Jun 3rd, 12:00 AM

Altmetrics is an Indication of Quality Research or Just HOT Topics

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Abstract

With the widespread use of social media tools in the discovery, dissemination and discussion of research output, altmetric measurements are fast gaining popularity and they supplement the traditional research metrics by tracking the number of social mentions of research articles. In recent years, there a few such tools and they adopt different models and have different coverage. Publishers such as Scopus and PLoS have already incorporated altmetrics in their websites. This paper seeks to make sense of these available tools and evaluate their effectiveness. Do they identify quality research or just HOT topics? This paper also analyses most cited papers from 18 different subject categories in Web of Science (WOS) and compares the results with an altmetrics database to find out the correlation between these 2 sets of data. This paper ends by highlighting how users could leverage altmetrics effectively to disseminate their works to a wider audience.

Keywords : altmetrics, scholarly communication, citation tools, research impact, research quality assessment, Web of Science, WebTrends

Introduction

Traditional citation measures how well a journal article has been referenced by other researchers. With the widespread use of social media in the discovery, dissemination and discussion of research output, altmetric measurements are fast gaining popularity and they supplement the traditional research metrics by tracking the number of social mentions of research articles. Major Publishers like Elsevier and Ebsco are also jumping the wagon and incorporating these metrics to their articles. Popularized by Priem in 2010, altmetrics seem to be more responsive because it gives a more direct and rapid gauge of a researcher's impact on the community. It presents a more holistic measure of research impact by including mentions on social media platforms like Twitter, Facebook and blogs; saves on online reference management tools like Mendeley and CiteULike; usage figures such as page views and downloads and citations. On the other hand, traditional citations take time to accumulate and reflect predominantly the viewpoints of researchers.

Background

Altmetrics have generated a great deal of hype and sprouted many studies trying to make sense of the new alternative metrics. Of particular interest are those studies investigating the link between alternative metrics and traditional citation counts.

Eysenbach (2011) attempted to find out whether a highly tweeted article published in the Journal of Medical Internet Research (JMIR) will attract more citations. The study showed a strong correlation and proposed that highly tweeted articles were 11 times more likely to be highly cited.

A large 2013 study compared 11 altmetrics with WOS citations for 76 to 208,739 PubMeb articles published between 2010 and 2012 (Thelwall et. al. 2013). The results show that 6 out of these 11 altmetrics had close association with citation counts, at least in subject areas like medical and biological sciences.

A more recent study done by Coastas, Zahedi & Wouters (2014) took this further and looked at the correlation between 718,315 publictations covered in WOS which have attached altmetric indicators provided by altmetric.com. Their study showed that 15% of the publications have altmetric scores and that there was a positive but weak correlation between altmetrics and citations.

In general, research studies on altmetrics tend to focus on one or a small range of subject areas and specific altmetric tools. For instance, they may drew articles from arXiv or medical sciences and compare their WOS citations with social mentions in Twitter and Facebook. This paper aims to find out if the top most cited articles in WOS will also obtain high altmetric scores and vice versa. As our main intention is to explore and advise our diverse academic community about the usefulness of altmetrics, we have decided to cover 18 broad subject areas. Instead of a detailed report, we would like to find some preliminary evidence about the relevance of altmetrics for faculty with different research interests, paving the way for designing a more thorough study later.

Data and methodology

The primary goal of this exploratory study is to examine the relationship between WOS citations and altmetrics. The use of citation counts for research evaluation is widely accepted in universities. An article with high citation count is considered to be of high quality as it has been “endorsed” by other researchers. While having a high altmetrics score implies that an article has high social impact, it may not be deemed to be scholarly important. As a result, attitudes towards the use of altmetrics range from curiosity to downright skepticism. It would be easier to convince the faculty if it could be demonstrated that there is a strong positive correlation between high citation and high altmetric score.

In this paper, the three main questions are -

1. Do the top 20 most cited articles in WOS across 18 broad subject categories have altmetric scores?
2. Do the top 20 articles with highest altmetric scores have WOS citation for the same 18 broad subject categories?
3. Do altmetrics generally identify popular research topics that are “newsy” in nature?

In total, this paper examined 720 articles, made up of 360 articles with the most citations in WOS and 360 articles with the highest altmetric scores from altmetric.com. For each of the 18 categories in WOS, we looked at the top 20 most cited articles published between 2011 and 2013. The subject areas are Medicine, general & internal; Sociology; Psychology; Computer science, Information systems; Engineering, multidisciplinary; Mathematics; Physics, applied; Chemistry, applied;

Biology; Business; Economics; Literature; Language and linguistics; Law; History; Art; Music; and Communication.

Altmetric.com is a company that offers article level metrics. Competing sites such as PLOS and Impact Story also offer article level metrics by displaying a set of figures for pdf downloads, html views, tweets, bookmarks and other metrics. While these figures are informative, it does not allow us to compare the social impact of different articles easily.

This study uses metrics generated by Altmetric.com because it assigns a composite score to an article using a formula. This is an interesting feature because it assigns different weights to a retweet or a blog posting by a journal editor or sharing of an article in Mendeley and aggregates them to derive an altmetric score. As such, it allows us to evaluate the social impact of different articles easily. In this paper, the composite score derived by altmetic.com will be referred to as an altmetric score.

To pull articles from altmetric.com, we have to make a few adjustments. One, the dashboard provided by altmetric.com does not allow its articles to be filtered by year. Most of the articles with high altmetric scores in altmetric.com are published between 2011 – 2013, though there are also a few articles published in 1980s. Given altmetric data's recency bias, articles published between 2011 to 2013 have higher altmetric scores compared to articles which had been published much earlier. (Costas, Zahedi, & Wouters, 2014; Holmberg & Thelwall, 2014; Lapinski, Piwowar, & Priem, 2013; Thelwall, Haustein, Larivière, & Sugimoto, 2013). In contrast, it usually takes 2-3 years before an article gets citation counts in WOS.

Two, to ensure consistency, we use the 18 subject areas in WOS. Due to the limited subject categories in altmetrics.com, we have to search for articles using the "keyword" field instead of "subjects" field. The altmetric score is also limited to "1 year" under "Mentioned in the past" field to pick up past altmetric score too.

We compare the top 20 articles for WOS and altmetrics.com. For articles that have an altmetric score but could not be found in WOS, it will be assigned the value zero. Similarly, the top 20 cited papers in WOS that could not be found in altmetric.com will be assigned the value zero.

Results and Discussion

Below, the chart presents one way of looking at the relationship between high citation and high altmetric score. For each of the 18 subject areas, this chart plots the likelihood that a highly cited article, say an Economics article, has an altmetric score against the likelihood that an Economics article with a high altmetric score will be cited in WOS. For example, 8 out of the 20 articles most cited in WOS under the subject area "Economics" appear in the Top 20 Economics articles listed by atmetric.com, giving a 40% likelihood that highly cited Economics articles will have altmetric scores.

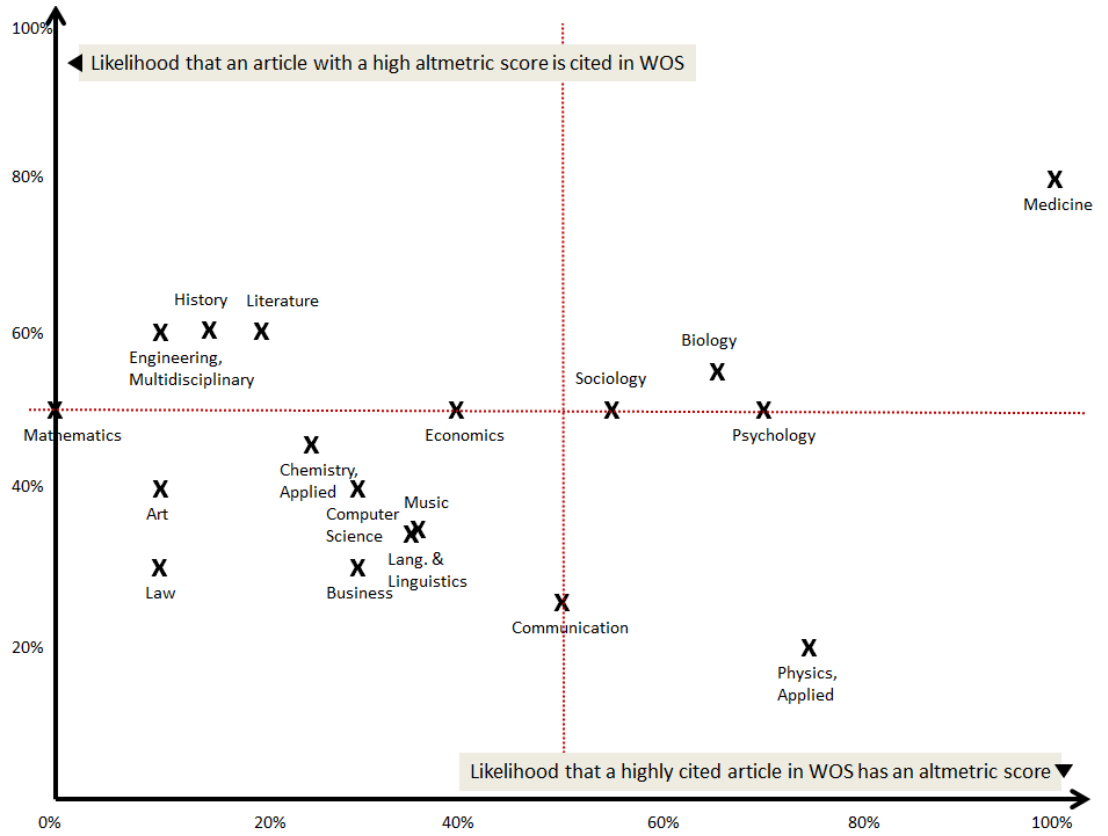

Figure 1 : *Comparing the likelihood of the most cited articles in WOS having altmetric scores and the likelihood of articles with high altmetric scores having citation counts in WOS*

From the wide scattering of data points in the chart, the relationship between high citation and high altmetric score for the different subjects are indeed mixed. On average, there is a 38% chance for a highly cited paper in WOS to have good online buzz. This is particularly true for subject areas such as Medicine, Sociology, Psychology, Applied physics, Biology and Communication where the likelihood is 50% or higher. On the other hand, articles with great online buzz have a 46% chance of getting cited in WOS. This percentage increases to at least 50% for subject areas such as Medicine, Biology, Literature, History, Multidisciplinary engineering, Economics, Sociology and Psychology.

Overall, while articles that are most cited in WOS do not necessarily have altmetrics scores, articles with high altmetric scores tend to be cited in WOS. High correlation between high citation and high altmetric score is seen for subjects such as Medicine and Biology. Moderate correlation is seen for Psychology, Sociology and Economics. For the other 13 subjects, the correlation is low.

There are a number of articles which have good online buzz but low citation in WOS. For example, the article “The Burden of Disease and the Changing Task of Medicine” has an altmetric score of 821 but it is only cited 20 times in WOS. However, many of these articles are in subject areas such as Law, Business, Language, Music, Computer science and Art. One possible reason is that these are the “General IT and Lifestyle” topics which are picked up and routinely reported by the mass media.

	Subject Areas	Pearson Correlation [1]	
		For the most cited articles in WOS	For articles with the highest Altmetric Score
1	Economics	(0.1408)	0.1681
2	Medicine, General & Internal	0.3637	0.0126
3	Mathematics	NA	0.2101
4	Sociology	0.4935	0.2546
5	Psychology	0.2521	0.1371
6	Computer Science, Info. Systems	0.0405	0.0546
7	Engineering, Multidisciplinary	(0.0205)	0.3474
8	Physics, Applied	0.3946	0.1234
9	Chemistry, Applied	(0.0424)	0.2540
10	Biology	(0.1209)	0.2429
11	Business	(0.1967)	0.0869
12	Literature	0.6155	(0.0597)
13	Language and Linguistics	0.2423	0.2685
14	Law	0.1590	(0.0355)
15	History	0.3112	(0.0929)
16	Art	0.4117	0.2312
17	Music	0.6711	0.0168
18	Communication	0.0890	0.3078
	Average	0.19572	0.14044

Table 1 : *Pearson Correlation between an article's citation count and its altmetric score.*

[1]*Coefficient of +0.40 to 0.69 is taken to indicate strong positive relationship, +0.30 to +0.39 for moderate positive relationship, +0.20 to +0.29 for weak positive relationship, +0.01 to +0.19 for no-negligible relationship.*

Pearson correlation is computed for the top 20 most cited articles in WOS against their altmetric scores and vice-versa for articles with high altmetric scores. In general, it shows a weak or no correlation. It is interesting to note certain subject areas display negative correlation. Upon closer examination, an important reason for negative or low correlation is the differences in the universe of articles indexed by WOS and altmetric.com. Using Economics as an example, WOS covers journal titles such as Journal of Economic Literature and American Economic Review while altmetric.com indexes sources such as Social Science Research Network. For subject areas having moderate to strong correlation, it is noted that the coverage of journals or sources are more similar. For example, both WOS and altmetric.com cover common journal titles are New England Journal of Medicine and The Lancet for the subject Medicine.

	For articles with high Altmetric Scores	Altmetric Sources			
		Twitter	Facebook	News	Blogs
1	Economics	89%	3%	1%	6%
2	Medicine, General & Internal	82%	7%	7%	2%
3	Mathematics	73%	3%	14%	6%
4	Sociology	89%	1%	0%	8%
5	Psychology	79%	4%	9%	6%

6	Computer Science, Info. Systems	70%	7%	19%	2%
7	Engineering, Multidisciplinary	78%	11%	3%	5%
8	Physics, Applied	83%	8%	1%	3%
9	Chemistry, Applied	65%	7%	11%	12%
10	Biology	82%	5%	6%	3%
11	Business	80%	4%	7%	7%
12	Literature	79%	5%	3%	11%
13	Language and Linguistics	79%	7%	8%	2%
14	Law	83%	7%	5%	3%
15	History	70%	9%	11%	6%
16	Art	67%	6%	19%	6%
17	Music	76%	11%	6%	3%
18	Communication	73%	6%	13%	5%
	Average	78%	6%	6%	6%

Table 2 : *Sources which contribute to the high altmetric scores for articles in 18 research areas*

Next, we look at sources which contributed to the high altmetric scores for articles in the 18 subject areas. Thelwall's (2013) paper showed that among the 11 altmetric sources studied, the bulk of social buzz were mainly due to tweets. Similarly, in this paper, it was clear that tweets contributed significantly to high altmetric scores for all subjects. It ranged from 89% for Economics to 65% for Applied Chemistry.

Holmberg & Thelwall (2014) performed a content analysis of the tweets sent by researchers for 5 different disciplines, namely Astrophysics, Biochemistry, Digital humanities, Economics, and History of science. They concluded that researchers shared more links than the general Twitter users, with 27% of their tweets as being retweets as compared to 3% of tweets for the general Twitter users.

The other altmetric sources – Facebook, News and Blogs were generally less impactful except for certain subject categories like Applied Chemistry, Computer Science and Art. Facebook strongly impacts the altmetric scores for Music, Multidisciplinary Engineering and History. News plays a bigger role in Mathematics, Computer Science, Applied Chemistry, History, Art and Communication. Blogs are important to Applied Chemistry and Literature.

As tweet is a key contributor to altmetric scores, the under-reporting tweets would render the altmetric score less accurate. Taylor (2013) gave several examples of such under-reporting. When an important piece of research was publicised in the press and social media channels, the source was seldom cited and even the links to the original research was not given. This trend could be attributed to journalists and bloggers simplifying complex research ideas for the general public and platform factors such as the 140 character limit for a tweet.

Taylor (2013) shared the example of a high profile story "£30 cancer tests on the National Health Service within 5 years" which was reported on March 27-28, 2013 in all the major UK news. This research on genetic markers for breast, prostate and bowel cancer is likely to have a strong social impact but it has a low altmetric score. Taylor found the tweets, blogs, Facebook and other popular social media sites which have generated a lot of interest about the discovery failed to provide a link to the original research and they did not create any consistent hash tags that would have helped to capture the buzz about the discovery. As a result, it may unfortunately give

the impression that altmetrics generally identify popular research topics that are "newsy" in nature. We may therefore conclude that the original research has great social impact but weak social reach and that altmetrics was unable to identify important scholarly articles.

Conclusion

From the above discussion, it is clear that this brief but broad study highlights the varied and complex relationship between citation counts and altmetric scores for the 18 subject areas. The correlation differs for several reasons – the researchers in the 18 subject areas use social media differently, under-reporting of social media metrics such as tweets and unique characters of the social media platform which may drive certain behaviours.

By comparing only the top 20 articles for each subject area, there is clear evidence that with the exception of Medicine, an article with a high altmetric score does not imply it will be highly cited and vice versa. Also, an article may have a high altmetric score because it is focusing on a popular topic. If we were to extend the study and compare the top 100 articles instead, the relationship between citation counts and altmetric score is likely to be even weaker. Going forward, it would useful to use a bigger dataset and perform content analysis for the various altmetric sources to gain deeper insights.

Currently, altmetrics shows great promise but it is still at its infancy. With more funding agencies, database vendors and academic institutions accepting altmetrics as a measure of research impact, altmetrics is definitely gaining greater acceptance among the faculty (Piwowarm, 2013). Altmetrics could help to address the limitations of using citation counts for evaluating arts and humanities research with its greater focus on social impact and the usage of scholarly works by non-researchers. Librarians can extend their roles to guide faculty on using social media more effectively as a means of disseminating their research, conduct altmetrics workshops and compile altmetrics reports in the coming years. Such metrics could help a faculty to secure research funding and support tenure and promotion processes at academic institutions.

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