An altmetric comparison of highly cited digital library publications of India and China

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A comparative altmetric study of highly cited publications on 'digital library' from India and China pertaining to the period 1989 to 2017 reveals that computer science discipline has more readership of digital library publications in China whereas social science disciplines has more readership in India. Indian articles on digital library received higher altmetric scores as compared to articles of Chinese origin, whereas the Chinese articles on digital libraries received more citations as compared to the Indian articles on the subject. The study also reveals that there is a low correlation between citations and altmetric scores.

Introduction

Jason Priem coined the term 'Altmetrics' in 2010, as a metric and qualitative data complementary to the traditional metrics[1]. It includes the peer-reviews, blog-posts, video uploads, mentions on social media platforms as well as bookmarks on reference manager sites. Altmetrics today is part of the changes taking place in the open research and scholarly communication landscape[2]. The advent of Web 2.0 led to not only the discussions but recommendations, followings, and mentions on social media platform[3].

In today's digital era, altmetric is the method which can be used to assess research impact beyond citations. As the research activity is moving from closed scientific labs to the open web platform, the societal impact of research is also measured in addition to the scientific impact. The advent of social media for discussion, sharing, and posting of research related articles have led to the development of altmetric as a domain that tracks the online scholarly communication and measures the impact of research[3]. Due to the limitations of citation-based metrics, there is always a need for alternative metrics. Today, altmetric tools such as altmetric.com, Impact story, and PlumX offer the possibility to address the limitations of the citation-based metrics[4].

This study is an attempt to identify highly cited publications on digital library that have been published from India and China during 1989-2017. The paper has used altmetrics.com tool to identify the online attention to find out the altmetric scores of highly cited publications in the field of digital library. It also measures the demographic and geographic readership via the Mendeley Readership to record the overall impact of research publications on digital libraries in India and China and identify the correlation between citations and altmetric scores of highly cited articles in studied countries on the mentioned subject.

Review of literature

Many studies have been conducted worldwide to validate altmetrics by studying citations in comparison with altmetric scores along with the role of various academic and non-academic social networking sites in research studies and measuring its impact in a research world.

Maggio *et al* (2018) examined the "relationships between altmetrics, citations, and access counts (among several other variables) and suggested that several altmetrics outlets are positively associated with citations and that public accessibility, holding all other independent variables constant, is positively related to article access"[5] Baheti and Bhargava (2017) discussed that "the altmetric score and growing role of altmetrics for measuring research impact by

mentioning that topic are more reliable to general attention as compared to traditional method."[6] Bormann (2014) mentioned that "for the correct scientific impact, it would be fallacious to use the metrics as complementary to one another rather than a replacement"[7].

Syamili and Rekha (2017) identified the "correlation between altmetrics score and citations by collecting articles on Ebola published in *PLOS One* during 2010-2015. The result reveals that all altmetric scores except twitter have a reasonable correlation with traditional bibliometric citations"[8]. Wang et al. (2014) in a study identified that "the relationship between various metrics of 63,805 PLOS research articles have low correlation between social attention and citation. High altmetric score has the potential role in promoting the long-term academic impact of articles, when a conceptual model is proposed to interpret the conversion from social attention to article view, and citation finally"[9]. Edith and Purtee (2017), reveals that analysis of high initial altmetric scores over the course of the three years shifted from a possible predictor of future impact in the second year to no indicator of long-term interest in the scientific community as the public interest waned over time[10]. Many studies have been conducted on the identification of a correlation between citations and altmetric scores.

Altmetrics continues to attract the attention of researchers, including bibliometricians, and this study is another attempt to examine the altmetric and citation scores of highly cited articles of India and China in a specific area.

Methodology

The top 10 papers each of India and China on Digital Library for the period 1989-2017 and their citations data was obtained from Web of Science (core collection of humanities, sciences, and social sciences). Each of these papers were searched in Altmetric.com during July 2018 to August 2018 to obtain their altmetric scores. The data thus obtained were tabulated in Excel and analyzed.

Altmetric Attention Scores

The altmetric attention score is the scores which provide an indicator for the amount of attention received by the research publication.[11] These scores are influenced by the quantity of posts mentioning an output and the quality of the post's sources. The scores are based on the automated algorithm and weighted amount of attention for certain research output. Algorithms are used to calculate the scores, and the decimals would be rounded off to the nearest whole number.[12] Table 1 demonstrates the online platforms which have default weighting for the research output platforms.

Analysis
Highly cited digital library publications of India and China

Highly cited publications are those that have received the maximum number of citations as compared to other papers in the same field in a particular country for a period of time[12]. It has been observed that during 1989-2017, the maximum number of 12 citations were received by the article, "Access to scholarly communication in higher education in India Trends in usage statistics via INFLIBNET" is 12 in the 2008, whereas maximum 24 citations have been received by an article, titled "a co-word analysis of digital library field" in China in 2012. Altmetric Attention Score (AAS) is designed to help in easy identification of the online attention received by an article[1]. It was found out that only two articles received altmetric attention in both the countries but they were not the highly cited articles. It shows that it's not essential that highly cited articles may receive altmetric attention score too and an article which doesn't receive any citation can have altmetric attention score (Tables 2 and 3).

Table 1 — Weighted Score for Online platforms for Altmetric Attention Score

News	08
Blog	05
Policy document (per source)	03
Patent	03
Wikipedia	03
Twitter	01
Peer review (Publons, Pubpeer)	01
Weibo (not trackable since 2015, but historical data kept)	01
Google+ (not trackable since 2019, but historical data kept)	01
F1000	01
Syllabi (Open Syllabus)	01
LinkedIn (not trackable since 2014, but historical data kept)	0.5
Facebook (only a curated list of public Pages)	0.25
Reddit	0.25
Pinterest (not trackable since 2013, but historical data kept)	0.25
Q&A (Stack Overflow)	0.25
Youtube	0.25
Number of Mendeley readers	0
Number of Dimensions and Web of Science citations	0

Table 2 — Altmetric attentions received by highly cited publications in India on digital library

Item No.	Title	Citations	Altmetric Score	News	Peer Review Site	Blogs	Twitter	Facebook	Sina Weibo	Wikipedia	Policy Documents	Q&A Thread	F1000/Publons/Pubpeer	YouTube	Reddit/Pinterest	F1000	LinkedIn	Open Syllabus	Google+	Mendeley	CiteULike	Commotea
1	Access to scholarly communication in higher education in India Trends in usage statistics via INFLIBNET	12	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Digital libraries and repositories in India: an evaluative study	09	8	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	57	-	-
3	A comprehensive information resource on traditional, complementary, and alternative medicine: Toward an international collaboration	08	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	IIM digital library system: consortia-based approach	07	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Indian National Digital Library in Engineering Science and Technology (INDEST): A proposal for strategic co-operation for consortia-based access to electronic resources	07	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Using open source software for digital libraries A case study of CUSAT	06	2	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	20	-	-
7	Digital content creation and copyright issues	06	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Use of information and communication technology in libraries and information centers: an Indian scenario	06	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	Development of a digital library of manuscripts A case study at the University of Pune, India	05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Design and development of institutional repositories: A case study	04	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Citation and altmetric score of highly cited publications in India and China on digital library

Spearman correlation method used in this study to identify the correlation between citation and altmetric score. Through the formula given by Spearman, the R-value of a displayed data is -0.11 in case of Indian articles whereas 0 is in case of China publications. It reveals that the negative relationship because most publications didn't receive many citations and any Altmetric Attention Score (AAS).

$$R = 1 - \frac{6\left\{\sum D^2 + \frac{1}{12}(m_1^3 - m_1) + \frac{1}{12}(m_2^3 - m_2 + \ldots\ldots\ldots)\right\}}{N^3 - N}$$

Geographic distribution of users of publications in India and China through Mendeley

Table 4 represents the geographic distribution of users of publications through Mendeley (which is a free reference management tool for researchers to organize, share, and discover research). It shows that in India, the article entitled "Digital libraries and repositories in India: an evaluative study" has a total of 57 Mendeley Readers in which maximum are from unknown sources. Table 3 also shows that the article 'Mapping knowledge domains of Chinese digital library research output, 1994-2010' have total 49 Mendeley Readers in which maximum are from unknown sources. Although these Mendeley numbers are not considered in Altmetric Score calculation, these help the researcher to know which countries the readers belong to.

Demographic distribution of users of publications in India and China through Mendeley

Table 5 represents the demographic distribution of users of publications in India and China through Mendeley. It reveals that maximum users are Librarians apart from others followed by PhD Scholars and master students in India for the "Digital libraries and repositories in India: an evaluative study" and "using open source software for digital libraries a case study of CUSAT" articles whereas in China, maximum users are PhD Scholars of the "mapping knowledge domains of Chinese digital library research output, 1994-2010" and for the article

Table 3 — Altmetric attentions received by highly cited publications in China on digital library

Item No.	Title	Citations	Altmetric Score	News	Peer Review Site	Blogs	Twitter	Facebook	Sina Weibo	Wikipedia	Policy Documents	Q&A Thread	F1000/Publons/Pubpeer	YouTube	Reddit/Pinterest	F1000	LinkedIn	Open Syllabus	Google+	Mendeley	CiteULike	Connotea
2	A co-word analysis of digital library field in China	24	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Mapping knowledge domains of Chinese digital library research output, 1994-2010	23	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49	3	-
4	Automatic generation of English/Chinese thesaurus based on a parallel corpus in-laws	20	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	A Comparative Study of Digital Library Use: Factors, Perceived Influences, and Satisfaction	18	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Research characteristics and status on social media in China: A bibliometric and co-word analysis.	14	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	The development of digital libraries in China and the shaping of digital librarians	13	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	A review of the significant projects constituting the China Academic Digital Library	12	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	The development of the China networked digital library of theses and dissertations	11	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Comparing digital libraries with virtual communities from the perspective of equality	06	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-
10	Comparing Flow experience in using Digital libraries Web and mobile context	05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4 — Geographic distribution of users of publications in India and China through Mendeley

Country	Article-2		Article-6		Article-9		Total	
	I	C	I	C	I	C	I	C
Mendeley Total	57	49	20	-	-	26	77	75
India	06	-	03	-	-	-	09	-
Poland	-	01	-	-	-	-	-	01
Finland	-	01	-	-	-	-	-	01
Tanzania	-	01	-	-	-	-	-	01
Indonesia	01	-	-	-	-	-	01	-
Iran	01	01	-	-	-	-	02	01
United States of America	-	01	02	-	-	-	02	01
Canada	-	01	-	-	-	-	-	01
Spain	-	-	01	-	-	-	01	01
Unknown	49	43	14	-	-	-	63	68

Source: Altmetric.com, https://www.altmetric.com/details, (accessed on 28 Oct 2018).
Note: * I=India and **C=China

Table 5 — Demographic distribution of users of publications in India and China through Mendeley

Readers	Article-2		Article-6		Article-9		Total	
	I	C	I	C	I	C	I	C
Librarian	16	-	21	-	-	09	37	09
Student > Ph. D.	09	13	07	-	-	04	16	17
Researcher		05	-	-	-	00	-	05
Student > Master	08	09	10	-	-	06	18	15
Student > Doctoral	-	-	03	-	-	03	03	03
Student > Postgraduate	06	00	00	-	-	02	06	02
Student > Bachelor	00	-	03	-	-	-	03	-
Professor> Associate Professor	-	05	-	-	-	00	-	05
Professor	-	03	-	-	-	00	-	03
Unspecified	05	-	00	-	-	-	05	-
Other	13	14	06	-	-	02	19	16

Source: Altmetric.com <https://www.altmetric.com/details> (accessed on 28 Oct 2018).
Note: * I= India and **C=China

"comparing digital libraries with virtual communities from the perspective of equality" maximum readers are Librarians followed by PhD Scholars.

Subject-wise distribution of readers of publications in India and China through Mendeley

Table 6 represents the subject wise readership for those articles which received altmetric attention score (as seen in Tables 2 and 3). It reveals that in India, maximum readers are from social sciences discipline followed by computer science, whereas, in China, computer science discipline has maximum readers followed by social sciences.

Table 6 — Subject-wise distribution readers in India and China

Readers by subject	Article- 2		Article- 6		Article- 9		Total	
	I	C	I	C	I	C	I	C
Social science	26	08	18	-	-	06	44	14
Computer Science	21	18	16	-	-	08	37	26
Unspecified	05	05	00	-	-	-	05	05
Arts and Humanities	01	04	05	-	-	02	06	06
Linguistics	-	00	-	-	-	00	-	00
Agricultural and Biological Sciences	01	-	00	-	-	-	01	-
Engineering	00	00	04	-	-	02	04	02
Business, Management, and Accounting	-	06	02	-	-	06	02	12
Other	02	-	05	-	-	-	07	-

Source: Altmetric.com <https://www.altmetric.com/details> (accessed on 28 Oct 2018)
Note: * I= India and **C=China

Table 7 — Comparison of citation and altmetric scores

	India		China	
Articles	Citations	Altmetric Score	Citations	Altmetric Score
Article 01	12	00	24	00
Article 02	09	08	23	01
Article 03	08	00	20	00
Article 04	07	00	18	00
Article 05	07	00	14	00
Article 06	06	02	13	00
Article 07	06	00	12	00
Article 08	06	00	11	00
Article 09	05	00	06	01
Article 10	04	00	05	00
Total	70	10	146	02

Comparison of altmetrics score and citation between India and China

Table 7 gives the comparison of altmetric and citation scores between India and China. It could be seen from the table that while most articles in both the counties have not received altmetric scores, India received a higher altmetric score as compared to China, whereas China receives more citations on the digital library publications between 1989 and 2017.

Conclusion

Altmetrics is considered a complementary metrics to traditional metrics as it is not time-bound and track the online attentions in the form of Altmetric Attention Score. The study indicates that to measure overall research impact, there is a need to use altmetrics along with the traditional indicators. It can be concluded that in both China and India, there is low uptake of social media platforms for discussing research papers related to digital library.

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