COMMUNICATION AND MEASUREMENT OF SCIENTIFIC INFORMATION USING SOCIAL MEDIA

Sanat Kumar Behera

Technical Assistant, National Institute of Technology, Rourkela
Email: sanatku.behera@gmail.com
ORCID ID: orcid.org/0000-0001-7789-8099

ABSTRACT: Scientific community produced scientific information and shared with the people in a different medium through public lectures, seminars, by writing reports, articles, etc. Web 2.0 and Social media tools are the revolutionary tools and technologies which help libraries in creation, collaboration, communication in the field of scientific information. As the social web is a participative and interactive web many people like to comment, discuss, and share scientific information if they found it useful. Previously citation was the only medium to calculate the impact of particular research work but now-a-days people think of some other alternatives like article level metrics which include the social feedback of one particular research output. The paper briefly outlines the use of social media by the scientific community and library professionals and also discusses various metrics, tools available to evaluate an impact of a research work.

KEYWORD: Scientific Information, Social media, Article level metrics, Almetrics, Library, Scientific community

INTRODUCTION

The goal of science gets fulfilled when it is being shared or used by people who meant for that. From the ancient age, Library acts as a center for preservation and communication of scientific information. The invention of world wide web by Tim Berners-Lee have not only helped the library in making the job easier but also provides enough freedom for the user community to share, communicate directly to the common mass. The introduction of web 2.0 tools and advanced technologies over the Internet have made the web as a social web. It has changed the web as a user-centric web where the user takes the lead role in creating and sharing contents. Twitter had 305 million monthly active users worldwide as the fourth quarter of the year 2015 and it is increasing with the time (https://www.statista.com).

Scientific information is written or produced by the scientific community, researcher, and academician. It includes all kinds of creations and publications generated by the scientific community to outreach or communicate their research findings with their fellow researcher or for the public. Scientists mostly relate their research work through journal which is widely used tools for many of the researchers. The journal with certain impact factor helps the scientific community in getting recognition of their work and advancing their career. Thomson Reuter calculates Impact Factor and publishes through citation report. Impact factor derives or tracks the citation of the paper. The advancement of web i.e. from static web to the dynamic web has influenced the scientist in sharing and measuring their work. This paper briefly outlines the communication of the scientific information using social media as perceived by the scientific community and Library. It also discusses the measurement of the scientific contents available in social media and how it is promoting the Library and Researcher to communicate the scientific information efficiently.

WHAT IS SOCIAL MEDIA

Merriam-Webster's Learner's Dictionary defines Social media as "forms of electronic communication (such as Web sites) through which people create online communities to share

information, ideas, personal messages, etc." as the definition describes social media is a virtual platform where people communicate and share their thoughts.

Carr, CT & Hayesh, R.A. (2015) have defined social media as "Social media are Internet-based channels that allow users to opportunistically interact and selectively self-present, either in real-time or asynchronously, with both broad and narrow audiences who derive value from user-generated content and the perception of interaction with others."

Social Media is the transformation of the web tools and apps for better sharing, communication, and discussion. It has taken the principle from society what usually people follow to do. It is simply an Integration of Technology, Platform, and social principles. Social media not only connects people but also provides a platform for content sharing or in other words it accelerates the exchange and use of knowledge.
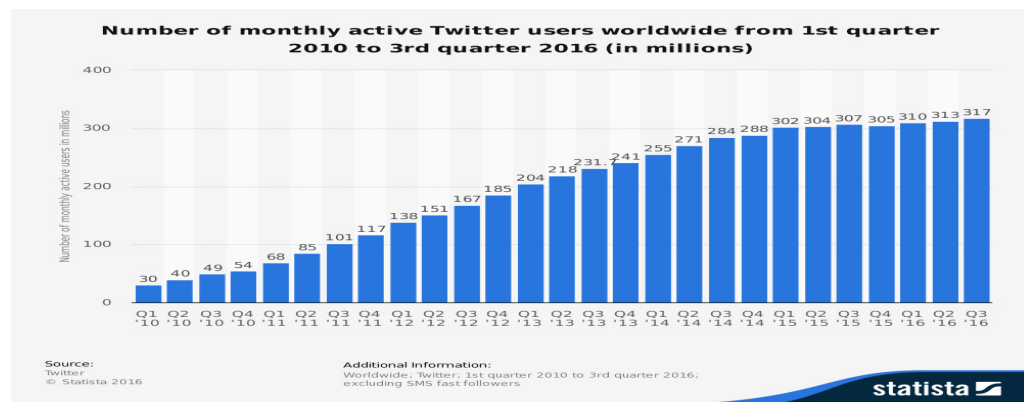

Figure 1. Twitter active user worldwide from 2010-16
Source: https://www.statista.com/

The growing popularity of the social media like Facebook, Twitter, LinkedIn etc. is bringing impact on the communication of scientific information. The social networking tools are now a big platform for collaboration, creation, participation, interaction of scientific thoughts where it directly connect people with researchers and libraries.

COMMUNICATING SCIENTIFIC INFORMATION USING SOCIAL MEDIA
The increasing cost of the journals both concerning publishing and subscribing have influenced the library and Scientific community to go for openness for the scientific communication. Beside that to improve the public visibility and to ensure development in scientific information and production, have also made the library and Scientific Communities to prefer all possible medium for communication of scientific information.

COMMUNICATING INFORMATION BY SCIENTISTS USING SOCIAL MEDIA
Scientists in the present age largely depends upon the online resources and also the Internet has removed the barriers to access the remote information. Many studies from the ancient reveal that many of the scientific communities share their research through public discussion, seminars, lectures and other media for public engagement. 64% of the respondents in a study carried out by The Royal Society in 2006 reveals that they engage the non-scientific people as science is relevant to everyday life and 60% of the respondents believe that their research is benefited to the individual. In the same survey, 74% of the researchers have participated at least one scientific communication or public engagement activity in last 12 months (Royal Society of Chemistry, 2006).

Scientists find social media as a useful platform for engaging the public as well as the fellow researchers. "Many scientists say they use Twitter to communicate specifically with other scientists. Some use it as a forum to share their research directly with the public and media, but most see it as a tool to share research within their field and to stay updated with science outreach and communication," reports Ms. Collins.
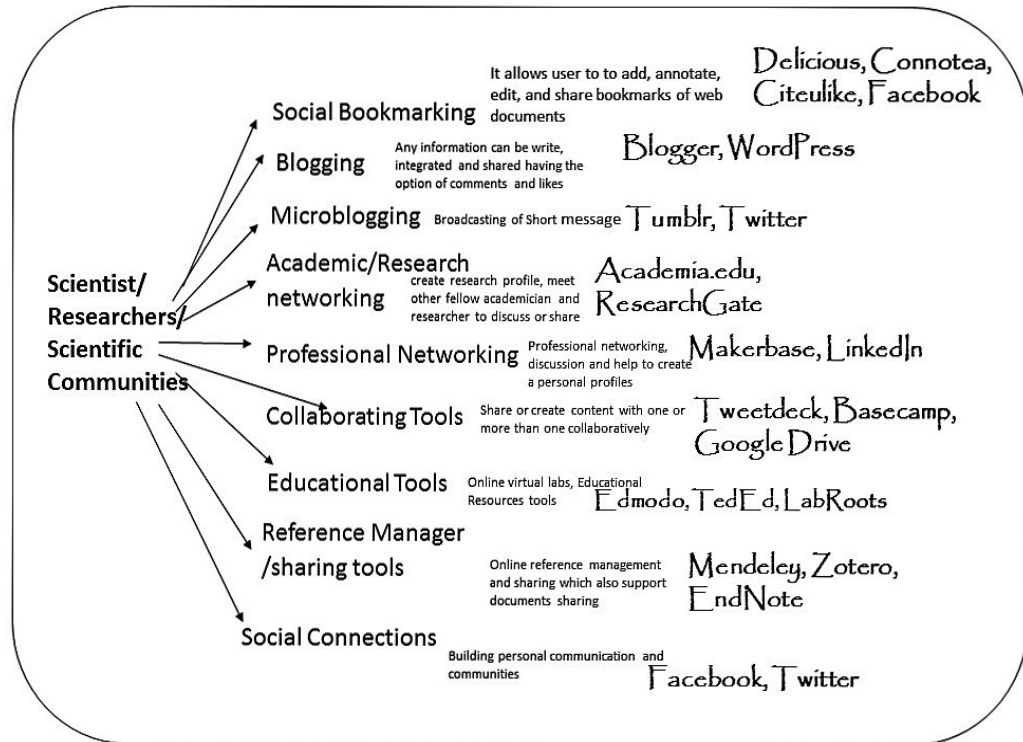

Figure 2. Dissemination of Scientific Information by Researcher using Social media

The Fiji describes the general perception of a scientists or researchers perception towards using social media. Social media helps scientific community to collaborate, organize, share their scientific content with other. Facebook, Twitter, Researchgate and Mendeley are some of the most used social media tools for the researchers. Scientific community faces many challenges in conducting research and accessing the useful literature. Social Bookmarking tools like Delicious, Connotea and CiteULike help the researcher to organize, share their web related bookmarks to others. It saves their precious time as they don't have to locate the particular web page. Besides that, they can share valuable bookmarks with their colleague and students. Blogging and Microblogging tools assist the researcher to contribute and share something with others. Especially the blogging tools make the researcher follow other ideas, discuss with them and help to get recognition of their work as they hold the copyright of their content using creative commons license. ResaerchGate is one of the buzzing academic research networks which facilitates self-archival of the contents and help the researchers to interact, questions and share their research problem and scientific information with others members of the network. Beside that other standard social media tools like Facebook and Twitter are the giants in communicating and connecting with other not only for personal communication but also it supports others forms such as making groups, sharing events, news, etc. Wikipedia, Google Drive, Pbworks and other such tools are useful for collaboration and sharing of scientific information. The professional networks like Linkedin helps the scientific community to discuss, work and contribute professionally. It also guides them to

know about different organizations and people, their expertise area, educational qualification etc. there are many other tools in social media which are very much useful and can be used for scientific communication.

COMMUNICATING INFORMATION BY LIBRARY USING SOCIAL MEDIA

Library Plays a vital role in the dissemination of scientific information. It adopts many technologies or tools to satisfy the information needs of the users. On 2012, Kai-Wah Chu and Du4 have found that 71% of the libraries in Asia, North America and Europe use social networking tools and 13% are planning to implement. On 2014, Taylor and Francis conducted a survey in which it found that over 70% of librarian's now feel social media as important tools and 68% library have one to four accounts. It not only acts as disseminator, sometimes it helps the scientific community to produce scientific content collaboratively. In other words, it provides platform for the scientific community to create and archive the contents. There are a number of tools which help the library to disseminate scientist information.
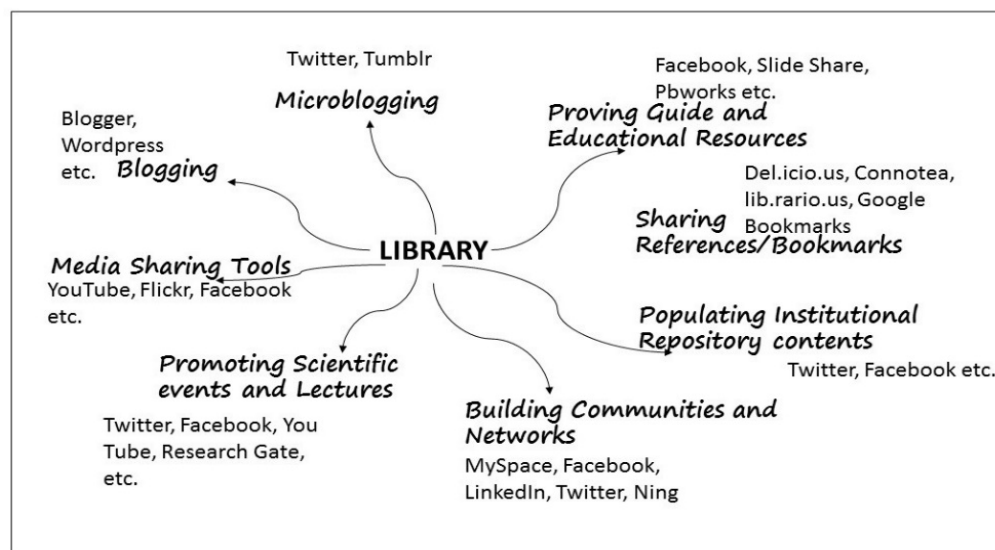

Figure 3.Dissemination of Scientific Information using Social media

Social media helps the library to make its own user community for personalized information services. The tools like Facebook, twitter, Linkedin help library to quickly circulate information. Library of Congress is having more than 50000 subscribers and more than 1 crore views in its Youtube total videos.

MEASURING SCIENTIFIC INFORMATION

For decades the common metrics used for evaluating impact of scientific information is the number of time a research work got cited. The more number of time a paper gets cited are known to have more influence or impact. The impact of scientific publication can be measured by evaluating the number of publication, citations to these publications and influence of the publication. The increasing production of the scientific work over the internet and social media have created the emergence of the adoption of new strategies as well as enhancement of traditional metrics system to measure the impact of a scientific work.

Traditional Tools

There are different methods in which success or academic excellence of scientific community and institution is measured. Scholarly publication is one of the most integral parts of the measurement of success and excellence of one researcher or institute.

The increasing number of journals and to consider their quality, scientific community depend solely upon its metrics. In 1972 Eugene Garfield mentioned in his paper about the calculation of impact factor using citation analysis method to evaluate the incidence of the scientific paper and journals. The same paper has also introduced the Science Citation Index (SCI) and mentions about the importance of citation and how it is a linkage with similar scientific paper and literature.

The Impact factor: Eugene Garfield the founder of the 'Institute for Scientific Information' (ISI) has invented the Impact Factor. Impact factors are calculated yearly and it includes the journal indexed in Journal Citation Report published by Thompson Reuter. "The impact factor of a journal is calculated by dividing the number of current year citations to the source items published in that journal during the previous two years" (Thomson Reuter). It publishes the impact factor of the journal in form of Journal Citation Reports and It uses the data of science citation Index or Web of Science.

SCImago Journal & Country Rank(SJR): It is publicly available ranking portal which ranks the journal, country and categorize on the basis of different broad subjects. It includes the journals and country scientific indicators generated from the Scopus database and uses the Google Page Rank algorithm to analyze the data. It calculates and displays the TOP rank Journal and their SJR Point which is calculated on the basis of citations collected for a document or Journal on a given period. It also displays the **h**-Index of the Country and Journals.

Google Scholar Citation: Google Scholar is a search engine of the google which indexes scholarly publications and track their corresponding citations citations related information. It allows the users to create a scholar profile and attract the users to prompt archival of their article metadata. Google Scholar also ranks the journal according the metrics which they receive form their database. It also analyses the data and generate h-index and i10 Index of the Scholar. Google Scholar as an open access citation database is quite popular among the researchers.

***h*-index** is the author level metrics used to measure individual research impact proposed by Jorge Hirsch in the year 2005. According to Hirsch "A scientist has index h if h of his or her Np papers have at least h citations each and the other (Np−h) papers have ⩽h citations each". It reflects both the number of papers and the citation received by those paper. For example, in series of paper 1(36), 2(28), 3(25), 4(6), 5(5), 6(4). Then the h-index will be 5. As the no.5 paper is similar to the citation whereas the no.6 paper have less citation that the serial no.6. Scopus, Web of Science and Google Scholar calculate the h-index of the authors and organizations as well.

There are many other formulas like SNIP, IPP etc. which are calculated using some algorithms developed by Scopus based on citation metrics.

SOCIAL MEDIA AND SCHOLARLY METRICS
Social media is now a huge platform where within a second scholarly work got posted, created, shared, mentioned and also commented by different people. As the process of calculating impact factor is slow and it is usually meant for the journal metrics people search for a metrics which can calculate the impact of a paper from social media when it got shared, commented, liked or mentioned by somebody. The Article-Level Metrics (ALMs) first introduced by PLOS (Public Library of Science) for its own publication it has developed a

system which can calculate the information related to that particular articles. How much time it got shared or mentioned by the people. Some of the tools which calculates the article level metrics are as follows.

Altmetric It helps the researchers, publishers, Funders and Institutions to explore and track the impact of their scholarly output. It monitors the influence, early engagement of the research work in social media environment. It tracks journals articles, dataset, an identifier and the source of the scholarly work. It uses the identifier like PubMedID, arXiv ID, ADS ID, SSRN ID, RePEC ID, Handle.net identifiers, URN, ISBNs, DOI and URL to track the social presence of the research documents. It can be embedded into the institutional repository, websites, etc. to display the impact of the scientific publications. Anybody can access to the altmetrics but to explore it needs a subscription.

Impactstory Impactstory is an open-source Tools or website which discovers the online impact of a research work and helps the researchers to explore, share the online impact of their research to other. It connects DOIs, GoogleScholar Citations, ORCID Identifier and gathers data from Altmetric, Mendeley to count and see the research impact of the product. It helps the researcher to create their profile and provide a persistent URL to their profile. It corporate incorporating the publication, research data into the profile and all the researchers to share on-line resumes as like Linkedin (https://impactstory.org/).

PLOS | ARTICLE-LEVEL METRICS PLOS Article-Level Metrics examines the overall performance, metrics, use, reuse, influence of articles published by PLOS (Public Library of Science). It incorporates both academic and social metrics. It trackes the information like viewed file formats, saved, cited, recommended and discussed from many of the portals including CiteULike, Mendeley, CrossRef, Datacite, Europe PMC, PubMed Central, Scopus, Web of Science, PLOS Comments, Facebook, Reddit, Twitter, etc. It also provides API to embed in third party websites and portals (https://plos.org/article-level-metrics).

PLUM ANALYTICS Plum Analytics has a suite of products called PlumX which provides both traditional metrics and altmetrics by using different resources. It is a commercially based metrics provider. It collects data from different sources and categorize them into 5 categories usage, Captures, mentions, Social Media, Citations.
Usage – clicks, downloads, views, library holdings, video plays
Captures – bookmarks, code forks, favorites, readers, watchers
Mentions – blog posts, comments, reviews, Wikipedia links
Social media – +1s, likes, shares, tweets
Citations – citation indexes, patent citations, clinical citations
(Source: http://plumanalytics.com/learn/about-metrics/)
PlumX Comes with five different products such as PlumX Dashboards, PlumX Metrics, PlumX +Grants, PlumX Funding Opportunities, PlumX Benchmarks

ResearchGate ResearchGate is an online social networking platform for academician and researchers which facilitates to share publication, connect with fellow researchers, discussion and find the right job. It measures the researcher's profiles and calculated RG score according to that. RG score is a metrics that measures the contribution, interaction and

reputation of a researchers in ResearchGate Portal. RG scores are also calculated for different institutions based on member of contributions and Interactions https://www.researchgate.net/.

CONCLUSION

Sharing scientific information using social media not only enhances the popularity of the paper but also it facilitates greater visibility and helps to increase citation counts of the concerned paper. Scholars are beginning to go "beyond the paper" and engage with their colleagues via Twitter, blogs and reference managers (Priem, 2013). Scientists and librarians are now understanding the usefulness of social media and they are following the openness of the scientific information. With the developments of metrics social media is now getting its recognition.

NOTES

https://plos.org/article-level-metrics
https://www.researchgate.net/
https://www.altmetric.com/
https://scholar.google.co.in/
https://impactstory.org/about
http://plumanalytics.com/
https://www.youtube.com/user/LibraryOfCongress/about
http://www.scimagojr.com

REFERENCES

- Featherstone, R. M. (2014). Scholarly Tweets: Measuring Research Impact via Altmetrics. *Journal of the Canadian Health Libraries Association*. 35(2), 60–63.
- Garfield, E. (1972). Citation Analysis as a Tool in Journal Evaluation: Journals can be ranked by frequency and impact of citations for science policy studies. *Science*, 178(4060), 471-479.
- Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. Proceedings of the National Academy of Sciences of the United States of America, 102 (46), 16569-16572.
- Jensen, P., Rouquier, J., Kreimer, P., & Croissant, Y. (2008). Perform better academically, 35(August), 527–541.
- Kai-Wah Chu, S. & Du, H. S. (2012) Social Networking Tools for Academic Libraries. *Journal of Librarianship and Information Science*. 45 (1), 6.
- Liang, X., et al. (2014). Building Buzz (Scientists) Communicating Science in New Media Environments. *Journalism & Mass Communication Quarterly*, 1077699014550092.
- Macmillan, D., & Macmillan, D. (2013). Mendeley: teaching scholarly communication and collaboration through social networking.doi: 10.1108/01435121211279902
- McCallum, I. (2015). Use of social media by the library: Current practices and future opportunities. A white paper from Taylor & Francis. *The Australian Library Journal*. 64(2), 161-162.
- McCormick, T. (2014). Social media for scientists—including the shy, overcommitted and unconvinced. Blog post at: http://www. elsevier. com/connect.

- Roemer, R. C., & Borchardt, R. (2012). From bibliometrics to altmetrics A changing scholarly landscape. *College & Research Libraries News*, 73(10), 596-600.
- Tenopir, C., Volentine, R., King, D. W., Tenopir, C., Volentine, R., & King, D. W. (2014). Social media and scholarly reading. doi; /10.1108/OIR-04-2012-0062.