Altmetrics: The Emerging Alternative Metrics for Web Research Analysis

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Abstract

The use of web 2.0 is becoming the essential part of present day life. People are spending time for many purposes and academic activities among these uses of web 2.0 social media services by users are prominent for searching, sharing, discussing, and messaging of scholarly content. The wider use of social media has given birth to various buzz words and 'altmetrics' is one of them. In simple words, altmetrics provides online measurement of scholars or scholarly content derived from the web 2.0 social media platforms. Altmetrics is diversified in nature and categorised in five categories i.e. (i) recommended (ii) cited (iii) saved (iv) discussed and (v) viewed. Altmetrics are becoming widely used by publishers (for showcasing research impact of authors over readers), librarians and repository managers (for adding value to their libraries and institutional repositories) and by the researchers (for complementing reading by instantly visualising papers online attention).

Keywords: Altmetrics, Article Level Metrics, Social Media

1. Internet Usages

The Technological advancement, infrastructure development, and dwindling prices, universally acceptable technologies have brought growth on the Internet in the manifold. The internet accessibility and connectivity have increased to the billions of people around the world. In 2015 there are more than 7 billion mobile cellular subscriptions worldwide, up from less than 1 billion in 2000. Globally 3.2 billion people are using the Internet, of which 2 billion are from developing countries.

The Internet usage in India has gone up with more and more claimed internet users using the internet on a regular basis. India is currently home to 149 million active internet users. Of this 108 million belongs to Urban India and the rest 41 million is from Rural India, which is increasing day by day.

2. Social Media

Currently, people are more inclined towards social media. which can be defined as an electronic web-based service which allows its users whether personal or organizational login id based account or profile for making contact with other individuals for communication, collaboration, content sharing among them. Most of the social media platforms allow their members to set security features for unauthorised visibility of their user accounts, profile or information to registered members only, people on an established list of contacts, or particular

groups of service users. Some of the popular examples include Facebook, Twitter, and Google Buzz, LinkedIn, Tumblr, Instagram, Flickr, YouTube, etc.

Social media and Web 2.0 is one of the key growth drivers of the Internet. The growth of Social media usage is exponential among the youth. Not only in urban even rural people also strongly inclined towards social networking sites.. This has given a new business idea for the business world as many of the companies are offering special packages to the customers for using various social media platforms, as the mobiles and tablets are not merely handsets they are smarter now. The top ten active social media platforms are as follow:

measuring the impact of a scholarly research work is beyond the previously set boundaries of discipline due to emergence of new media such as blogs and social media, audience, and formats of communications. Thus, how the landscape of impact of scholarly communication over academic community is changing. Therefore, the academic world as like traditional impact measurement metrics (i.e. Journal impact factor, h-index, g-index etc.) is finding new alternative metrics for the web based/ online research work for tracking online impact or influence of the work. This alternative metrics is popularly known as "altmetrics".

As altmetrics are used for measuring the online impact of research work these are non-traditional

Table 1: Top Ten Active Social Media Platform Users

Sl. No.	Name of the Social Media Platform	URL	No. of Registered users	In crores
1	Google+	https://plus.google.com/	1,600,000,000	160
2	Facebook	https://www.facebook.com/	1,280,000,000	128
3	Twitter	https://twitter.com/	645,750,000	64.57
4	Qzone (in Chinese)	http://qzone.qq.com/	480,000,000	48
5	Sina Weibo (in Chinese)	http://weibo.com/	300,000,000	30
6	Instagram	https://www.instagram.com/	300,000,000	30
7	Habbo	https://www.habbo.com/	268,000,000	26.80
8	VK (originally VKontakte)	https://vk.com/	249,409,900	24.94
9	Tumblr	https://www.tumblr.com/	226,950,000	22.69
10	LinkedIn	https://in.linkedin.com/	200,000,000	20
Source:https://en.wikipedia.org/wiki/List_of_social_networking_websites, accessed on: 01/04/2016				

3. Altmetrics

Today bibliometric is widely used as the method of measuring scholarly impact. Now the scope of

metrics in nature. Hence, these metrics serve as an alternative to the traditional citation impact measurement metrics. Although altmetrics are often

thought of as metrics about articles, they can be applied to people, journals, books, data sets, presentations, videos, source code repositories, web pages, etc. As an alternate to the traditional citation counts it covers the other online aspects of the impact of a research work, like how many times it referred, viewed, downloaded, or discussed on social media. Thus, altmetrics can be defined as "the creation and study of new metrics based on the Social Web for analyzing, and informing scholarship."

In Sept 2010 Jason Priem propounded the term altmetrics. The Altmetrics is also known as 'Alternative Metrics' (ALM) or 'Altmetrics' enhancing and complementing the traditional citation based ways of impact assessment by expanding the idea of the impact. Altmetrics supporting multidimensional measurements of published works, beyond citation counts.

❖ Altmetrics should be used in parallel with impact factors and citation counts to add a more nuanced, qualitative side to impact as it is complementing traditional metrics.

❖ Useful in tracking the social impact of specific articles over academic community.

❖ Exploring new measures of impact and provide the geographical breakdown and consumption of scholarly content in the profession or discipline.

❖ Showcase public engagement, received feedback via social media and highlights research visibility by providing a new way to discover research.

❖ Identification of probable collaborators for research engagement .

Table 2: Differences between Altmetrics and Traditional Metrics

Factors	Altmetrics v/s Traditional Metrics	
Time	Metrics available Instantly after publication	Took years to get citations
Impact	Evidence of influence of research on society	Impact within academic community
Sources	Social media	Major data sources are: Web of Science, Scopus, Google scholar
Indicators	No standard theories and indicators. Still in development phase	Standard measurement factors h-Index, Journal Impact Factors, g-Index

3.1 Need of Altmetrics in Research

❖ Adding value to the research and engaging colleagues and researchers.

❖ Adding values to resume to make it more comprehensive.

❖ Shows instant indications of impacts results in real time thus no more wait for like traditional metrics for impact assessment.

❖ An alternative for impact measurement of diversified content i.e. datasets, software, blog posts, videos, and more thus it discovers new

outlets for scholarly content and integrating with repositories (like e-Prints)

3.2 Advantages of Altmetrics

❖ **Altmetrics data is complementary to the traditional citation-based metrics:** Sourced from the web, unlike traditional citation based metrics Altmetrics data is complementary in nature. It tells how the scholarly content i.e. journal articles, datasets, research work etc. is discussed, shared, saved, viewed and cited among the community.

❖ **Measure of dissemination of research:** Altmetrics indicators can showcase that how a research gets attention and influence over academic community. These metrics can help to understand where and why a piece of research is being discussed and shared, both among other scholars and in the public sphere. Examples of this would include coverage in the news; social sharing and blog features.

❖ **Research attention:** Altmetrics can indicate people exposure and engagement towards the scholarly output. For example discussion and mentions in the news, blogs, and on social networks, page views and downloads.

❖ **Quicker to accumulate:** Altmetrics data is quicker to accumulate than traditional citation-based metrics as the data is sourced from the web. It is possible to monitor and collate altmetrics data of a work in real time as soon as it published online.

❖ **Measure diverse impact:** Altmetrics can measure more diverse impacts of a research work than traditional citation-based metrics. As described above, altmetrics data can complement citations that how research is being referred.

❖ **Diversified categories of research work:** Altmetrics data is more than that apply to journal articles and books. A researcher can share more than scholarly work such as their data, software, presentations, and other scholarly outputs online. It means that the altmetrics can be tracked for these on the Web as easily as we have traditional citation data for articles and books.

4. Altmetrics Categories

Altmetrics is consisting of broader groups to measure online impact probably and an article can have on its online audience. In September 2012, Impact Story had proposed following five categories of altmetrics

❖ **Viewed:** In the case of the conventional mode of publishing an author is very much intended to print his/her papers in the journal, which is highly referred by the professionals and having a higher reputation among the academic fraternity, so that the research work could attract higher access and impact. Due to advancement and faster adoption of the online publishing, authors are more inclined towards online publishing of their research. Moreover, publishers are publishing research work online first than to print to meet that timely availability of the journal. Pay per article business model is another factor for online publishing. Now authors can be aware of that how many time his/her articles is actually viewed in HTML or PDF which is similarly correlated like citation received by an article.

❖ **Discussed:** Social Media platforms i.e. Facebook, Google+, Twitter, Scientific Blogs, and wikipedia pages typically provide a platform for discussion. Thus, a paper captures the potential impact by mention, likes, trending. Analysing the relationship between metrics the study published by Gunther Eysenbach in the Journal of Medical Internet Research (JMIR) states that the highly tweeted papers are more likely to become highly cited . Blogging platforms such as Research Blogging (http://researchblogging.org/) and Chemical Blogspace (http://cb.openmolecules.net/) other platforms offering research discussion.

❖ **Saved:** Altmetrics obtained metrics of the articles from the social bookmarking sites or reference management tools. It is obvious that a reader would not bookmark a paper of which do not have any value or impact on the reader. Mendeley, CiteULike, and other socal bookmarks are the good examples of this.

❖ **Cited:** Altmetrics tracks formal citations received by a scholarly article in other scientific journals and databases i.e. Google Scholar, Web of Science, Scopus, CrossRef, PubMed Central, Wikipedia mentions and others.

❖ **Recommended:** An article is formally endorsed for other users by another senior faculty. For example F1000 Prime provides review and explanation that what significant value is possessed by an article by ranking it on the scale of Good, Very Good, or Exceptional (just like 1, 2 or 3 stars).

5. Leading Altmetrics Service Providers

5.1 Altmetric (https://www.altmetric.com)

Is a UK-based Digital Science Company expertise in data science and research metrics founded by Euan Adie in 2011. In July 2012 Altmetric becomes the part of Digital Science Group. It is involved in tracking and analysing of the online activity and impact of scholarly research outputs. Altmetric makes it possible for authors to know that what the impact has been generated by their articles among readers in real time. Publishers can show the response of peers which is attained by the scholarly work. The development of an altmetrics app project ended up winning Elsevier's Apps for Science competition. Later this becomes the full-fledged product in the form of the first standalone version of the Altmetric Explorer was released in February 2012 Altmetrics offers a wide range of products, services, and free tools to monitor and tracks the impact of research

i. Explorer for Publishers: It is a powerful and intuitive easy to use web application that helps to see all of the score and attention (collated and updated in real time) attracted by published content from various forms of sources i.e. discussions, policy documents, mainstream news, peer-review, social media, blogs, Wikipedia and online reference managers (Mendeley) as an indicator of the quantity and reach of attention it has received. It has access to the 4 million research outputs from Altmetric database.

ii. Explorer for Institutions: Explorer for Institutions enables to online monitor the research activity of faculty and can be browsed by author, group or department of the institution. It is helpful for

receiving grants and management of online reputations among the peers. Useful in planning and guidance of future research programmes.

iii. Explorer for Funders: Useful in Monitoring, tracking and reporting the influence, progress, weaker and stronger aspects of supported projects. It can be used for identification of early indicators of research. It is a powerful tool for ascertaining the public engagement.

iv. Altmetric Badges: Altmetric Badges showcasing the reach of published work recognisable instantly with embeddable badges. Easy-to-embed altmetric badges show online discussion and attentions gained by the scholarly content in the form of instantly recognisable score visualise to showcase the influence of published content.

v. Altmetric API (Application Programming interface): Altmetric API gives programmatic access to the metrics data associated with articles, datasets books, and many other research outputs collected by Altmetric. The API enables to select how and where Altmetric data appears on your platform. The data can be fed via the API into other internal systems.

vi. Bookmarklet for Researcher: Instantly get free article level metrics for the recently published paper. Quick and easy to install bookmarklet freely available for Chrome, Firefox and Safari are very useful for viewing the online shares and mentions of an article. Bookmarklet only works with PubMed, arXiv or pages containing a DOI and supporting publishers those embed Google Scholar citation.

vii. Free Tools: New altmetrics users can get started with easy-to-use free altmetrics tools and services listed below:

- Altmetric Bookmarklet

- Institutional Repository badges

- Explorer for Academic Librarians

- API for research

5.1.1 The Altmetric Score Count

The Altmetric score is an automatically calculated, weighted count of all of the attention a research output has received because Altmetric data gets updated in real time. It depends on

Fig. 2 Altmetrics Score Count

431

Source:https://www.altmetric.com/about-altmetrics/the-donut-and-score/ accessed on 08.06.2016
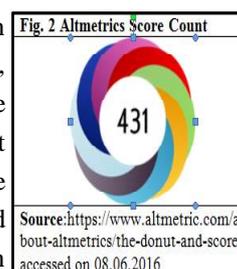
the following factors (i) **Volume** (when more and more people mentioned/discussed research, (ii) **Source** (each category of source contribute different base) and, (ii) **Authors:** to avoid any bias towards a specific content author are watched.

5.1.2 Score and Data Visualisation and Presentation

Altmetric score is represented in the form of the social networks users demographics based on the Twitter and Mendeley uses. The total score count is represented through donut score providing the landscape of research usage. When we say the altmetric score is 431 that means a scholarly content has received attentions 431 times from various sources. Thus, it is recognisable and easy to decipher at a glance from which source how much attention has been attained by an article for instantly and easily identifiable. The each colour of the Altmetric donut represents a different source of attention. The amount of each colour in the donut will change depending on which sources a research output has received attention from i.e. sources mentioned below:

Table 4: Different components of Altmetrics Score Count

●	Policy Document	●	Facebook	●	Reddit
●	News	●	Sina Weibo	●	Faculty1000
●	Blogs	●	Wikipedia	●	Q&A (stack Overflow)
●	Twitter	●	Google+	●	YouTube
●	Post publication peer reviews	●	LinkedIn	●	Pintrest

Source:https://www.altmetric.com/about-altmetrics/the-donut-and-score, accessed on 08.06.2016

5.2 Plum Analytics (http://plumanalytics.com)

PlumX metrics can be embedded into the institutional repository through PlumX

Fig.3: Plum Analytics Visualizing Impact

Source: http://plumanalytics.com/visualizing-impact-the-plum-print/ accessed on : 06.06.2016
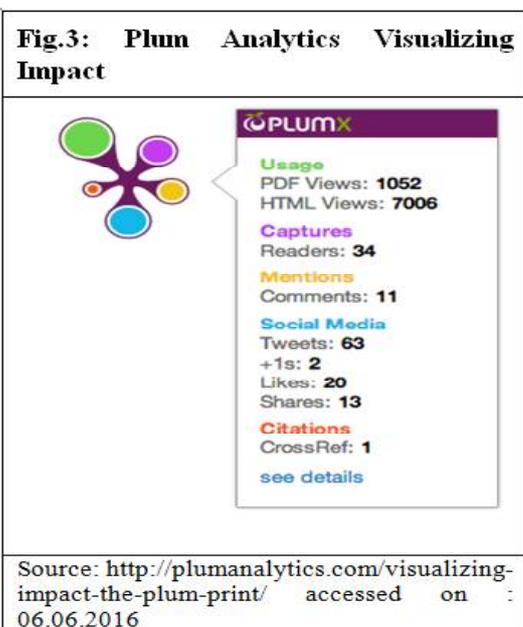
Metrics product. The PlumX is a group of products which acquaint about the various kinds of metrics generated when people encountered with published research output. PlumX has categorised metrics into the following five categories:

❖ **Usage** – clicking, downloading, viewing of research articles, library holdings, video plays

❖ **Captures** – bookmarks, code forks, favourites, readers, watchers

❖ **Mentions** – blog posts, comments, reviews, Wikipedia links

❖ **Social media** – +1s, likes, shares, tweets

❖ **Citations** – PubMed Central, Scopus, patents

PlumX Suite enables:

a) To analyse research,

b) To assess impact of the research deposited in institutional repository

c) Understanding and identifying funding opportunities for future and

d) Comparing and benchmarking against peer institutions

PlumX Suit of products includes:

❖ **PlumX Dashboards:** allows to knowing without waiting for years that what is people's response with research. PlumX Dashboard organizes research into defined groups and categories.

❖ **PlumX Metrics:** after embedding PlumX metrics institutional repository can get more value. It is a subset of PlumX Dashboards. PlumX Metrics is powered with the embeddable widget, known as Plum Print, which splits the metrics into

the five categories for the items of the institutional repository.

❖ **PlumX +Grants:** PlumX +Grants help to gain the insight input for grants. It plugs PlumX Dashboards to give further a wider analysis of research output.

❖ **PlumX Funding Opportunities:** It helps in finding the right funding opportunity. It searches US government grant opportunities so one can get appropriate updated grants opportunities applicable to research initiatives.

❖ **PlumX Benchmarks:** Compares institution to other selected institutions that are the peer in the area. It helps in the measure of research on four categories (usage, captures, mentions, and social media) before it gets cited.

5.3 ImpactStory (https://impactstory.org)

It is funded by National Science Foundation and Alfred P. Sloan Foundation. ImpactStory is non-profit organisation and one leading ALM data provider of. ImpactStory is a Web-based Application program interface that makes the wide range of research impact easy to track referred as artifacts (i.e. papers, datasets, slides, research code). The impact data is aggregated by the system from various sources (such as Mendeley, GitHub, Twitter and more) and displays the end result as a single permalink report. For gathering data ImpactStory collate with various popular web based platforms (i.e. Google Scholar Profiles, Mendeley, Software's on GitHub, SlideShare, datasets on Dryad, Twitter, etc). It informs about the bookmarking, recommendations, saving and citing of research work making an impact.

5.4 PLOS Article Level Metrics (http://article-level-metrics.plos.org):

ALM is seemed to be a comprehensive suite of indicators that enable numerous ways to assess and navigate impact of research. The PLOS is among one of the pioneering publishers those has implemented Article Level Metrics (ALM) for the Open Access journals published by it. Derivation of PLOS ALM is from various data sources such as usage counts, viewing, downloading, citations, social bookmarking, blogs, media coverage, and comments. It is notable that PLOS ALM not only gets views or downloads statistics for PLOS journals but from the PubMed Central database also. PLoS ALMs has well established metrics for measurement of overall performance of researchers (maximization of research), Publisher (enhancing publication value and influence), Institutions (Capturing researcher impact), Funders (Research Track and impact).

5.5 ReaderMeter (http://readermeter.org)

ReaderMeter is a free tool that was developed by Dario Taraborelli of the Wikimedia Foundation. It crowdsources impact based on readership metrics of consuming of a scholarly research work. ReaderMeter is a mashup visualizing API powered by the Mendeley API reference management service, providing author-level and article-level metrics in real time for calculate the impact of research. It uses bookmarks, not citations. ReaderMeter has redefined h-index and g-Index as hr-Index and gr-Index. The data is pulled from external sources and can generate reports in HTML and in machine-readable version (JSON).

5.6 ScienceCard (http://sciencecard.org)

ScienceCard was started as a web based service that automatically collects Article-Level Metrics (i.e. citations, download counts, altmetrics)for scientific articles and particular researcher using a unique authors identifier like AuthorClaim or Microsoft Academic Search ID, Twitter account could also be used to add articles from PubMed via the DOI or PubMed ID. Open Researcher & Contributor ID (ORCID) account can be linked by registered users the articles will be imported into their ScienceCard profile. Article-Level Metrics is not about collecting numbers, it is about capturing the activity surrounding an article post-publication.

5.7 PaperCritic (http://www.papercritic.com)

PaperCritic helps researchers to organize their publications library. It is an open publication review tool powered by the third-party Mendeley API. PaperCritic facilitates commentary and public reviewing of published articles. The prerequisite for this is to have a Mendeley user account for connecting with the PaperCritic platform. Then after an individual can only be able to have publication details for tagging, summarising, reviewing, commenting and rating. It has the potential to become an effective tool for crowdsourcing the reviews and insights of journal articles in addition to the formal reviewing process for journal articles.

5.8 CrowdoMeter (http://crowdometer.org)

CrowdoMeter is another web service developed by Martin Fenner and Euan Adie that displays links of tweets related to the scientific articles discussed over social media and allowing users to add semantic information. CrowdoMeter uses a subset of the Citation Typing Ontology (CiTO), for the characterization of citations, both factually and rhetorically published on the Web. The results based on crowdsourcing effort are displayed in real-time.

5.9 Wikipedia Cite-o-Meter (https://tools.wmflabs.org/cite-o-meter)

The Wikipedia Cite-o-Meter provides the estimate of a particular journal article that how many numbers of times particular journal articles from a specific publisher is cited in the largest 100 articles of Wikipedia. Cite-o-Meter searches occurrences of unique Digital Object Identifier (DOI) of the articles cited by Wikipedia (the de facto standard Digital Object Identifier is a unique string used to identify the scholarly publications in the form of digital objects). Cite-o-Meter data is available in diverse forms such as graphs, tabular data and machine-readable form (JSON) and under CC license. The citations are not tracked by Cite-o-Meter for digital objects not having DOI. Cite-o-Meter does not differentiate between the single and multiple occurrences of a DOI prefix in a Wikipedia article. Journal DOIs remains to persist even transferred to another publisher. Therefore, the DOI prefix can be considered as an indication of the original publisher only.

6. Adoption of Altmetrics

Publishers have started showing interest in alternative metrics. Now the big publication houses and academic institutions have started experimenting with altmetric and promoting their research. Some of them are BioMed Central Public Library of Science, Frontiers, Nature Publishing Group, and Elsevier. Furthermore, several institution and universities experimenting with altmetrics at an institute level are: Duke University, University of Manchester, University of Cambridge, Michigan

Publishing, Genetics Society of America, Biodiversity Heritage Library, Taylor & Francis Group, Terrie Moffitt, The John Templeton Foundation.

7. Discussion and Conculsion

It is notable to understand that altmetrics show influence or engagement of research rather the impact. A much discussed article may not have a positive impact on the peer. It is very difficult to ascertain whether the article is discussed is due to its positive or negative content. Even it is also difficult with paper with high scoring citation based metrics whether positive impact has on society. Thus, the usefulness of Altmetrics for estimating the impact is often controversial. When comes to funding agencies sponsoring projects looks for the measurable impact of their sponsorship. Therefore, Altmetrics can be regarded as one of the processes of tracking the impact how research is used by users. As the data is collected in real time and gets updated immediately that's why Altmetrics data is more difficult to standardize than traditional citations metrics. It can also be vulnerable towards self-citation and gaming for impact enhancement. Recently published articles may have the higher score. Therefore, it will be unfair to compare with the articles published before web 2.0 revolution. Altmetric is emerging as a promising area for ongoing research. Many organisations are carrying out research for altmetric standardisation and bringing out special issues on the subject.

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