

Altmetrics as alternative tool for measuring the impact of scholarly documents based on readers attention: A Comparative Study

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1. Introduction: Citation Impact

There is no doubt that scholarly journal articles have received sufficient attention to measure their impact factor by counting the average number of citations to their contents. Thus, citations have been considered as an academic tool to assess and evaluate the scholarly papers. The conclusion of such measurement will be used to distinguish the highly cited journals, authors or article from those which are poorly cited and counted of no impact. Since 2009, and with the explosion of the increasingly disseminated electronic content, scholars have increased their reading of article papers up to "50 percent more than they did in the 1970s, spending less time on average with each one" (Renear and Palmer, 2009). Consequently, other alternative reading measurement along with the already existed traditional measure was required. That is to deliver a richer impression of how to quantify a product is being reached, shared, used and saved. (Tananbaum, 2013:3-4)

Mainly, Citation impact is a result of analyzing citations frequency that reflects the usage of publications or individuals in the scholarly works. Thus, it is a measurement of quantifying the already cited works and it is limited to the work itself (the author, article or publishing medium). In 1973, Garfield stated that "citation frequency reveals the impact of a particular publication or scientist." (Garfield, 1973) Hence, Garfield also emphasized that "there are papers which are not frequently cited but which nevertheless are significant because they help to bridge gaps of knowledge in rapidly developing fields " (Garfield, 1973) Accordingly, Carpenter declared that " while the value of the journal as a container is an important value metric and one that needs to continue, the rapidly evolving alternative metrics (Altmetrics) [movement](#) is concerned with more than replacing traditional journal assessment metrics."(Carpenter, 2012). To emphasize that, the Altmetrics sites ensure that "every day, thousands of scholarly papers are being discovered, discussed and shared, altmetric tracks

what people are saying about papers online on behalf of publishers, authors, libraries and institutions. "<http://www.Altmetric.com/>) Thus, it becomes more as quantitative measure that can be applied for measuring both the quality and quantity of consideration and attention that any scholarly article with a digital object identifier (DOI) or other standard identifier has received from readers. The site, moreover, extended the importance of the Altmetrics to the following: <http://www.Altmetric.com/>

Publishers: here, Altmetrics can be a showcase research impact for the publishers' authors and readers in terms of the discussion around the received articles. from all across the Web by gathering attention from newspaper, Twitter, Facebook, science blogs, mainstream news outlets and many more sources

Institution: to add value to the institution's libraries and institutional repositories by tracking the value of the institution's research output for its community

Researcher: to help matching his/her reading by directly visualizing paper's online attention. Discover new scholarly articles in hundreds of disciplines, while monitoring your personal research impact in academia and beyond.

On this respect, Piwowar and Priem (2016) state a clear definition to Altmetrics as being tools for measuring the scholarly impact of a wide variety of places in an online environment apart from traditional citation counts. Altmetrics, then increases the publishing opportunity to cover journal article webpages, university press officer dashboards, data repository grant applications, social networking such as blogs, MyCites, Mendely, ResearchGet and many others. Generally speaking, Sud & Thelwall (2013) thought of Altmetrics as "social web metrics for academic publications. "Das and Mishra (2014) added that "the impact of scientific publications and their social outreach to intended audiences." (p. 82) Moreover, Below are the interested writers' judgment for applying the Altmetrics as a measuring tool:

- Altmetrics aggregators are pulling data daily or weekly, so they can produce a quicker turn-around time to reflect the influence an article or piece of research is exerting on a particular field. (Brigham, 2014: 440)
- "As scholarly communication moves increasingly online, more indicators have become available, how many times an article has been bookmarked, blogged about, cited in Wikipedia and so on" Moreover, "indications of impacts (will affect) diverse audience including scholars, practitioners, clinicians, educators, and the general public (Piwowar, 201: 9)
- Altmetrics illustrates a clear understanding of how an article is not only cited, but, most important, how it is read, discussed and used on daily basis not yearly. (Piwowar, 201: 9) Pulling data on daily or weekly

basis can speedily reflect the impact of an article or piece of research on a particular field. (Tara, 2014:438)

- Altmetrics "can be used in an evaluative role, to give early estimates of the impact of publications or to give estimates of non-traditional types of impact. They can also be used ...to help draw a digital library user's attention to papers that have attracted social web mentions" (Sud & Thelwall, 2013:)
- Altmetrics are measures of research impact that supplement citations. They allow researchers (themselves) to better understand how their work is being discussed, shared, saved, read, and reused by other scholars and the public. (Altmetrics for Researchers. n.d.)

Despite the above advantages, altmetrics, as with other measures, are facing several drawbacks that limit its use, including:

- "Article-level metrics reflect a naïve view of the scholarly publishing world, the true impact of science is measured by its influence on subsequent scholarship, not on how many times it gets mentioned on *Entertainment Tonight* or how many Facebook likes it gets in the Maldives." (Beall, 2013)
- "Altmetrics do not apply as readily to traditional works such as books or art. When searching for works in these mediums, the option of using Altmetrics to supplement search techniques may not apply".(Konkiel, 2013)
- "One of the difficulties of gathering accurate Altmetrics is author or creator Disambiguation. While a new initiative, called the ORCID is working to accurately attribute articles and products to authors by assigning each author a unique identifier, it is still not widespread.13 ORCID is free for anyone to register and is supported by many publishers and research universities, but is self-driven which means that the authors typically have to sign up themselves." (Tara, 2014)
- Another limitation of using altmetric figures is the inability to use them comparatively between different disciplines. Some disciplines are more active than others online, and involvement can also vary depending on the social media tool. Whereas one discipline has adopted Twitter as a platform for discussing new and relevant information, another might have a stronger following on Mendeley." (Tara, 2014)

2. Altmetrics Indicators as a Quantity and Quality Measure

Priem confirms that altmetrics, from researcher's side, are online tools which make it possible for us to study the broad and rapid impact of scholarly literature beyond the peer reviews citation counts and JIF, which measures journals' average citations per article. (Priem, 2010). For more details, interested writers in the field listed different categories of altmetrics measures, each is accompanied with an explanation of how it has been generally used, these are (Konkiel, 2013, Tara, 2014 & UNC, Health Sciences Library, 2015):

- 1- Shares: for sharing news of research article or output through Twitter, Facebook, blog posts, Google+, YouTube, Figshare and Mendeley
- 2- Saves: to follow the saved article on social bookmarking sites or social media such as Mendeley, CiteLike, Dilicious, Twitter and Slideshare
- 3- Reviews: for discussing articles with additional commentary added through blog posts, Facebook comments, article comments and Faculty of 1000.
- 4- Adaptations: to create a derivative works using an article or other outputs through, for example Github
- 5- Social usage statistics: when downloading or reviewing an article on web services and social media sites through Figshare, Slideshare, Facebook and YouTube

For altmetrics to access as a measure, several open access sources have been used to track readers attentions and citations and to report to altmetrics to display the impacts in percentage. among these sources are (<http://altmetrics.org/tools/>):

- 1- Impact story: Within this application scholars use Google Scholar, PubMed IDs, DOIs, ORCID and others to create a folder for uploading their products, then Impact story will track and report any citation or intentions from many sources (Mendeley, Twitter, Researchgate, etc.) to display the impacts.
- 2- ReaderMeter:" is a web-based service that compiles readership information about scientific content to create an estimate of the content's community impact." It was introduced by Dario Taraborelli to analyze the impact of publications based on statistics collected from readers using Mendeley records. Moreover, Readermeter adopts two major impact metrics (H-index and G-index) to evaluate author's readership impact which might not been visible through traditional bibliometrics measurement. (Digital Curation Centre, 2016)
- 3- ScienceCard is a web service that collects citations and downloads for a particular researcher. "It was started at the hackathon of the 2011 Science Online London Conference, and was a finalist in the PLOS/Mendeley API Binary Battle" (ScienceCard, 2016)
- 4- PLoS Impact Explorer: It is a web based tool that allows authors to examine their scholarly impact that are related to papers published by the Public Library of Science (PLoS). Conversations are collected from Information presented on tweets, Facebook pages, google posts, and blogs, etc. (Yang and Li, 2016)
- 5- PaperCritic: It is a gateway that offers researchers to monitor all types of reviews, critiques and appraisals to their scientific literature and allows them to easily review others scientific works in an open access environment. The application is powered by the Mendeley API

3. Altmetric for Scopus

Scopus is entitled as being the largest database for both abstracts and citations of peer-reviewed journal paper as well as being the quality web sources. However, the University of Cincinnati, in its guide to "Research impact, citation analysis and altmetrics " indicated that Scopus is not a complete citation search for several reasons, including (Cincinnati University, 2015):

- Citation searching in Scopus only covers the titles include in this database.
- Since Scopus was only released in 2004, it does not have the long established record of Web of Science.
- Citation tracking in Scopus is only available for articles published from 1996 to the present.
- In the past, coverage was considered weak and uneven in some areas such as physics, astronomy, math, sociology, philosophy, theology, arts and literature.

On the other hand, Cincinnati University Libraries maintained a cluster of other filters to online track peer-reviewed articles daily, and to make sense of them through thousands of readers opinions while assessing their impacts on daily bases. Accordingly, the libraries applied a number of applications that takes the faculty beyond citation-based assessment and help them assessing their research impact. These applications include ImpactStory, Mendeley altmetrics group, PaperCritic, LinkedIn altmetrics group, and PloS Impact Explorer.

To look beyond scholarly use of research paper, Elsevier also took a step towards a "media impact metric" for measuring the societal impact. That is to help researcher to be informed about "the media interest in their work" (Bonasio, 2015). This approach led Mendeley to join Elsevier's existing platforms for ongoing impact assessment integration, The first to measure the media conversations (attentions) impact and the second to measure the citations impact. On this bases, Elsevier highlighted that " Altmetrics for Scopus offers a quick and easy way to see all of the social or mainstream media mentions gathered for a particular paper as well as reader counts on popular reference managers" (Elsevier, 2012).

4. Purposes of the Study

The purpose of this paper is twofold:

- i. Tries to find out the readers intentions in library and information science about the highly cited scholarly papers in social media
- ii. 2- Intends to investigate the correlation between the Altmetrics indicators from social media (Researchgate, Twitter, Mendeley, CiteLike, blog posts, Facebook comments) and the bibliometric indicators from the Scopus database about the scholarly papers.

5. Research Questions

To achieve the purposes of the study, the following research questions were tested:

- i. What are the intentions of library and information science readers have about the scholarly cited papers in social media?
- ii. Is there a connection (correlation) between the most cited articles and the attention surrounding these articles

6. Limitation of the study

Publication years: (2012-2013): The sample was started with 2012 according to altmetrics limitation "if the article was published before July 2011, we'll have missed any transient mentions of it, tweets in particular. As such, its score won't be accurate, and will represent a lower bound of the attention received."

Population and Sampling:

For illustrating the use of altmetrics as a tool for measuring the intentions of others in the area of library and information science toward the use of the scholarly cited articles, the following attributes were selected to search and retrieve scholarly articulated listed in Scopus database in November 17, 2015. (Figure -1-):

1. **Database:** Scopus
2. **Topic:** library and information science
3. **Subject Area:** social sciences and humanities
4. **Period:** 3 years (2012-2014)

The screenshot shows the Scopus search interface with the following settings:

- Search Term:** library and information science
- Search Scope:** Article Title, Abstract, Keywords
- Limit to:**
 - Date Range (inclusive):** Published from 2012 to 2014
 - Document Type:** Article
 - Added to Scopus in the last:** 7 days
 - Subject Areas:**
 - Life Sciences (> 4,300 titles . .)
 - Health Sciences (> 6,800 titles . 100% Medline coverage)
 - Physical Sciences (> 7,200 titles . .)
 - Social Sciences & Humanities (> 5,300 titles . .)

Figure 1: Searching Attributes for Population of the Study

The search resulted a group of 883 articles out of around 5300 articles in the subject area of social sciences and humanities. The result, then was distributed according to the 3 defined years.

However, as the current research intended to find out the most cited articles among the resulted group to correlate the frequency of citations against the frequency of attentions the articles have received from readers, thus the retrieved articles were rearranged based on citations, from highly cited to less cited and a sample of 10% was selected. This (89 articles) constituted the sample of the study. Table 1 shows the distribution of the population and the sample of articles in library and information science for three years 2012-2014.

Year	Number of Articles	Sampling	% of Sample
2014	342	5	1.5%
2013	269	36	13%
2012	272	48	18%
Total	883	89	10%

Table 1: Population and Sample of Articles from Scopus

According to year 2014 (table 2) the percentage of highly cited papers are five constituting 1.5% of the sample but with low citations and attentions as comparing to years 2012 and 2013 though avoided from analysis to stay with only 84 articles as being the studied sample. The low citations and attentions account is related to the availability of the 2014 scholarly papers to be cited and to couch readers intentions as well.

Citation	Twitter	Mendeley	CiteULike	Google+	FaceBook	Blogs
7		16	1			
6		11				
6		14				
4		3				
4	3	6				

Table 2: Year 2014 articles' citations and attention frequencies

7. Data Analysis and Discussion

To respond to the research question 1 " What are the intentions of library and information science readers have about the scholarly cited papers in social media?" Frequency distributions and average of use were calculated to display the sources that readers use more for catching their intentions.

# Artic les	# Citati ons	Sources for readers attentions						Total Attenti ons
		T	M	CU	G	F	B	

2012	48	272	320	1328	49	1	3	10	1711
2013	36	269	145	980	16	3	5	7	1156
Total	81	541	475	2308	65	4	8	17	2867
General Average of citations to articles= 7									
General Average of attentions to articles= 35									

T= Tweeter, M= Mendeley, CU= CiteULike, G= Google+, F= FaceBook, b=Blogs

Table 3: Distributions of citations and readers attentions frequencies

Data in Table 3 shows that:

- i. The total readers attentions for the year 2012 is 1711 (60%) and 1156 (40%) for the year 2013 which emphasize the impression that the more the availability ways to access the scholar paper, the more opportunities to attract the readers' attentions.
- ii. The Percentage of citations to article during the years 2012 and 2013 are relatively equal (50%) which show type consistency comparing to attentions percentage.
- iii. The average of attentions (35) is higher than the average citations (7) to a single article and this is relevant to the several access to online sources that catch the reader's attention.
- iv. Among the attentions sources, Mendeley approves to be the most accessible desktop and online web application as will. The percentage of 78% and 85% consequently for the years 2012 and 2013 consequently reflects the increased attentions to use Mendeley as a social media for managing and sharing scholar papers.

To respond to the second question, " Is there a connection (correlation) between the most cited articles and the attention surrounding these articles", Pearson's correlation was calculated between the citation (Scopus) and readers attentions (altmetrics indicators) about scholarly papers generally and for each year independently. The results show the following:

- 1- Generally, there is a significant linear correlation between citations and attentions, hence the value of correlation is moderate (positive) as illustrated in Figure 2 and Table 4.

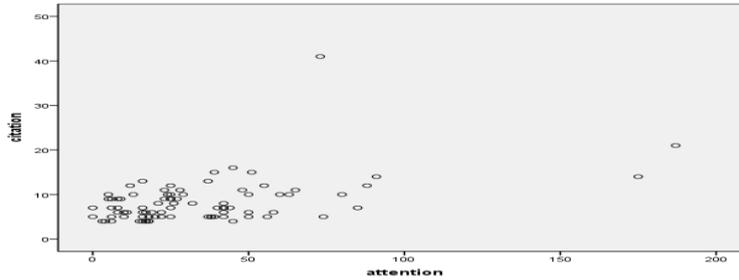


Figure 2: Correlation between citations and attentions

		citation	attention
citation	Pearson Correlation	1	.456**
	Sig. (2-tailed)		.000
	N	84	84
attention	Pearson Correlation	.456**	1
	Sig. (2-tailed)	.000	
	N	84	84

Table 4: Pearson's correlations test results in general

Another Pearson's correlations were calculated between the citation (Scopus) and readers attentions (altmetrics indicators) about scholarly papers for the years 2012 and 2013. The results show that there is a significant correlation between the two with difference in the value of the correlation which is high (0.622) in the year 2012 and low in the year (0.384), Tables 5 and 6, Figures 3 and 4.

		citation	attentions
citation	Pearson Correlation	1	.622**
	Sig. (2-tailed)		.000
	N	48	47
attentions	Pearson Correlation	.622**	1
	Sig. (2-tailed)	.000	
	N	47	47

Table 5: 2012 Pearson's correlations

		Citation	Alternatives
citation	Pearson Correlation	1	.384*

	Sig. (2-tailed)		.023
	N	36	35
Alternatives	Pearson Correlation	.384*	1
	Sig. (2-tailed)	.023	
	N	35	35

Table 6: 2013 Pearson's correlations

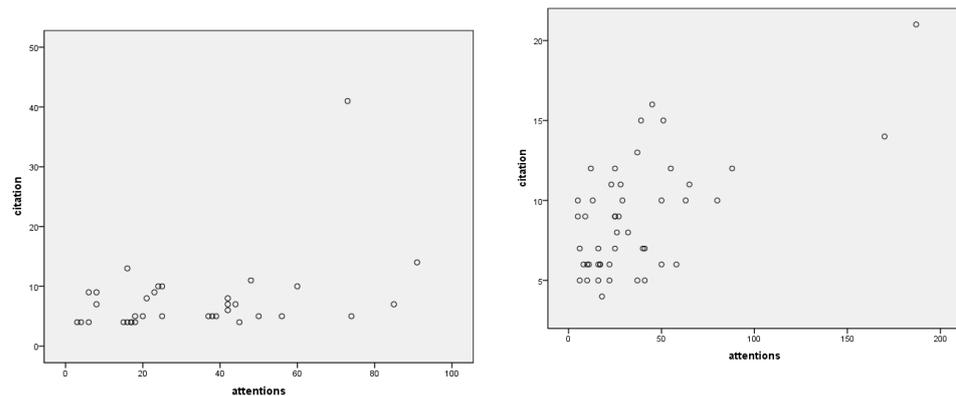


Figure3: 2012 correlation Figure4 2013 correlation

8. Conclusion

The study concludes that new approaches to measure the scholarly impact associated with the growth of Open Access and digital publishing are actually required to track readers attentions about scholarly papers. To approve that, results from analyzing a sample of highly cited papers in library and information science in Scopus were checked against the altmetrics indicators. The resulted data demonstrates that a high value correlation appears in 2012, but it is decreased in 2013 as a result of the increased number of attentions against the number of citation. Such indicators, as with Mendeley, provide clear and early realistic pictures of the utilization of the papers. Moreover, altmetrics, from the high average of attentions comparing to citations average, can be utilized as a supplement tool to traditional bibliometrics for tracking online impacts. Still more researches are required in different subject areas to clarify the actual meaning and benefits of altmetrics impact measurement

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