Introduction to Altmetrics

In today's modern era of analytics, electronics, and scholarly competition, metrics are an important part of the everyday lives and workflows of people across the higher education community. From researchers applying for federal grants to faculty members preparing their tenure and promotion files, metrics have become an increasingly visible part of how academics and administrators are expected, if not required, to talk about impact and value. However, just as what it means to do research has changed drastically over the last fifteen years with advances in information technology, so have the qualifications for what constitutes a useful impact metric begun to evolve and expand with changes in scholarly communication. Of these expansions, the most significant is arguably the development of altmetrics, which constitutes a strictly twenty-first-century approach to impact measurement that relies heavily on the connection between scholarly activity and the opportunities afforded by the Social Web.

In this *Library Technology Report*, we introduce the most important features of the current altmetrics movement, from its origins in scholarly communication and citation-based bibliometrics to its recent flourishing in partnership with academic innovators and a growing population of academic librarians. Within each chapter, we highlight key players and issues that have arisen in combination with the altmetrics movement, including the uncertainties and opportunities that have alternatively stymied and encouraged its acceptance in certain higher education circles. By providing the facts surrounding the growth and development of altmetrics, particularly as they overlap with the concerns of academic libraries, we seek to provide today's library leaders with the necessary context to make decisions and take actions pertaining to the future of this quickly changing field of research and practice.

Figure 1.1
The first recorded use of the term *altmetrics*, in a Tweet posted by Jason Priem on September 28, 2011.

We begin this first chapter with a review of the recent origins of altmetrics, as well as a look at how the approach of altmetrics relates to more established practices for measuring scholarly impact, such as citation-based bibliometrics.

Defining Altmetrics

Altmetrics as a term was coined in September 2010 by Jason Priem, a doctoral student at UNC-Chapel Hill's School of Information and Library Science (see figure 1.1).[1] A firm believer in the power of online scholarly tools to help researchers filter information and identify relevant sources, Priem was interested in identifying a set of metrics that could describe relationships between the social aspects of the web and the spread of scholarship online. With few terms available to encompass this diverse-yet-specific group of analytics, Priem decided to popularize one of his own making. The result, *altmetrics*, is a shortened version of the phrase *alternative metrics*, presumably because

Figure 1.2
The Altmetrics Manifesto, authored by Jason Priem, Dario Taraborelli, Paul Groth, and Cameron Neylon, provided the first comprehensive online description of altmetrics. http://altmetrics.org/manifesto.

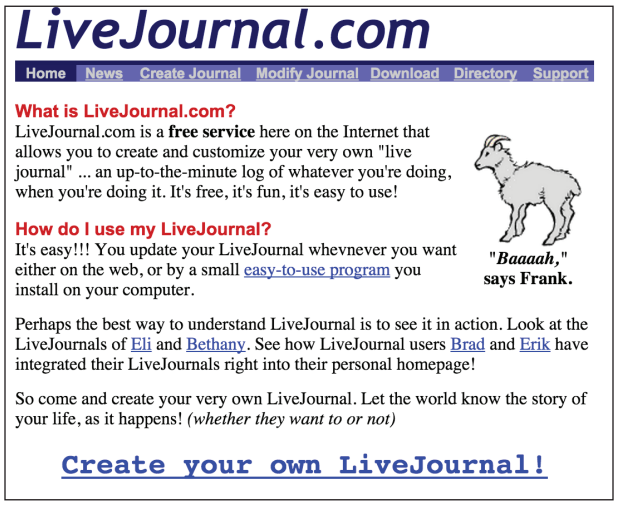


Figure 1.3
Screenshot of the LiveJournal home page, circa 2000. (Source: Internet Archive)

it offered scholars an alternative to metrics derived from a purely print-based understanding of scholarly research and communication.

For practical purposes, the best-known definition of altmetrics comes from Altmetric.org, a website set up by Priem and three of his colleagues in October 2010 in order to promote their more detailed Altmetrics Manifesto (see figure 1.2). On it, the altmetrics approach is described as "the creation and study of new metrics based on the Social Web for analyzing, and informing scholarship."[2] However, in the years following the release of this resource, new questions have arisen about exactly what this definition of altmetrics encompasses, and what it actually means to calculate altmetrics in different scholarly contexts. We will discuss these issues later, in the third chapter of this report.

In order to better understand the early history of altmetrics, we look now at a few of the more significant events leading up to its development, beginning with the changes in information technology and scholarly communication at work toward the end of the twentieth century.

Development of Altmetrics

As the definition of altmetrics makes clear, one of the first prerequisites for its development was the growth of the Social Web, or the part of the Internet focused on social relationships and activities.

Between the late 1990s and early 2000s, the texture of the Internet underwent a dramatic shift as innovative toolmakers began offering users more and more ways to create and share original, personal content on the web. Free online journaling platforms, such as LiveJournal (figure 1.3), led to an explosion in the number of blogs and bloggers, while early social networking sites such as MySpace and Friendster broadened the scope of online social sharing to include shorter updates, media, and more. By 2004, the year of the first Web 2.0 Conference, the Social Web had officially blossomed from a possible fad into a real and significant part of the Internet.

The technological changes of the late 1990s and early-to-mid 2000s were also important from the perspective of academia, although not entirely in the same ways. For instance, for the first time, researchers at colleges and universities were beginning to see the widespread availability of scholarship online. "Big Deals" made by librarians with certain scholarly publishers resulted in new electronic access to thousands of articles, often from journals previously outside of libraries' print collections. This sudden spike in the range and availability of electronic scholarly material quickly altered the ways that users searched for and found academic information. In response, most academic libraries continued to pursue bundled subscriptions to scholarly e-journals. However, at the start of the twenty-first century, mounting evidence began to suggest that such deals do little to solve the long-term problem of increasing costs for serials access.

In December 2002, at the height of the serials crisis, the attendees of a small conference in Budapest convened by the Open Society Institute released a short public statement, in which they proposed using the Internet to make research literature free for anyone to use "for any … lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself."[3] Later known as the Budapest Open Access Initiative, this powerful statement became a founding document of the open-access (OA) movement, for which many libraries and librarians have since become champions.

While the history of the open-access movement is too rich a topic to go into here, it is notable that its

Figure 1.4
The Public Library of Science "Open Access" webpage (www.plos.org/open-access). PLOS is committed to open access and applies the Creative Commons Attribution (CC-BY) license to all the content it publishes.

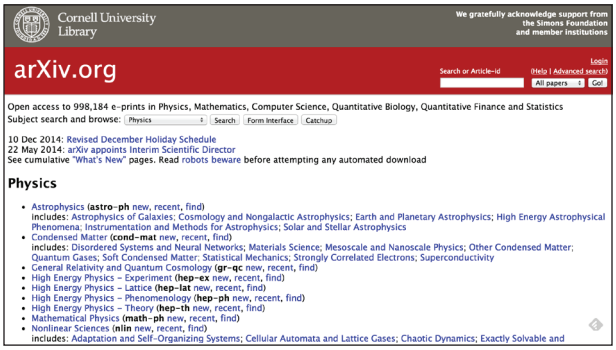


Figure 1.5
The home page of arXiv.org (http://arxiv.org). ArXiv is an e-print service owned and operated by Cornell University. It specializes in publications from quantitative fields such as physics, mathematics, and computer science.

invention helped set the stage for the later development of altmetrics. By emphasizing the power of the Internet as a tool for research, the benefits of rapid research discovery for purposes of innovation, and the positive consequences of openly sharing scholarly content with the public, OA helped encourage deeper connection between libraries, scholars, and makers of alternative platforms for scholarly publishing and networking. Evidence of this can be seen in the type of online scholarly venues that began to grow and thrive in the early 2000s following the articulation of open access, including the Public Library of Science (figure 1.4) and arXiv (figure 1.5), both of which endorse OA values while tracking interactions between objects and users online—that is, alternative impact metrics.

Perhaps it is for the combination of these various reasons that the mid-2000s saw the first true flourishing of both Web 2.0 and "open values" across the spheres of both academia and the general public. The year 2004, for instance, saw the release of Facebook, a social networking tool aimed originally at college students, which today sees 864 million daily active users.[4] In the same year, academic users of the Internet gained access to the citation-sharing tool CiteULike, which PhD candidate Richard Cameron developed based on the social bookmarking model popularized by Web 2.0 tool Delicious. Gradually, this cross-pollination of social principles and "serious" user interests resulted in the release of a flurry of game-changing tools for both scholars and professionals alike, including Twitter (founded 2006), GitHub (founded 2007), and Academia.edu, Mendeley, and ResearchGate (each founded in 2008). In chapter 2, we will look more closely at each of these tools and more, as well as the ways in which they variously embrace the tracking of impact through metrics.

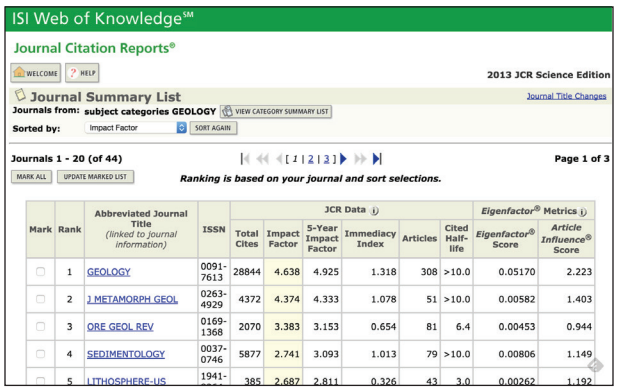
All this is to say that, by the time *altmetrics* was officially coined in 2010, many events had already taken place within both general society and academic culture to make the idea of a set of web-based metrics for measuring impact a tempting proposition—not just for scholars, but for publishers, toolmakers, and librarians, too. However, the "alternative" positioning of altmetrics, specifically in relation to citation-based bibliometrics, created an immediate set of obstacles for the movement, obstacles that the field of altmetrics has had to work hard to overcome ever since. For this reason, we take a moment here to briefly examine the relationship between bibliometrics and altmetrics, including how each has been received by proponents of the other over time.

From Bibliometrics to Altmetrics

In contrast to altmetrics, which has emerged as a fully articulated idea only within the last five years, bibliometrics has been around as a formal concept since the early 1960s and was originally defined as the set of quantitative methods used to analyze scholarly literature.

Best known for its inclusion of metrics such as Journal Impact Factor (see figure 1.6), which was proposed as early as 1955, bibliometrics is traditionally concerned with analyzing scholarship through the counting and tracking of journal article citations—which themselves tend to lean toward citations of other journal articles. Because of this, the major providers of bibliometrics tend to be closely connected to, or synonymous with, established indexers of scholarly articles, such as Thomson Reuters (Web of Science, Journal Citation Reports, Book Citation Index, Data Citation Index), Scopus (SCImago Labs [figure 1.7], Eigenfactor.org), and the increasingly popular Google Scholar (Google Scholar Profiles, Google Scholar Rankings).

These citation-based tools and metrics have come to dominate the scholarly impact landscape,



ISI Web of Knowledge℠

Journal Citation Reports®

2013 JCR Science Edition

Journal Summary List

Journal Title Changes

Journals from: subject categories GEOLOGY VIEW CATEGORY SUMMARY LIST

Sorted by: Impact Factor SORT AGAIN

Journals 1 - 20 (of 44) Page 1 of 3

MARK ALL UPDATE MARKED LIST

Ranking is based on your journal and sort selections.

Mark	Rank	Abbreviated Journal Title (linked to journal information)	ISSN	JCR Data						Eigenfactor® Metrics	
				Total Cites	Impact Factor	5-Year Impact Factor	Immediacy Index	Articles	Cited Half-life	Eigenfactor® Score	Article Influence® Score
	1	GEOLOGY	0091-7613	28844	4.638	4.925	1.318	308	>10.0	0.05170	2.223
	2	J METAMORPH GEOL	0263-4929	4372	4.374	4.333	1.078	51	>10.0	0.00582	1.403
	3	ORE GEOL REV	0169-1368	2070	3.383	3.153	0.654	81	6.4	0.00453	0.944
	4	SEDIMENTOLOGY	0037-0746	5877	2.741	3.093	1.013	79	>10.0	0.00806	1.149
	5	LITHOSPHERE-US	1941-	385	2.687	2.811	0.326	43	3.0	0.00262	1.192

Figure 1.6
Journal Citation Reports sample view. This page includes a list of top journals for the field of geology from the 2013 JCR Science Edition, sorted according to their Journal Impact Factors.

	Title	Type	SJR	H index	Total Docs. (2013)	Total Docs. (3years)	Total Refs.	Total Cites (3years)	Citable Docs. (3years)	Cites / Doc. (2years)	Ref. / Doc.	Country
1	Gondwana Research	j	Q1 3,898	61	276	405	20.316	2.862	386	7,91	73,61	
2	Remote Sensing of Environment	j	Q1 3,190	146	340	954	17.189	5.327	944	5,18	50,56	
3	Quaternary Science Reviews	j	Q1 3,124	113	378	852	29.394	4.218	823	4,66	77,76	
4	Geology	j	Q1 3,109	134	342	962	9.145	4.148	846	4,72	26,74	
5	Precambrian Research	j	Q1 3,073	93	275	433	24.392	2.537	420	5,91	88,70	
6	Journal of Metamorphic Geology	j	Q1 3,008	75	54	152	4.261	673	148	4,58	78,91	
7	Geological Society of America Bulletin	j	Q1 2,881	94	113	385	12.023	1.847	375	4,48	106,40	
8	Quaternary Geochronology	j	Q1 2,420	31	52	273	2.646	779	253	2,53	50,88	
9	Progress in Oceanography	j	Q1 2,347	84	124	257	9.013	999	243	4,06	72,69	
10	Economic Geology	j	Q1 2,271	62	99	222	7.109	724	215	2,25	71,81	
11	Earth, Planets and Space	j	Q1 2,092	45	163	387	5.389	1.015	375	3,28	33,06	
12	GSA Today	j	Q1 2,085	52	25	59	428	179	54	3,28	17,12	
13	Basin Research	j	Q1 2,058	51	41	129	3.614	444	125	3,62	88,15	
14	Geothermics	j	Q1 2,020	32	38	93	1.166	280	86	3,52	30,68	
15	Shiyou Kantan Yu Kaifa/Petroleum Exploration and Development	j	Q1 2,006	20	110	214	2.390	606	214	3,57	21,73	

Figure 1.7
SCImago Journal Rankings is a bibliometrics resource produced by SCImago Labs, which utilizes citation data from Scopus to create its own impact metric, called SJR. This sample shows the 2013 SJR rankings for journals in the field Geology within the Subject Area Earth and Planetary Sciences.

particularly in the STEM fields, where article-based productivity metrics are more commonly accepted for purposes of evaluation and benchmarking. However, by the same coin, for scholars in areas that emphasize the production of scholarly monographs over scholarly articles, the field of bibliometrics has garnered significantly less attention and clout. The same can be said for the use of bibliometrics among individual scholars whose research portfolios go beyond the bounds of traditional citation, such as those in the fine arts or academic departments with strong ties to professional practice.

While the analysis of print-based journal citations has always been the bread and butter of the bibliometrics world, this is not to say that the landscape of bibliometrics hasn't shifted noticeably with innovations in the technologies that drive scholarly communication. Even before the rise of altmetrics as a buzzword, bibliometricians and bibliometrics-producing organizations were clearly very interested in how to incorporate both the web and broader forms of scholarly output into their quantitative analyses; hence the occasional appearance of *webometrics*, *cybermetrics*, and other portmanteaus ending in *-metrics* in the pre-2010 era literature.

Thus, although the field of altmetrics may have positioned itself originally as an "alternative" to the filtering systems offered up by print- and citation-based bibliometrics, its core interest remains largely congruent with that of bibliometrics in that both are essentially interested in what can be learned from the quantitative analysis of information related to scholarly output and publication. Such similarities have not, however, prevented occasional perceivable periods of tension between the two fields' respective followers. A number of bibliometrics proponents, for instance, have expressed public skepticism about altmetrics based on their seeming rejection of citation-based standards for tracking and identifying impactful scholarship. In the same vein, altmetrics advocates have occasionally submitted statements that could be interpreted as denigrating bibliometrics in general, rather than the specific monopoly of bibliometrics indicators like Impact Factor—a monopoly that had already generated substantial controversy within the larger academic community.

An example of this tension can be found in the recent online back-and-forth between Jeffrey Beall, author of a well-known blog that publishes the names of predatory open-access publishers, and the team behind the altmetrics product Impactstory, who often respond to criticism of altmetrics via their blog. Writing in a blog post published in August 2013, Beall calls the idea of altmetrics "ill-conceived" and expresses the opinion that article-level metrics "reflect a naïve view of the scholarly publishing world"—that is, one that does not properly recognize efforts to game the system by unethical authors, publishers, and readers.[5] In response, former Impactstory team member Stacy Konkiel published a post on Impactstory's own blog in September 2014, in which she called Beall's comments "ill-informed" and refuted numerous assumptions about altmetrics taken from Beall's 2013 post. "There's no denying that 'gaming' happens, and it's not limited to altmetrics," she writes at one point, before launching into a more detailed explanation of how altmetrics providers deal with efforts at fraudulent activity.[6] Konkiel also refutes Beall's claim that, as a set of metrics that can be influenced by the public, altmetrics cannot be taken as serious means to gauging article quality. "The point of altmetrics isn't to measure quality," she explains. "It's to better understand impact: both the quantity of impact and the diverse types of impact."[7]

We will return to this discussion of the controversies and criticisms that have surrounded altmetrics in chapter 3 of this report. However, it should be noted

Figure 1.8
Cover of a special altmetrics-themed issue of *Information Standards Quarterly* (*ISQ*), published in summer 2013.

that flare-ups between altmetrics and bibliometrics have become noticeably rarer in the last year or two. This change, while not yet a sign of altmetrics' full higher education acceptance, is certainly an indication of its transition from fringe topic into mainstream academic conversation.

Present-Day Altmetrics

Looking at the pace and progress of altmetrics in the present day, it becomes hard to imagine that the field won't have at least some place in the foreseeable future of scholarly research metrics. But is this acknowledgement the same as saying that the field of altmetrics has answered the necessary questions to deserve a stable spot in the long-term lineup of recommended practices for measuring scholarly impact? The anxiety of librarians and library administrators around how to present, contextualize, and, indeed, invest in altmetrics is especially high and in need of relief in the form of up-to-date information.

On the one hand, as we will further discuss in chapter 2, altmetrics as a movement has certainly "grown up," to borrow a phrase from Martin Fenner, the Technical Lead for the Public Library of Science's (PLOS) Article-Level Metrics project and the recent editor of a special issue on altmetrics for *Information Standards Quarterly* (see figure 1.8).[8] The initial period of uncertainty over whether the collection of data surrounding web-based interactions with scholarly objects would be of serious value to any academic parties has given way to a new phase of practical curiosity, mostly in light of the interest expressed in altmetrics by researchers across the disciplines, as well as influential funding groups like NSF and NIH. Likewise, the producers of alternative metrics have significantly matured over the last two years, moving from a handful of one-man pet projects like ReaderMeter—an early altmetrics tool that considered impact solely from the perspective of Mendeley Readership metrics—to a lively marketplace of sleek systems and sophisticated user networks, most of which calculate their metrics using a variety of sources or methods. The decision on behalf of major publishers like Elsevier and EBSCO to acquire altmetrics-focused startups (Mendeley and Plum Analytics, respectively) is another tick mark in favor of altmetrics' eventual stability and wider acceptance as a supplement to bibliometrics.

On the other hand, even if the altmetrics movement is no longer in its infancy, one might be hard-pressed to place it beyond the phase of toddlerhood. After all, change continues to be rampant throughout the altmetrics community, and nowhere more so than in its business quarters. Major altmetrics harvesters may suddenly decide to rebrand themselves, as in the 2012 case of Impactstory (formerly Total-Impact). Experimental partnerships between altmetrics providers and publishers have also led to the unexpected cropping up of altmetrics in new online spaces overnight, such as the adding of metrics from Altmetric.com to some (but not all) Scopus articles in 2012,[9] and again to all online Wiley journals in 2014.[10]

Similarly, while the acquisition of altmetrics providers by for-profit publishing companies like Elsevier and EBSCO has buoyed the reputation of altmetrics for some parties, it has been a cause for concern for others, who see it as a sign that altmetrics may lose its connection to values of openness and online community. Thus, if altmetrics has grown up in the last two years, it has grown up via growth spurt—a pace that has come with a good deal of risk and that will necessitate a slowdown that still sits somewhere on the horizon. The efforts of groups like the National Information Standards Organization (NISO) to create new conversations around altmetrics standardization are part of this next stage of development, but participation by everyday users, researchers, administrators, and librarians is equally essential to success.

In summary: Between our present place and that horizon sits a good deal of opportunity, but also a great deal of work, which we will further discuss in

chapter 4 of this report, along with the role of libraries, library liaisons, and library administrators in shaping the future of altmetrics.

Understanding Altmetrics

In this chapter, we introduced the concept of altmetrics, from its recent origins in scholarship and technology to its evolving position next to other quantitative fields like bibliometrics, up to the present day. In the next three chapters of this report, we will significantly elaborate on this portrait by detailing the major tools and provider types related to altmetrics (chapter 2); the issues, controversies, and opportunities that have arisen during the growth of altmetrics as a movement (chapter 3); and the various ways that academic libraries and librarians have become involved, or are positioned to become involved, in the next phase of the field's development (chapter 4).

Recommended Readings

Fenner, Martin, ed. "Altmetrics." Special issue, *Information Standards Quarterly* 25, no. 2 (Summer 2013). www.niso.org/publications/isq/2013/v25no2.

A well-scoped special issue of NISO's print and electronic magazine, *Information Standards Quarterly*, focused on recent developments in altmetrics as of Summer 2013. Articles include reflections on the consumption of article-level metrics (ALMs), the potential use of altmetrics by educational institutions, and other practical applications of altmetrics.

Piwowar, Heather, ed. "Altmetrics: What, Why, and Where?" Special issue, *Bulletin of the American Society for Information Science and Technology* 39, no. 4 (April/May 2013). https://www.asis.org/Bulletin/Apr-13/AprMay13_Piwowar.html.

A second altmetrics-focused special issue from 2013, this time from the ASIS&T online *Bulletin*. Edited by altmetrics leader Heather Piwowar, this issue contains several useful articles on altmetrics written by toolmakers in the field, as well as a valuable discussion of the overlap between altmetrics and institutional repositories.

Priem, Jason, Dario Taraborelli, Paul Groth, and Cameron Neylon. "Altmetrics: A Manifesto." Altmetrics.org. Last modified September 28, 2011. http://altmetrics.org/manifesto.

The original and still the most widely recognized statement about altmetrics available online. Links and tool references on other pages of the site are mostly out of date, as the four founders have since moved on to other, larger altmetrics projects.

Notes

1. Jason Priem (@jasonpriem), message to Twitter, September 28, 2010, https://twitter.com/jasonpriem/status/25844968813.
2. Jason Priem, Dario Taraborelli, Paul Groth, and Cameron Neylon, "Altmetrics: A Manifesto," Altmetrics.org, last modified September 28, 2011, http://altmetrics.org/manifesto.
3. "Read the Budapest Open Access Initiative," Budapest Open Access Initiative website, February 14, 2002, www.budapestopenaccessinitiative.org/read.
4. Based on data released for September 2014. See "Company Info," Facebook Newsroom, accessed December 19, 2014, http://newsroom.fb.com/company-info.
5. Jeffrey Beall, "Article-Level Metrics: An Ill-Conceived and Meretricious Idea," *Scholarly Open Access* (blog), August 1, 2013, http://scholarlyoa.com/2013/08/01/article-level-metrics.
6. Stacy Konkiel, "What Jeffrey Beall Gets Wrong about Altmetrics," *Impactstory Blog*, September 9, 2014, http://blog.impactstory.org/beall-altmetrics.
7. Ibid.
8. Martin Fenner, "Altmetrics Have Come of Age," Information Standards Quarterly 25, no. 2 (Summer 2013): 3, www.niso.org/apps/group_public/download.php/11270/Fenner_Editor_Letter_isqv25no2.pdf.
9. "Altmetric for Scopus," Elsevier Author's Update, last modified September 1, 2012, www.elsevier.com/authors-update/story/impact-metrics/altmetric-for-scopus.
10. Graham Woodward, "Altmetric is Now On Board for All Wiley Journals," *Wiley Exchanges Blog*, last modified July 8, 2014, http://exchanges.wiley.com/blog/2014/07/08/altmetric-is-now-on-board-for-all-wiley-journals/.