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From bibliometrics to altmetrics

A changing scholarly landscape

When future Science Citation Index founder Eugene Garfield first came up with the idea of journal impact factor in 1955, it never occurred to him "that it would one day become the subject of widespread controversy."[1]

Today, techniques for measuring scholarly impact—traditionally known as bibliometrics—are well known for generating conflict and concern, particularly as tenure-track scholars reach beyond previously set boundaries of discipline, media, audience, and format. From the development of more nuanced academic specialties to the influence of blogs and social media, questions about the scope of scholarly impact abound, even as the pressure to measure such impact continues unabated or increases.

As faculty at universities around the world struggle to find new ways of providing evidence of their changing scholarly value, many librarians have stepped forward to help negotiate the landscape of both traditional impact metrics, such as h-index and journal impact factor, and emerging Web-based alternatives, sometimes called *altmetrics, cybermetrics,* or *webometrics*. With interest in online venues for scholarly communication on the rise, and the number of tools available for tracking online influence growing steadily, librarians are in a key position to take the lead in bolstering researchers' knowledge of current trends—and concerns—in the new art and science impact measurement.

General resources

• **Google Scholar Citations.** This free Google service allows authors to create profiles that manage, calculate, and track citation data such as h-index and i10-index (i.e., number of articles with at least ten citations). Using a statistical model based on author and article metadata to identify relevant citations, the service offers the option of automatically adding new articles to users' public or private profiles. Google also recently launched a related service, Google Scholar Metrics, that gauges the "visibility and influence" of articles and publications from 2007 to 2011, based on Google Scholar citation data. *Access:* http://scholar.google.com/intl/en/scholar/citations.html.

• **SCImago Journal and Country Rank.** SCImago is a free Web site that runs on Scopus data to calculate two metrics: SCImago Journal Rank (SJR) and Source Normalized Impact per Paper (SNIP), which compare directly to Web of Knowledge's Impact Factor. SJR is based on times cited, but also uses an algorithm similar to Google's PageRank to calculate article influence, which it uses to create rankings. Using SCImago's online interface, users can compare rankings of up to ten journals at a time, display top journals, and even display countries with influential journals in a discipline. *Access:* http://www.SCImagojr.com.

• **Scopus.** Scopus is a subscription database known primarily as an alternative

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to Web of Knowledge, as it offers similar article, author, and journal-level metrics, but uses slightly different algorithms to calculate them. Metrics include standard options such as times cited and h-index, as well as original offerings like SJR and SNIP from SCImago. Scopus recently launched "Altmetric for Scopus," a third party application that runs within the sidebar of Scopus pages to track mentions of papers across social media sites, science blogs, media outlets, and reference managers. *Access:* http://www.scopus.com.

• **Web of Knowledge.** This Thomson Reuters subscription database helped usher in modern bibliometrics with its introduction of the h-index in 1982. Web of Knowledge includes Web of Science, for article and author queries, and Journal Citation Reports, for journal queries. Its metrics include times cited, h-index, impact factor, Eigenfactor, and field-based journal rankings. While many of these metrics have been criticized for not fully representing scholarly value in certain disciplines, they are still considered the gold standard in traditional bibliometrics. *Access:* http://www.webofknowledge.com.

Altmetric resources

• **Altmetrics.org.** This free Web site is a central hub for information about the growing altmetrics movement, which it defines as "the creation and study of new metrics based on the Social Web for analyzing and informing scholarship." Cofounded by prominent figures in the world of bibliometrics, such as Jason Priem and Heather Piwowar, altmetrics.org maintains links to new online tools for calculating impact. Other prominent features include an altmetrics "manifesto" that argues how altmetrics can improve existing scholarly filters. *Access:* http://altmetrics.org.

altmetrics

• **Impact Story.** Formerly known as Total Impact, Impact Story is a free open source tool designed to support URL-based publishing through the aggregation of online altmetrics. Users create collections of materials through online identifiers, such as Google Scholar Profiles, DOIs, and PubMed IDs. Impact Story uses more than a dozen APIs to search for metrics on these collected items, with sources ranging from popular social media to scholarly tools like Mendeley and PLoS. Items are subsequently assigned impact categories, such as generally/highly "saved," "cited," "recommended," or "discussed." This resource is most useful for researchers publishing in nontraditional venues or with scholarship too new to have accumulated traditional citations. Not a comprehensive source for tracing Web impact. *Access:* http://impactstory.it/.

ImpactStory.

• **PLoS Article Level Metrics.** Public Library of Science (PLoS) has emerged as the leading open access journal repository, in part due to its high traditional impact factors. However, PLoS offers an alternative to traditional impact in the form of Article Level Metrics, which track the influence of individual PLoS articles, from times downloaded to mentions in social media and blogs. PLoS also tracks internal article metrics, including comments, notes, and ratings. While a valuable resource for impact, only PLoS articles benefit from its metrics. Nevertheless, this resource represents an important new avenue for metrics, which future publishers will likely replicate. Available for free online. *Access:* http://article-level-metrics.PLoS.org/.

• **Publish or Perish.** Anne-Wil Harzing created Publish or Perish (PoP) to assist faculty looking for more diverse bibliometrics. PoP is a free, downloadable program that harvests data from Google Scholar based on author name. Users can manually remove records to refine the data, similar to what is now offered by Google Scholar Citations. PoP can also calculate numerous metrics, including alternatives to the h-index. However, because few people are familiar with

non h-index calculations, it is up to users to explain such metrics to larger audiences. *Access:* http://www.harzing.com/pop.htm.

• **ReaderMeter.** ReaderMeter is a free tool that "crowdsources" impact by processing readership data from Mendeley. Created by Dario Taraborelli of the Wikimedia Foundation, it contrasts with traditional bibliometric tools in its focus on readership, not citation. The site functions by compiling reports based on authors' names, which are subsequently processed through the Mendeley API. Each report highlights information such as an author's "HR-Index," "GR-Index," "Total Bookmarks," and "Top Publications by Readership." ReaderMeter has been by criticized some in the altmetrics community for drawing data exclusively from Mendeley.[2] However, plans exist to integrate data from multiple reference management sites, such as CiteULike. *Access:* http://readermeter.org/.

Scholarly peer networks

• **Academia.edu.** Academia.edu is a free online paper-sharing platform that encourages academics to increase their visibility and monitor research within and across its scholarly network. With nearly 2 million profiles and 1.5 million uploaded papers, academia.edu has become a popular player in the world of online repositories. Impact metrics for the site are similar to those offered by many blogs, and include profile views, document views, and country-based page traffic. In another increasing trend for scholarly networks, the site also offers features geared toward social interaction, such as user statuses and an "ask a question" tool. *Access:* http://www.academia.edu/.

• **Mendeley.** Mendeley is a relatively recent startup from the same company that created Last.fm. It combines a citation manager with a scholarly social network to create a comprehensive research portal. Researchers with profiles can chart views and downloads of their research through the portal, join groups, and view popular articles within their fields. Mendeley has gained particular traction in the sciences, from which most of its users hail. However, with the integration of Mendeley data into more altmetrics tools, it will likely become popular with other disciplines, too. Mendeley is free with for-cost storage upgrades, and available both online and as a download. *Access:* http://www.mendeley.com.

• **Social Science Research Network (SSRN).** SSRN is an online article repository, recently listed number one in the Web of World Repositories' rankings for 2012. It encompasses three key features: an database of more than 400,000 abstracts, a large electronic paper collection, and 20 specialized subject networks through which registered users can promote their work and connect to free abstracts and articles. Though praised for its ability to facilitate discovery of scholarship, SSRN has also been criticized for the strictness of its policies, which some see as stifling in comparison to emerging scholarly networks. Still, its site-specific metrics for "top papers," "top authors," and "top institutions" remain key to social science faculty. *Access:* http://www.ssrn.com.

• **VIVO.** VIVO is a free, downloadable semantic Web application designed to facilitate research collaboration both within and between institutions. Originally developed at Cornell, it invites institutions to upload data related to faculty profiles, which it crawls in order to draw meaningful connections between researchers. VIVO doesn't directly support user-centered metrics, but has the potential to be a powerful tool in collecting university-level research metrics. To date, only a few large institutions have implemented VIVO, as it requires significant programming knowledge and commitment. *Access:* http://vivoweb.org.

Blogs and media

• **Citation Culture.** This two-year-old blog is the creation of Paul Wouters, director of the Centre for Science and Technology Studies at Leiden University (LU). Authored by Wouter and a fellow LU professor, the blog is dedicated to discussion of academic impact, from citation analysis to the broader

evaluation of research across universities. Recent multipart posts have touched on topics, such as humanities bibliometrics and scholarly altmetrics. While information on the site is excellent and detailed, posts are published sparingly, at a rate of one to two per month. *Access:* http://citationculture.wordpress.com/.

• **Jason Priem's Web site.** Jason Priem is a Ph.D. candidate at University of North Carolina-Chapel Hill's School of Information and Library Science and the cofounder of Impact Story. Priem has emerged as one of the strongest advocates for altmetrics, and a champion for library involvement. His interests touch on a variety of altmetrics topics, including the future of scientific communication, the open data movement, and author's rights. As the emerging altmetrics landscape continues to move forward, expect Priem to be at the front. *Access:* http://jasonpriem.org/.

• **Scholarly Kitchen.** Established by the Society for Scholarly Publishing, Scholarly Kitchen is a moderated blog that presents ideas on current topics of scholarly publishing and communication. While not strictly focused on bibliometrics, many of the site's "chefs" boast expertise in the intersection between impact and publishing. The site also offers useful category filters such as "Metrics & Analytics," which includes more than 280 posts and counting. *Access:* http://scholarlykitchen.sspnet.org/.

Bibliometrics research support

• **Elsevier Bibliometrics Research Program (EBRP).** EBRP was designed by Elsevier as a way for bibliometrics researchers to gain access to large amounts of data for free. Available data includes publication metadata from Scopus, usage data, and full-text data from ScienceDirect. Researchers apply for the data, and successful applicants receive a dataset specifically designed for their project by Elsevier. Examples of successful projects on the site are especially useful to those who are interested in current altmetrics topics, such as the relationship between article downloads and citations. *Access:* http://ebrp.elsevier.com/index.asp.

• **OII Toolkit for the Impact of Digitised Scholarly Resources.** This JISC-funded toolkit was developed by the Oxford Internet Institute to help authors, publishers, and librarians, learn more about measuring the impact of digital scholarship. The Web site is divided into three sections: case studies, quantitative methods, and qualitative methods. The two latter sections define and discuss methodological subcategories, such as bibliometrics/scientometrics and content analysis. Contributions to the toolkit are encouraged in the form of articles and comments, which can be submitted after creating a free user account. *Access:* http://microsites.oii.ox.ac.uk/tidsr/welcome.

Organizations, conferences, and electronic lists

• **ACM Web Science Conference.** The Web Science Conference is dedicated to the study of socio-technical relationships that shape and engage with the Web. An official ACM conference since 2011, Web Science brings together computer scientists with researchers from the social sciences, humanities, and law. Each conference has included a major workshop on the impact of the Web on scholarly communication—including this year's "Altmetrics12" workshop, run by affiliates of altmetrics.org. *Access:* http://www.websci12.org/.

• **ASIST SIGMETRICS.** This electronic list covers bibliometrics and altmetrics from a LIS perspective. Posts are equal parts information/announcement and discussion of factors related to bibliometrics, such as open access or "gaming" metrics systems. This electronic list is a great option for those interested in bibliometrics culture or in networking with bibliometrics specialists. Includes a searchable archive. *Access:* http://web.utk.edu/~gwhitney/sigmetrics.html.

• **International Society for Scientometrics and Informetrics (ISSI).** ISSI is a major society dedicated to the study of bibliometrics, particularly in the sciences.

Highlighted features include a biannual conference, abstracts of bibliometric journals, and a electronic list. Librarians interested in detailed analyses of bibliometrics should look to this site for a wealth of information. *Access:* http://www.issi-society.info.

Articles for further reading

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Notes

1. E. Garfield, "Journal Impact Factor: A Brief Overview," *Canadian Medical Association Journal* 161(8), 979–80, retrieved August 21, 2012, from www.cmaj.ca/content/161/8/979

2. Björn Brembs, "Check out ReaderMeter," Björn Brembs Blog, http://bjoern.brembs.net/comment-n643.html, accessed September 19, 2012.