Scholarly Research Articles Published from Anna University, Tamil Nadu during 2011-2016: An Altmetrics Evaluation

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Abstract

This paper presents an altmetrics evaluation of scholarly publications of Anna University published during 2011-2016, and indexed in Web of Science (WoS) database. A total of 5056 publications, i.e. only articles with a total of 25850 citations was collected. The other types of published materials such as reviews, book chapters, editorial materials, and proceedings papers have not been considered for this study. Among those 5056 publications, only 4306 (85.17%) publications which were found to have DOI were considered for this study. Webometric Analyst 2.0 software was used to retrieve the altmetrics data from Altmetric.com for those 4306 articles by fetching queries of 4306 DOIs. It was found that only 361 publications were having altmetrics data as per the data retrieved from Altmetric.com which includes online readership / posts / attentions / mentions, etc. Further, this paper presents the year-wise growth of publications and citations, presence of altmetrics data by their sources, altmetrics mentions across WoS - Broad Subject categories, most prominent publications as per their altmetrics score, and finally reveals the Twitter demographics and geographic (country) of tweets / mentions for these publications from Anna University.

Keywords: Altmetrics; Scholarly Research Article; Anna University; Altmetric.com; Social Media; Twitter

1. Introduction

Assessment of scholarly research impact is very much a tough task in the part of research evaluator. Since long, traditional metrics based on citation analysis are in use as a profound measure for the research impact assessment. With the advancement of the Internet and web technologies, there is a growing trend in the use of social media platforms and web sources by the research communities and academia in their research environment to perform various research activities, for collaborating, discussing, and sharing of research, etc. The role of social media in scholarly communication have been proven in their use in research dissemination. However, in recent years data collected from these social media platforms are considered and emerging as a new tool / method for research assessment collectively termed as "Altmetrics". There have been seen an increasing interest towards the importance and use of altmetrics as an alternative or complementary method to traditional citation-based metrics for assessing scholarly research impact; since after the term "Altmetrics" was coined in September, 2010 by Jason Priem, the then a PhD student at the School of Information and Library Science at University of North Carolina, Chapel Hill, USA. It is the new metrics for measuring research impact based on the data penetrating on the web & social media platforms like Facebook, Twitter,

LinkedIn, Mendeley and CiteULike etc. As new sources and early impact indicators, data from various social media platforms and online web sources have been exploited, and examined extensively in recent past few years to carry out altmetrics studies.

2. Related Work

There have been several studies on how the scholarly research publications of a specific discipline or institution are represented on various social media platforms like Mendeley, CiteULike, Twitter, Facebook, Google+, Blogs, Wikipedia, etc. collectively comes under the term Altmetrics. Haustein, Peters, Sugimoto, Thelwall, & Larivière (2014) conducted a study based on 1.4 million biomedical literatures published between 2010 and 2012 covered in both PubMed and Web of Science, They analysed the number of tweets containing links to those publications with citations and found out the existence of a low correlation between tweets and citations. Winter (2014) carried out an analysis of article-level metrics of 27,856 PLOS ONE articles which revealed that the number of tweets was weakly associated with the number of citations. Hammerfelt (2014) analysed the altmetrics coverage and impact of humanities-oriented articles and books published by Swedish universities during 2012. He examined some of the most common altmetric sources using a sample of 310 journal articles and 54 books, and found out that Mendeley had the highest coverage of journal articles (61 %) followed by Twitter (21 %) while very few of the publications are mentioned in blogs or on Facebook. Maleki (2015) investigated various academic and non-academic Twitter users' contribution to tweets and the significance of the relationship that might exist between each one's

contribution and conventional citations to articles. He studied a sample of 6445 tweeted articles published between 2011 and 2014 and 2533 random tweeted articles in other years, and observed a low positive correlation between tweets and citation counts. Further, it was found that the more recent years showed higher levels of correlations. Erdt, Aw, Aung, Mohammadi, & Theng, Yin-Leng. (2016) analysed 94,597 publications across 27 subject areas found in Scopus between the years 2009 to 2013, and found out that the altmetrics coverage across all disciplines was 18% for the years 2009 - 2013. Further, it was observed that correlation results between citation counts and altmetrics was medium to low correlations with distinct differences amongst the various disciplines. Ram (2017) measured the research impact of scholarly publications of Thapar University, India using altmetrics. He analysed 3499 articles published during 1972 to 2015 and indexed in Scopus database. Further, he analysed a top 100 most cited articles from the Mendeley readership perspectives. Togia, Koseoglou, & Zapounidou (2017) recently presented a study providing an overview of the coverage of altmetrics sources collected from Altmetric Explorer for the Aristotle University of Thessaloniki (AUTh) publications published from 2010 to 2016 retrieved from Scopus. They found out that only 17% of all publications had some kind of mentions, while there was a clear increasing trend over the years. Twitter represented around 81% of all mentions, while Facebook was a distant second, followed by news outlets.

However, the author could not find any altmetrics study conducted so far covering all altmetrics sources provided by Altmetric.com for scholarly research assessment of any Indian University publications. Thus, this study was carried out to

provide an overview of the coverage of altmetrics sources for Anna University, Tamil Nadu publications published during 2011-2016 retrieved from Web of Science.

3. Objectives

The present study focuses on the following research questions / objectives:

❖ To find out the density and kind of altmetrics data exist for the articles published from Anna University, Tamil Nadu during 2011-2016,

❖ To explore the presence of altmetrics for Anna University publications across broad subject fields categorized in Web of Science,

❖ To identify the differences in the presence of altmetrics in between Open and Paid publications,

❖ To prepare a list of year wise top and overall top publications with the highest altmetrics score, and

❖ To know the Twitter demographic and geographic breakdown of the mentions for the publications.

4. Methodology

4.1 Sources of Data

The "Web of Science Core Collection" of Web of Science database, a product of Clarivate Analytics was used to obtain the year wise number of publications published by Anna University, Tamil Nadu during 2011-2016 along with their citation data and associated DOIs. And, the altmetrics data were retrieved from "Altmetric.com", a leading altmetrics data provider.

4.2 Data Collection

A total of 5056 publications, i.e. only articles published from Anna University, Tamil Nadu during 2011-2016 along with a total of 25850 citations and other bibliographic data was collected. The other types of published materials such as reviews, book chapters, editorial materials, and proceedings papers were excluded from this study. Among those 5056 publications, 427 (8.45%) were open access (OA) and 4629 (91.55%) were not open access (NOA) publications. Further, only 4306 (85.17%) publications were found to have DOI from the extracted Web of Science file of 5056 publications, and the left 750 (14.83%) publications had no DOI associated with it. Then, Webometric Analyst 2.0 software was used to retrieve the altmetrics data from Altmetric.com by preparing and fetching queries of 4306 collected DOIs which is a prerequisite. It is because unique identifiers like DOI, PubMed ID, arXiv ID, etc. of published article is very much important for Altmetric.com to be able to track, match the social attention to the research, and recognise different versions of the same research over the different social media platforms and web sources to avoid disambiguation. Among those 4306 publications having DOIs, only 361 publications were found to have altmetrics data as per the data retrieved from Altmetric.com which includes online readership / posts / attentions / mentions, etc. in different social media platforms and web sources available over the web. And, this study is mostly based on only those 361 publications' altmetrics data. All the data for the study were searched and retrieved on Friday, 30/06/2017.

4.3 Data Analysis

After all the required data collection over, the data were saved in MS Excel file. Further, all the arithmetic calculations, tabular interpretations and visualization were performed in the same.

5. Findings and Discussions

5.1 Growth of Publications and Citations of Anna University

Chart-1 and 2 present the year-wise distribution of publications along with their citations of Anna University, Tamil Nadu indexed in Web of Science (WoS) for the period 2011-2016. As mentioned before, a total of 5056 publications, i.e. only articles were indexed in WoS, having a total of 25850 citations. It is clearly visible from both the charts that there is a positive trend in growth of publications and citations of Anna University. Further, these charts show the differences in the number of publications for open access (OA) and not open access (NOA) publications. Among those 5056 publications, 427 (8.45%) were (OA) and 4629 (91.55%) were (NOA) publications.

Figure 1 and 2: Year wise Publications (NOA & OA Publications) with Nos. of Citations of Anna University, Tamil Nadu

5.2 Presence of Altmetrics for Anna University Publications

Table-1 shows the number of Anna University publications with altmetrics. It can be seen that 85.17% of publications had DOIs associated with it. Any kind of unique identifiers like DOI, PubMed ID, arXiv ID, etc. of published article is necessary to retrieve altmetrics data from Altmetric.com. Thus, altmetrics data for only those 4306 publications having DOIs were searched in Altmetric.com and it was found that only 7.14% of all publications collected from WoS had some kind of altmetrics data.
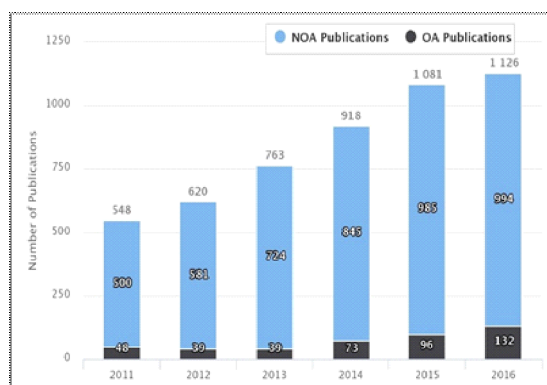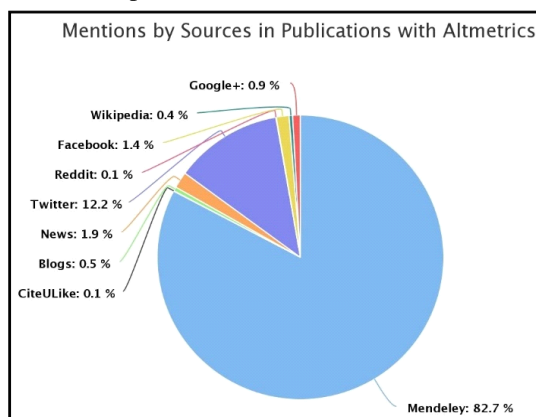
Table 1: Altmetrics coverage of Anna University Publications

Year	Total Publications				NOA Publications			OA Publications		
	Publications in WoS	Publications with DOI	Publications with Altmetrics	% of Yearly Publications	Publications in WoS	Publications with DOI	Publications with Altmetrics	Publications in WoS	Publications with DOI	Publications with Altmetrics
2011	548	442	12	**2.19**	500	411	10	48	31	2
2012	620	518	28	**4.52**	581	489	22	39	29	6
2013	763	642	34	**4.46**	724	615	30	39	27	4
2014	918	791	86	**9.37**	845	728	77	73	63	9
2015	1081	930	94	**8.70**	985	856	75	96	74	19
2016	1126	983	107	**9.50**	994	862	93	132	121	14
Total	**5056**	**4306**	**361**	**7.14**	**4629**	**3961**	**307**	**427**	**345**	**54**

Among all the altmetrics service providers available in the market today, it is found that Altmetric.com has the most extensive tracked sources for altmetrics data collection in comparison to others. Altmetric.com tracks online readership statistics from Mendeley, Connotea, and CiteULike; mentions in Blogs, news post, number of tweets from Tweeter, links and posts from Facebook walls, Wikipedia citations and articles, reviews and highlights in platforms like F1000, referenced in Policy documents and Open syllabus, etc. In this study, the presence of altmetrics for publications was mostly varied from each source. Around 82.71% of all mentions came from Mendeley, followed by Twitter (12.2%) and News posts 1.9% respectively. Table-2 and Chart-3 represent the number of online mentions with their source for publications with altmetrics.

Source	Mentions in Publications with Altmetrics	Mentions in "NOA" Publications with Altmetrics	Mentions in "OA" Publications with Altmetrics
Mendeley	4962	4065	897
CiteULike	3	2	1
Blogs	27	26	1
News	112	112	0
Twitter	730	631	99
Reddit	3	3	0
Facebook	86	77	9
Wikipedia	24	22	2
Google+	52	50	2
Total	**5999**	**4988**	**1011**

Mentions by Sources in Publications with Altmetrics

Google+: 0.9 %
Wikipedia: 0.4 %
Facebook: 1.4 %
Reddit: 0.1 %
Twitter: 12.2 %
News: 1.9 %
Blogs: 0.5 %
CiteULike: 0.1 %
Mendeley: 82.7 %

Table-2 and Figure 3: Altmetrics Mentions by Sources for Publications with Altmetrics

Further, the Table-3 and Chart-4 represent all the altmetrics mentions by sources on year wise publications. It can be seen that the highest mentions in all year came from Mendeley.

Table-3: Altmetrics Mentions by Sources on Year wise Publications

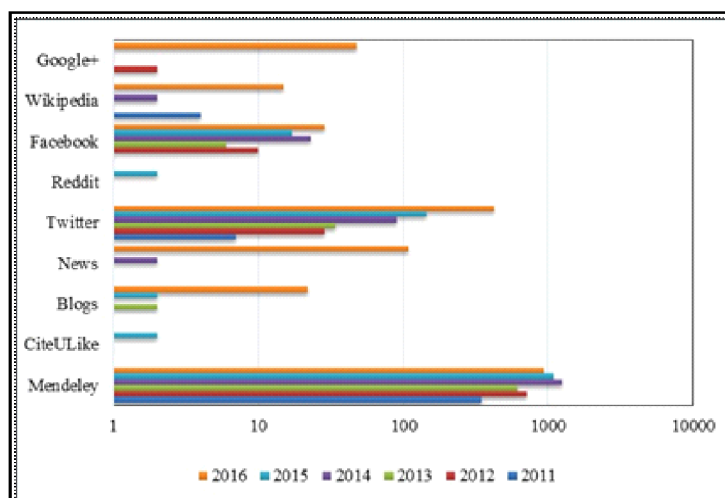| Year	Mendeley	CiteULike	Blogs	News	Twitter	Reddit	Facebook	Wikipedia	Google+	Total
2011	346	0	0	0	7	0	1	4	0	**358**
2012	721	0	0	0	29	0	10	1	2	**763**
2013	614	1	2	0	34	0	6	1	0	**658**
2014	1258	0	1	2	90	0	23	2	1	**1377**
2015	1089	2	2	1	144	2	17	1	1	**1259**
2016	934	0	22	109	426	1	29	15	48	**1584**
Total	**4962**	**3**	**27**	**112**	**730**	**3**	**86**	**24**	**52**	**5999**

Figure 4: Altmetrics Mentions by Sources on Year wise Publications

5.3 Presence of Altmetrics across Subject Fields (WoS - Broad Subject Categories)

All the 361 publications were grouped on the basis of their subject area under the five broad subject categories defined in WoS, such as: Life Sciences & Biomedicine, Physical Sciences, Technology, Arts & Humanities, and Social Sciences. It was done to examine the presence of altmetrics across different subject areas. But, it was found that there were no publications in the subject category of Arts & Humanities published from Anna University having any altmetrics mentions. While grouping, it was found that 234 publications were coming from one specific subject area, 73 and 10 publications were from two and three subject areas respectively. Thus, the altmetrics mentions of those 83 publications with altmetrics were calculated 2 & 3 times accordingly by considering their all subject areas. The Table-4 presents the distribution of altmetrics mentions across subject areas. As depicted in Table-4, Technology publications have received the highest number of altmetrics mentions (38.50%), followed by Life Sciences & Biomedicine (34.70%) and Physical Sciences (23.61%) respectively.

Table 4: Number of Publications with Altmetrics and Altmetrics Mentions across WoS - Broad Subject categories

WoS-Broad Subject categories	Nos. of Publications with Altmetrics	% of Publications	Altmetrics Mentions	% of Altmetrics Mentions	Nos. "NOA" Publications with Altmetrics	Altmetrics Mentions	Nos. of "OA" Publications with Altmetrics	Altmetrics Mentions
Life Sciences & Biomedicine	160	**35.71**	2580	**34.70**	138	2039	22	541
Physical Sciences	144	**32.14**	1756	**23.61**	130	1669	14	87
Technology	137	**30.58**	2863	**38.50**	115	2309	22	554
Social Sciences	7	**1.56**	237	**3.19**	7	237	0	0
Total	**448**	**100.00**	**7436**	**100**	**390**	**6254**	**58**	**1182**

The major source of altmetrics data across subject areas was Mendeley, followed by Twitter and News outlets respectively. The Table-5 presents the altmetrics data with their source in all subject areas.

Table-5: Altmetrics Mentions by Sources in WoS - Broad Subject categories

WoS-Broad Subject categories	Mendeley	CiteULike	Blogs	News	Twitter	Reddit	Facebook	Wikipedia	Google+
Life Sciences & Biomedicine	2317	1	2	2	217	2	33	3	3
Physical Sciences	1536	2	3	1	179	1	29	3	2
Technology	2177	0	24	109	448	0	36	20	49
Social Sciences	224	0	0	0	13	0	0	0	0
Total	**6254**	**3**	**29**	**112**	**857**	**3**	**98**	**26**	**54**

5.4 Overall Top and Year wise Top Publications with the highest Altmetric Score

The Table-6 presents the list of year wise top publications with the highest altmetric score retrieved from Altmetric.com. It can be seen that the publication of 2016 has relatively very high altmetric score and mentions as compare to other years' top publications.

Table-6: The Year wise Top Publications with the highest Altmetric Score

Altmetric Score (Altmetric.com)	Altmetrics Mentions	Title of the Publication	Source Journal	WoS Citations		Year
1232.5	623	Inter-group violence among early Holocene hunter-gatherers of West Turkana, Kenya	Nature		12	2016
21.888	63	Photocatalytic Water Splitting under Visible Light by Mixed-Valence Sn3O4	ACS Applied Materials & Interfaces		40	2014
19.64	73	Middle Palaeolithic occupation in the Thar Desert during the Upper Pleistocene: the signature of a modern human exit out of Africa?	Quaternary Science Reviews		14	2013
14.45	60	The effect of inorganic carbon on microbial interactions in a biofilm nitritation-anammox process	Water Research		18	2015
4	57	Evaluation and use of NS1 IgM antibody detection for acute dengue virus diagnosis: report from an outbreak investigation	Clinical Microbiology and Infection		7	2012
3	40	Relationship between process parameters and mechanical properties of friction stir processed AA6063-T6 aluminum alloy	Materials & Design		19	2011

The Table-7 presents a list of twelve overall top publications with the highest altmetric score retrieved from Altmetric.com. It can be easily found out that among these 12 publications, most publications were published recently in the year 2015 and 2016 and are (NOA) publications. Only 2 publications were published in open access (OA).

Table-7: The Top Twelve Publications with the highest Altmetric Score

Altmetric Score (Altmetric.com)	Altmetrics Mentions	Title of the Publication	Source Journal	WoS Citations	Year	Publication (OA / NOA)
1232.5	623	Inter-group violence among early Holocene hunter-gatherers of West Turkana, Kenya	Nature	12	2016	NOA
21.888	63	Photocatalytic Water Splitting under Visible Light by Mixed-Valence Sn3O4	ACS Applied Materials & Interfaces	40	2014	NOA
19.64	73	Middle Palaeolithic occupation in the Thar Desert during the Upper Pleistocene: the signature of a modern human exit out of Africa?	Quaternary Science Reviews	14	2013	NOA
14.45	60	The effect of inorganic carbon on microbial interactions in a biofilm nitritation-anammox process	Water Research	18	2015	NOA
10	6	Efficient reference-free adaptive artifact cancellers for impedance cardiography based remote health care monitoring systems	Springerplus	1	2016	NOA
10	16	A Method to Differentiate Mild Cognitive Impairment and Alzheimer in MR Images using Eigen Value Descriptors	Journal of Medical Systems	0	2016	NOA
8.58	18	Autophagy Protects Monocytes from Wolbachia Heat Shock Protein 60-Induced Apoptosis and Senescence	PLOS Neglected Tropical Diseases	1	2015	OA
7.9	21	Crystal structure of E-coli lipoprotein diacylglyceryl transferase	Nature Communications	6	2016	OA
7	5	Site-specific structural dynamics of alpha-Synuclein revealed by time-resolved fluorescence spectroscopy: a review	Methods and Applications in Fluorescence	0	2016	NOA
7	2	Polyphenolic and phytochemical content of Cucumis sativus seeds and study on mechanism of preservation of nutritional and quality outcomes in enriched	International Journal of Food Science and Technology	1	2016	NOA

The top six open access (OA) publications with the highest altmetrics score are presented in Table-8.

Table-8: The Top Six Open Access (OA) Publications with the highest Altmetric Score

Altmetric Score (Altmetric.com)	Altmetrics Mentions	Title of the Publication	Source Journal	WoS Citations	Year
8.58	18	Autophagy Protects Monocytes from Wolbachia Heat Shock Protein 60-Induced Apoptosis and Senescence	PLOS Neglected Tropical Diseases	1	2015
7.9	21	Crystal structure of E-coli lipoprotein diacylglyceryl transferase	Nature Communications	6	2016
3.6	42	Nitric oxide rescues thalidomide mediated teratogenicity	Scientific Reports	21	2012
3	37	Apoptosis Inducing Effect of Plumbagin on Colonic Cancer Cells Depends on Expression of COX-2	PLOS One	23	2011
3	14	High-Level Expression of Functionally Active Dengue-2 Non-Structural Antigen 1 Production in Escherichia coli	Biomed Research International	1	2013
2.25	52	The effect of indoor office environment on the work performance, health and well-being of office workers	Journal of Environmental Health Science and Engineering	2	2014

5.5 Twitter Demographics and Twitter Geographic (Country) for Publications with Altmetrics

In this part of the study, the author examined the demographics and geographic (country) data collected from the Twitter profiles of tweeters who tweeted about the publications or shared those in Twitter. Among all the Twitter mentions, the majority of tweets (74.79%) were tweeted by the members of the public, followed by scientists (16.86%). The
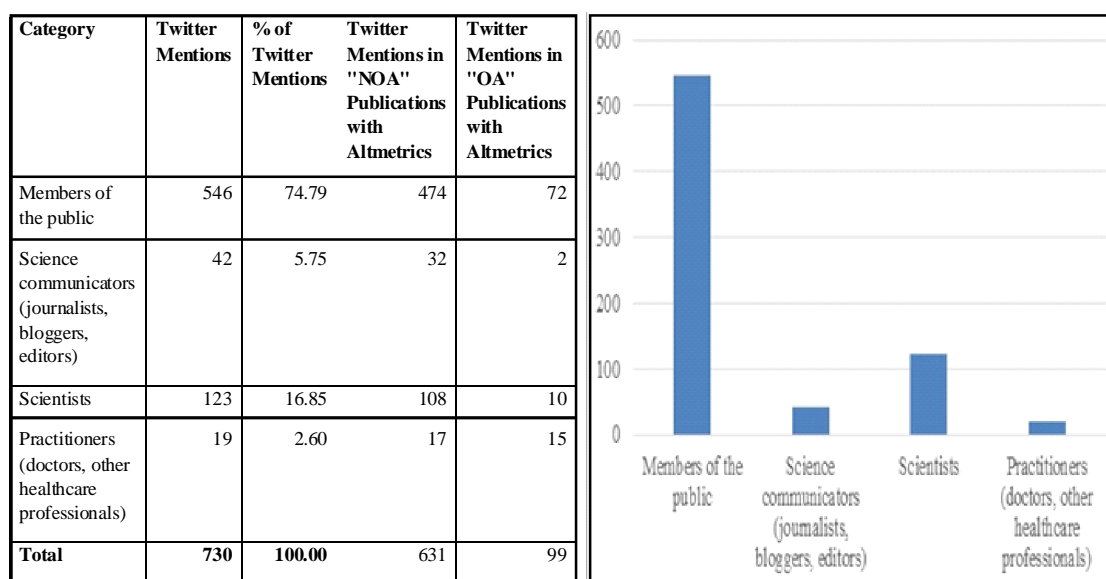
Table-9 and Chart-5 show the Twitter demographics for the publications with altmetrics.

Category	Twitter Mentions	% of Twitter Mentions	Twitter Mentions in "NOA" Publications with Altmetrics	Twitter Mentions in "OA" Publications with Altmetrics
Members of the public	546	74.79	474	72
Science communicators (journalists, bloggers, editors)	42	5.75	32	2
Scientists	123	16.85	108	10
Practitioners (doctors, other healthcare professionals)	19	2.60	17	15
Total	**730**	**100.00**	631	99

Table-9 and Chart-5: Twitter Demographics for the Publications with Altmetrics

The Table-10 depicts the results of Twitter Geographic (Country) for the 361 publications with altmetrics by analysing the data collected from the Twitter profiles of tweeters as same as Twitter demographics. However, sometimes due to the unavailability of sufficient information in Twitter profiles on Twitter, it is not possible to get details on demographics and geographic location of a tweeter. Those profiles demographics and geographic aspects are assigned as "Unknown" by Altmetric.com. Tweets came from such "Unknown" tweeters forms the major parts of all Twitter mentions, followed by United Kingdom and United States respectively. Further, Chart-6 displays the Twitter geographic (countries) with color representation in World Map with number of Mendeley readers.

Table 10: Twitter Geographic (Country) for the Publications with Altmetrics

Country	Twitter Mentions	Twitter Mentions in NOA Publications with Altmetrics	Twitter Mentions in OA Publications with Altmetrics	Country	Twitter Mentions	Twitter Mentions in NOA Publications with Altmetrics	Twitter Mentions in OA Publications with Altmetrics
Algeria	1	1	0	Korea	1	1	0
Argentina	2	2	0	Malaysia	2	2	0
Australia	12	8	4	Mexico	4	2	2
Austria	1	0	1	Netherlands	5	4	1
Bangladesh	1	0	1	Norway	1	1	0
Belgium	2	1	1	Oman	1	1	0
Brazil	1	1	0	Other	22	22	0
Canada	9	9	0	South Africa	1	1	0
Colombia	1	1	0	Spain	33	31	2
France	13	9	4	Sweden	6	6	0
Germany	13	12	1	Switzerland	3	0	3
Greece	3	3	0	Uganda	1	0	1
India	11	8	3	UAE	1	0	1
Ireland	2	1	1	UK	89	68	21
Italy	1	1	0	US	77	69	8
Japan	23	23	0	Unknown	381	337	44
Kenya	5	5	0	Venezuela, Bolivarian Republic of	1	1	0

Figure 6: Display of Twitter Geographic (Country) for the Publications with Altmetrics in World Map

6. Conclusions

The basic purpose of this study was to present the altmetrics landscape of scholarly research publications published from Anna University, Tamil Nadu. Although, it was a small study by analysing a sample of only 361 articles having altmetrics data collected from Altmetric.com, it provides an overview of altmetrics coverage of whole University publications. The presented study reveals that there is a positive trend in growth of publications and citations of Anna University. But, that is not same in the case of altmetrics data which is relatively low positive. The altmetrics coverage was very low with only 6.56% of all publications during 2011-2016. It was found that altmetrics mentions (readership) came from Mendeley forms the major part of all altmetrics mentions with 82.71%. And, the Technology publications which has the third highest share of publications have received the highest number of altmetrics mentions (38.50%), followed by the Life Sciences & Biomedicine publications which has highest share of publications have received the second highest number of altmetrics mentions (34.70%). Higher altmetrics mentions for most recent publications was observed in the study. It was found from the overall twelve top publications that most publications with the highest altmetrics mentions are published in not open access (NOA) journals. As far Twitter mentions study is concerned, the majority of tweets (74.79%) were tweeted by the members of the public for the publications, and

tweets tweeted by "Unknown" tweeters forms the major parts of all Twitter mentions.

7. Further Work

As a part of this study, there is further plan to study the correlations between Mendeley readership and citations received for these publications from Anna University, Tamil Nadu.

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