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Research in the spotlight on social web: Analyzing the top 100 Altmetric articles of 2015

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Research in the spotlight on social web: Analyzing the top 100 Altmetric articles of 2015

Abstract

The availability of research on social web is an important factor to determine its societal impact. The inability of traditional citation based metrics to provide a complete picture of web based scholarly content has given rise to alternative or to better say complementary way of measuring the impact of research, "Altmetrics". The phenomenon of altmetrics has received global attention for its role to share research and allows visualization of important and interesting papers from a specific research area and time period. The current study attempts to analyze the articles (Top 100) that have caught the public attention in 2015 as revealed by the Altmetric.com. The paper explores the disciplinary nature, contributing source, publishing body, authorship and collaboration pattern of the articles. It also spotlights the Institutional and geographical distribution of the articles along with the tools where articles were shared and discussed. The study is first of its kind to analyze the articles that have made their mark on the social media in the year-2015.

Keywords

Article level metrics, Social media metrics, Twitter analytics, Reference managers, Scholarly communication, Societal impact, Scientific impact.

Introduction

The research activity of any nature ends up with products to be diffused and taken up by the academic world. The success of research product depends on how much it is disseminated, discussed, commented, referenced and so on. The dissemination of research through social networking sites is relatively a new practice that is gaining popularity throughout the world (Shrivastava & Mahajan, 2015). The inclusion of publications in social sites turns the spotlight on research performance, and therefore, on research evaluation (Ortega, 2015). *The widespread adoption of electronic publishing, paired with the rise of social media for dissemination and discussion of scientific literature, makes it feasible to quantify the discussion of an article on blogs, podcasts, social media platforms, and news media - a phenomenon known as "Altmetrics" (Trueger et al., 2015).* Various websites are used by academicians and researchers for the purpose of tagging, bookmarking, sharing research, etc. Prominent amongst them are Academia.edu, ResearchGate, Zotero, CiteULike, Connotea, BibSonomy, etc., which are being used all over the world (Reher & Haustein, 2010).

Altmetrics holds the potential to change how research is discovered, disseminated, evaluated, rewarded, and even read. It works by looking for references to scholarly works on the web, including “traditional” social media (i.e. Twitter, Facebook, Google+), blogs (i.e. *researchblogging.com*, *ScienceSeeker*, *Wordpress.com*), academic bookmarking services and reference managers (i.e. *CiteULike*, *Mendeley*, *Connotea*), media outlets (i.e. *New York Times*, *The Economist*, *Wired*), and multimedia (i.e. *YouTube*, *podcasts*), post-publication peer review sites (i.e. *F1000 Prime*), and a handful of others (Alperin, 2015). Thus, Altmetrics is a term to describe web-based metrics for the impact of scholarly material, by using data from social media outlets (e.g. Twitter or Mendeley) (Shema, Bar-Ilan & Thelwall, 2014).

Alternative metrics (Altmetrics) are considered an interesting option for assessing the societal impact of research, as they offer new ways to measure (public) engagement with research output (Bornmann, 2014). More organizations become interested both in analyzing altmetrics for their content (publishers, universities, funders) or for providing altmetrics as a service (Fenner, 2014). Alternative metrics are viewed as complementary metrics to give new insights to the impact of research (Galligan & Dyas-Correia, 2013) and address many of the shortcomings of traditional impact metrics; they are available nearly instantaneously, measure the dissemination of individual articles, and assess total overall readership (Trueger et al., 2015).

The potentiality of altmetrics to increase the visibility of research products and provide prompt and wide-ranging impact measurement has garnered the global eye balls of the scholarly world. In line of this, the current study attempts to analyze the top 100 articles that were trending on social media in 2015.

Related Literature:

The altmetric community looks at a growing number of new metrics based on the social web for analyzing scholarship and providing immediate feedback. Not all metrics measure scholarly impact, some of them indicate attention e.g. Twitter activity typically peaks a few days after publication, and reflects attention rather than impact. Some metrics are good indicators of activity by scholars (e.g. citations or Mendeley bookmarks), whereas other metrics reflect the attention by the general public (e.g. Facebook or HTML views) (Fenner, 2014). The academic sites-ResearchGate, Academia.edu and Mendeley include most researchers’ profiles and are most popular in the scholarly community (Nentwich & König, 2014). However, Twitters use among the scholars is growing (Priem, Piwowar & Hemminger,

2012) and is often used professionally or for scientific purposes (Bornmann, 2015). In recent years, the use of the following seven platforms in the social web as alternative metrics is of primary interest: “bookmarking, reference managers, recommendation services, comments on articles, microblogging, wikipedia, and blogging” (Priem & Hemminger, 2010). The important alternative metrics seem to be F1000 scores for biomedical science, Google Books citations for humanities and book-oriented research and Mendeley readers for recent articles (Thelwall, Kousha, Dinsmore & Dolby, 2016).

Alternative metrics are currently one of the most popular research topics in scientometric research and the focus is moving from web citation analysis to social media usage analysis (Li, Thelwall, & Giustini, 2012). Bornmann (2015) credits easy accessible data on social media to perform statistical analysis and measure broad impact of research for the popularity of altmetrics. While as, Wouters and Costas (2012) identified four benefits that altmetrics offer: broadness, diversity, speed and openness. The idea behind the altmetrics is that the web is not just used by academicians and therefore data from the web about academic research may be useful as evidence of the wider impacts of the research. altmetrics also holds potential value for funding scheme evaluations. Some alternative indicators have advantages to usefully complement scientometric data by reflecting a different type of impact or through being available before citation data that can be used by funding agencies as part of their funding scheme evaluations. The indicators are useful for early impact evidence, particularly when large collections of publications are available to be assessed (Thelwall, Kousha, Dinsmore & Dolby, 2016). Some academic institutions and grant-funding agencies now recognize altmetrics as alternate forms of impact (Piwowar, 2013).

The importance of the alternative form of metrics is indicated by one of the biggest multidisciplinary database providers, Elsevier, by collaborating with Altmetric and Mendeley (Roemer & Borhardt, 2013). Academic authors also consider adding their article’s altmetric data into curriculum vitae to demonstrate the impact of articles and other non traditional scholarly products (Piwowar, 2013).

Academic social networking sites are changing the trend of disseminating research through journals and other scholarly publications and indexing databases, and hence, the statistics provided by such sites indicate the impact of articles and authors as well as their affiliations (Shrivastava & Mahajan, 2015). There is a positive correlation between the corresponding

altmetrics counts and citation counts (Bornmann, 2015). Ortega (2015) studied the altmetric and bibliometric indicators from RG, Mendeley, Academia.edu, Microsoft Academic Search and Google Scholar Citations for authors belonging to the Spanish National Research Council and found scant relationship at the author level. Shrivastava and Mahajan (2015) showed strong positive correlation between the altmetric indicators from ResearchGate (RG) and the bibliometric indicators from the Scopus database. Eysenbach (2011) found that highly-tweeted articles were 11 times more likely become highly-cited later. However to some scientific citation process acts relatively independent of the social dynamics on Twitter (de Winter, 2014).

Nevertheless, newer articles have an inherent advantage over older ones. Also, Journals, publishers, and specialties with a substantial social media presence may have more articles with higher altmetric scores than those that have a smaller social media presence. Additionally, the utility and reach of altmetrics may be limited in countries with restricted social media access and in developing countries with scarce internet resources (Trueger et al., 2015). The importance of altmetrics is also limited by - lack of theory, ease of gaming, possible biases (Priem, 2014) and commercialization, data quality, missing evidence, manipulation (Bornmann, 2014).

Methodology

The study is based on the data retrieved from Figshare. The data is made available by Altmetric.com grounded to the queries made to the Altmetric database in December 16 2015 to find out which academic research got most attention. The data was tabulated in Microsoft Excel for analysis and other purposes.

Data Analysis

Top ranking articles

The Top-10 papers that are highly shared and discussed by people in 2015 are listed in Table-1. The top most popular paper of the year reports *the discovery of a new antibiotic drug that kills drug resistant bacteria* published in Nature. The next highest scoring paper is the article about *Autism status in US children* conducted by Drexel University, Optum Company and Lewin group in USA. A study about *Cancer etiology and its variation among tissues* by Howard Hughes Medical Institute and Johns Hopkins University is at 4th rank with altmetric score of 2340. Climate change, risky Christmas gifts, spicy foods and plastic pollution are other research foci that caught the public attention in 2015; indicates the

enquiries belonging to scientific field of research with implications to the everyday lives dominating the social media.

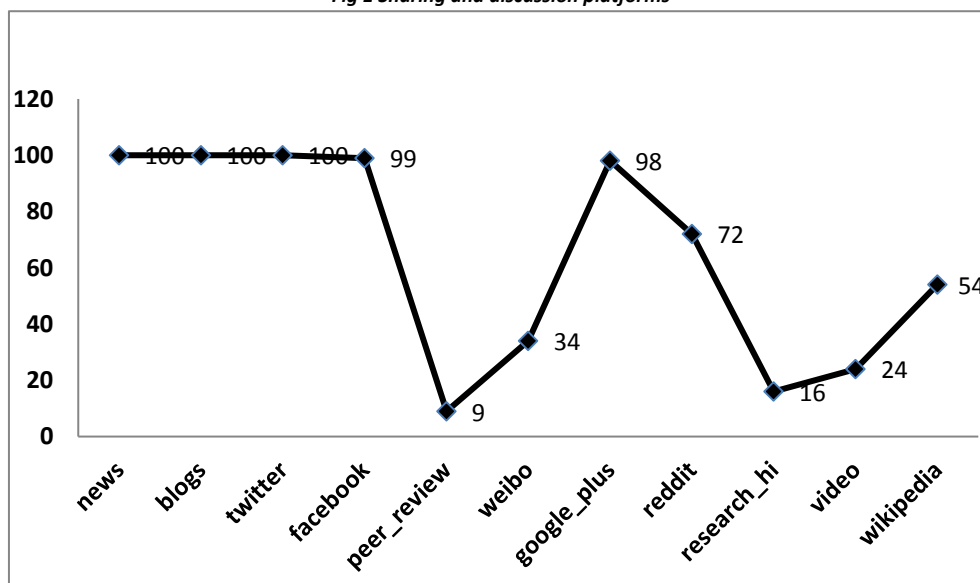
Table 1 Top 10 articles

Rank	Altmetric Score	Title
1.	2782	A new antibiotic kills pathogens without detectable resistance
2.	2728	Autism Occurrence by MMR Vaccine Status Among US Children With Older Siblings With and Without Autism
3.	2432	Accelerated modern human-induced species losses: Entering the sixth mass extinction
4.	2340	Cancer etiology. Variation in cancer risk among tissues can be explained by the number of stem cell divisions
5.	2294	Estimating the reproducibility of psychological science
6.	2129	Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea
7.	2013	The geographical distribution of fossil fuels unused when limiting global warming to 2 °C
8.	1913	An Efficiency Comparison of Document Preparation Systems Used in Academic Research and Development
9.	1873	A Neural Algorithm of Artistic Style
10.	1634	The Negative Association between Religiousness and Children's Altruism across the World

Sharing and discussion platforms

The articles are shared and discussed across mainstream and social media including blogs, peer-review forums, video sharing and bookmarking sites (Fig-1). News, blogs and twitter are the main platforms where articles have drawn the public attention (100%), followed by facebook (99%) and google-plus (98%). This indicates the popularity of these tools for research dissemination, discussion and evaluation. About 72% and 54% of the articles have references on reddit and Wikipedia and 9% of the top 100 articles were reviewed on peer review sites.

Fig 1 Sharing and discussion platforms



Contributing journals

Top 100 articles are published in 34 journals. Among these, the journals that make more than one contribution accounting to 75% are given in Table-2. Maximum number of articles is published in Nature (14) followed by Science (13) and PNAS (8). A total of 25 journals contribute only one paper.

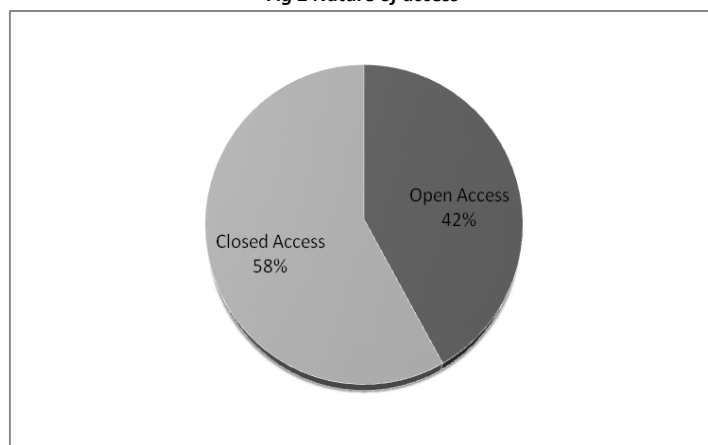
Table 2 Journal wise contribution

Journal Name	No. of articles.
Nature	14
Science	13
PNAS	8
BMJ	6
JAMA Internal Medicine	6
PLoS ONE	6
The Lancet	5
JAMA	3
Nature Communications	3
Science Advances	3
Current Biology	2
New England Journal of Medicine	2
PeerJ	2
Science Translational Medicine	2

Nature of access

The 2015 top 100 articles reveal that 58% of the articles are available in closed access model (Paywalled), whileas 42% are under open access category, 18 of which rank in the top 50 (Fig-2). About 60% of open access articles are contributed by just 4 publication sources: PNAS, PLoS ONE, BMJ and arXiv. In addition, open access titles- Science Advances, Open Heart and Royal Society Open Science have appeared in the top 100 for the first time (Altmetrics, 2015).

Fig 2 Nature of access



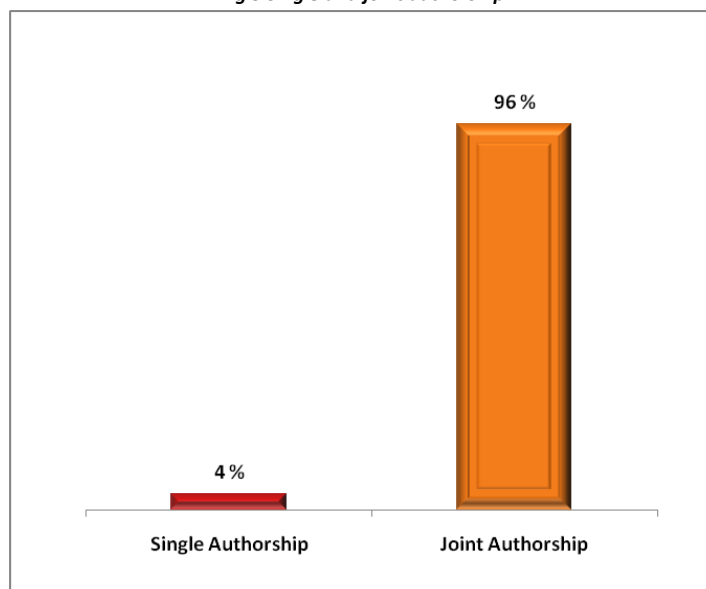
Authorship pattern and collaboration

A Total of 1840 authors contribute top 100 articles. Maximum number of articles has more than three authors (Table-3). Collaborative approach is much evident in Fig. 3 with joint authorship amounting to 96% and single authorship constituting just 4% of the total. The evidence of extensive collaboration can be found in many articles including some papers that have more than 700 authors' viz. *Observation of $J/\psi p$ resonances consistent with pentaquark states in $\Lambda 0 b \rightarrow J/\psi K-p$ decays* with 725 authors.

Table 3 Authorship Pattern

No. of Authors	Total
Single	4
Double	9
Triple	10
>3	77

Fig 3 Single and joint authorship

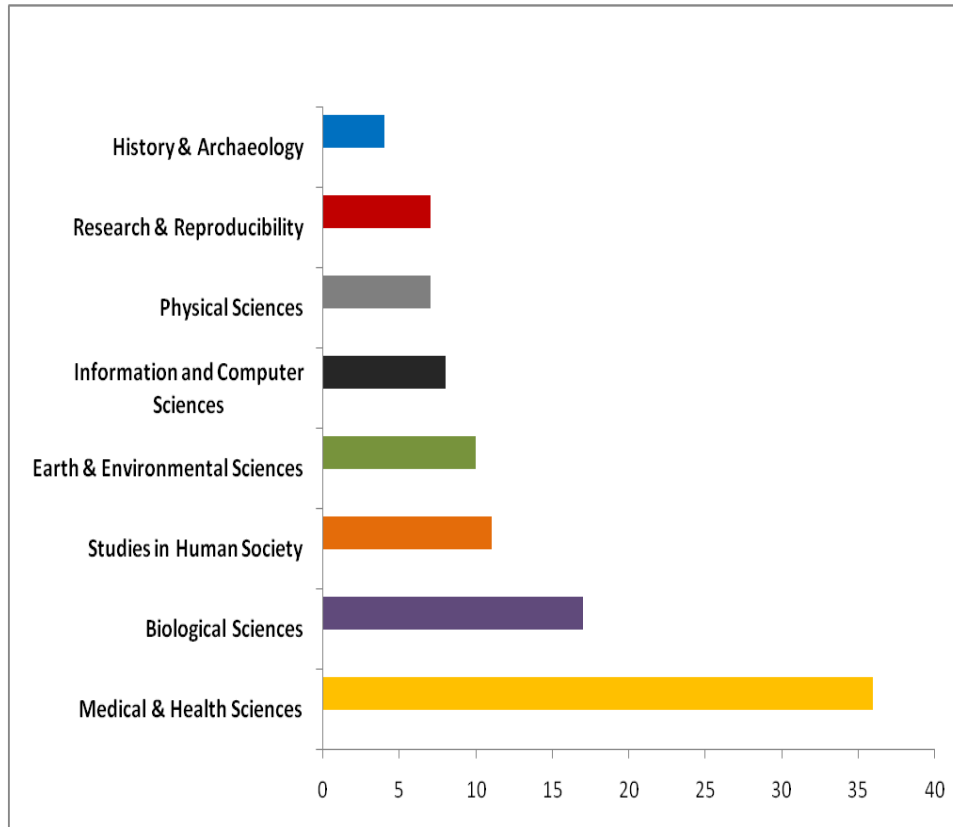


Subject category

Medical and health research tops the list of top 100 articles with 36% of sharing across mainstream and social channels (Fig-4). The most popular range from topics such as a *new antibiotic kills pathogens without detectable resistance to the association between sauna bathing and fatal cardiovascular events*. Biological sciences accounts for 17% of the Top 100. Articles in this category include structural and functional features of central nervous system lymphatic vessels, gene editing in human tripronuclear zygotes, genome of cultivated sweet potato and many others. Studies in human society rank third with 11% in

total – the most popular of which is *negative association between religiousness and children’s altruism across the world*. History and Archaeology ranks last contributing 4% to the top 100.

Fig 4 Subject wise contribution



Global Contributions

Authors from 107 countries contribute to the articles that make up 2015 top 100 ranging from Afghanistan to Zambia. United States (66) holds 1st rank, followed by United Kingdom (31) and Germany (21). The 10th position is hold by Denmark and Norway with 7 publications each. Authors from 62 countries contribute either one or two articles (**Table 4**).

Table 4 Top ranking countries

Rank	Country	TP
1.	United States	66
2.	United Kingdom	31
3.	Germany	21
4.	Australia	15
4.	France	15
5.	Canada	14
6.	Italy	12
6.	Netherlands	12
7.	China	11
8.	Finland	10

8.	Sweden	10
9.	Spain	9
9.	Switzerland	9
10.	Denmark	7
10.	Norway	7

TP= Total number of publications in top 100

Contribution at institutional level and type

Authors from 997 institutions across the globe contribute to top 100 articles that caught public imagination in 2015. Harvard University leads with 12 papers. It is closely tailed by University of Cambridge (10), followed by University of Oxford and Karolinska Institute with 9 articles each (Table-5). A total of 8 Universities hold 5th rank by contributing 6 articles each in the highly shared and discussed category of 2015.

The research from institutions of varied nature has featured in top 100 (Table-6). Of the 997 institutions, maximum number are “Educational” (557) followed by “Health Care” (128) and “Governmental” (102). However, the nature of 37 institutions was not provided. The “Facility” category includes German Center for Infection Research, Finnish Institute of Occupational Health, International Centre for Diarrhoeal Diseases Research, National Center for Global Health and Medicine and many others. Russian Academy of Sciences (RAS), American Museum of Natural History, National Radio Astronomy Observatory etc. are under the “Archive” category. The contributions are also from corporate world including Google and Facebook as well as number of pharmaceutical and analytics providers.

Table 5 Top ranking institutions

Rank	Institution	TP
1.	Harvard University	12
2.	University of Cambridge	10
3.	University College London	9
3.	University of Oxford	9
4.	Karolinska Institute	7
4.	University of Bristol	7
4.	University of Toronto	7
5.	Australian National University	6
5.	Columbia University	6
5.	Cornell University	6

5.	Emory University	6
5.	King's College London	6
5.	Stanford University	6
5.	University of California, San Francisco	6
5.	Yale University	6

TP= Total number of publications in top 100

Table 6 Institutional Types

Type	No.
Education	557
Healthcare	128
Government	102
Nonprofit	91
Facility	36
Company	31
Archive	8
Other	7
NA*	37

**Not available*

Discussion and Conclusion

Altmetrics is a fast growing area that might change dramatically in the years to come (Van Noorden, 2014). The tools under the umbrella of altmetrics allow researchers to move out from the closed system to open web to share their ideas, findings and get their research commented, referenced and peer reviewed from a wide range of diversified users. The number of times an article is discussed on altmetric platform is an important indication of its impact and contribution to the research world. The study shows the research trends that were steering the world in 2015. It indicates the research with implications to the everyday lives dominating the social media. The areas of study include Medical and Health research followed by Biological sciences and Studies in human society. The articles were highly discussed in the news outlets with maximum shares across blogs, twitter, facebook and google plus. The articles came from highly impacted journals with maximum share limited to Nature, Science and PNAS with just over the half articles available in paywalled model.

A total of 1840 authors from 107 countries with maximum articles in collaborative approach contribute top 100 articles. United States tops the list, followed by United Kingdom and Germany. The institutions are mainly educational ones with Harvard University, University

of Cambridge and University of Oxford among the leading ones. It is concluded that altmetrics offer supplementary means to evaluate research impact and new ways to measure public engagement with the research world. However, the potential of altmetrics is limited due to the fact that each of the underlying sources of altmetrics has a different degree of adoption and use around the world and between different online communities (Alperin, 2015).

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