer review. As the acceptance of social media and online tools has progressed, interest in employing these tools to gauge academic success has been amplified.

Awareness of new metric tools and how they relate to social media is important knowledge for producers of scholarly output. These tools complement their existing readership, promote their work to new readers, and also measure these outputs in concert with traditional scholarly metrics. Measuring the influence and impact of scholarly engagement with these new online tools and networks is gaining importance in academia today.

EndNotes

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