EVALUATING THE ASSOCIATION BETWEEN CITATION COUNTS AND MENDELEY READERSHIP: A CASE STUDY OF HIGHLY CITED PAPERS IN E-LEARNING

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Altmetric is an indicator which provides the attention for the publications on social media platforms. Mendeley is a free reference manager and an academic social network, through which altmetrics provides the readership counts on a various basis like demographic, geographic etc. The present study is carried out to evaluate the association between the citation counts and Mendeley readership by doing the case study of highly cited publications in E-Learning. In the digital era, the mode of learning is also shifted towards the digital platform, so the area E -learning is selected for the present study. The data were collected using Web of Science Core Collection (included SCI-Expanded, A&HCI, and SSCI) by selecting the top 25 highly cited publications in the area of E-Learning during 2012 - 2017. The study found that Mendeley Readership was higher as compared to citations received for the publications in both the year and the main reason for this is that it has a large coverage for measuring readership. One of the most important things of the Mendeley is that it does not provide statistics for zero readerships unlike the citations because if the publication does not have a single citation, the citation database shows that statistics also. The study also recommends that Mendeley readership counts can be used as complementary indicators for research evaluation.

Keywords: Altmetrics, Mendeley, Readership, Citation, E-Learning, Mendeley, Citation Analysis

INTRODUCTION

Scholarly research is an important phenomenon for the progress in any of the area and (Eldakar, 2019) scientific impact plays a prime role when it comes to assessing the country's performance in terms of research or research assessment (Thelwall & Maflahi, 2015). Research assessment assumes a key job in choosing the financing of specialists, ventures, projects, divisions and foundations (Shrivastava & Mahajan, 2016). Research evaluators regularly need to quantify the effect of scholastic distributions (Thelwall & Wilson, 2016). Scholastic research is assessed

for arrangement, advancement, and residency, for college class tables, for national research assessment practices and self-reflection purposes (Thelwall, 2017). The consequences of research assessment have been progressively utilized as contributions to investigate research administration(van Steen & Eijffinger, 1998). Funders and chiefs need to evaluate the effect of research to lead a money-saving strategy from time to time to guarantee that their cash is being spent adequately (Thelwall & Wilson, 2016). A typical way of evaluating research is citation analysis, which helps in understanding the basic idea and the verifiable setting of research(Shrivastava & Mahajan, 2016). Citation counts for peer-reviewed journal articles is a well-known source for quantitative data(Garfield, 2006; Waltman et al., 2011) but it does not yield the qualitative assessment (Kostoff, 1998). Moreover, citation counts are not reasonable for assessing new research since articles may take three years to pull in a considerable number of citations because of delay in publication (Brody et al., 2006; Wang, 2013). Citations simply measure the inûuence of the cited work, however, alternate parts of the cited work like its utilization by experts and others can't be estimated through citation analysis (Duy & Vaughan, 2006). Cronyism, whereby companions or associates cite one another to commonly raise their citation counts, is another downside of utilizing citation analysis for research assessment, as in such cases, the explanation behind citation is simply dishonest (Meho, 2007). Additionally, there is a stress that present generation of authors could trust that "citation analysis is an exercise in futility since creators don't sufficiently cite to the individuals who have influenced their work"(Garfield, 2011).

The shortcomings and the constraints of the citation-based measurements have demanded the utilization of altmetric indicators for research assessment (Shrivastava & Mahajan, 2016). Altmetrics are pointers derived from the social web that may mirror a part of the effect of scholarly papers (Priem et al., 2012). Nevertheless, the definition of what establishes an altmetric indicator is continually evolving (Haustein et al., 2014). Priem and Dzuba define altmetrics as the "study and use of scholarly impact measures based on activity in online tools and environments". Altmetrics is a metric which is evolving to assess the impact of research through the social networks, such as Mendeley and the other tools present on the social networking sites, and to help the scholars to measure the overall impact of research using traditional metrics indicators.

MENDELEY

The introduction of social media has made possible to assess the impact of research on even the non-distributing gathering of users (Haustein et al., 2014). Some of the prominent academic social networking sites used by the academicians are Mendeley, Zotero, Academica.edu, and Research gate (Beel et al., 2016; Reher and Stefaine, 2010). Mendeley is a reference management system that allows users to register scholarly publications of their interest and it generates a list of references for them (Gunn, 2013; Henning & Reichelt, 2008; Holt et al.,

2011). It was established in 2007 in London and has been derived from the names of acclaimed scholars Gregor Mendel and Scientific expert Dmitri Mendeleev. Likewise, it prescribes applicable article to its users and also assists in information seeking (MacMillan, 2012). A noteworthy superiority of Mendeley over numerous other reference supervisors is that it is free of expense and accessible on the internet only with an email id and without any membership fees (Rodgers & Sarah, 2013). In 2013, it got procured by Elsevier (Li et al., 2012) and has developed to be the most well-known item among the online reference managers (Haustein et al., 2014). Mendeley, not only provides the readership data about the article but also about the researcher who downloaded or read the article, their age, affiliation and experience in the field of research. Hence, by making use of Mendeley, the readership data about articles can be compared with citation-based metrics to evaluate the impact of research (Shrivastava & Mahajan, 2016). Similarly, the present study aimed at assessing the relationship between Mendeley readership and citation counts of the top 25 highly cited papers in the field of e-learning.

REVIEW OF LITERATURE

Several investigations have been attempted in the past focussing upon the utilization of different social media metrics (Shrivastava & Mahajan, 2016). Utilization of correlation analyses with conventional bibliometric indices has been a steady presumption for testing the validity and utility of new measurements (Eysenbach, 2011). A great deal of variety exists in the outcomes, contingent on the populace under investigation. Correlation analyses have likewise inspected the connection between different web-based social media metrics. Researchers would now be able to convey using web 2.0 tools, including social bookmarking destinations, twitter, websites, and wikis. These apparatuses are potential wellsprings of information for estimating the effect of scholarly publications at the article and journal levels, albeit numerous properties of these tools are not uncovered by their proprietors (Neylon & Wu, 2009). Researchers use reference managers and social bookmarking tools in their day to day activities. Interaction among users in social bookmarking sites can give important information that could be valuable for research assessment (Price & Gursey, 1976). The investigation found that Academia.edu is generally utilized by humanists and social researchers while Research Gate is well known among biologists. Differences dependent on disciplines are evident in each academic social networking sites. The investigation additionally saw that clients from humanities and sociologies, and natural science are more dynamic in utilizing the locales contrasted with biologists.

An analysis based on tweets and Mendeley readership data of 1.4 million PubMed papers in the field of biomedicine revealed that the Mendeley readership of PubMed papers was significantly higher than their inclusion on Twitter. The relationship between Mendeley readership data and citation counts in the discipline of humanities and social science highlighted that correlation between Mendeley readership data and citation count was maximum in social science as

compared to humanities (Thelwall & Wilson, 2016). Li et al. (2012) compared Mendeley and CiteULike user counts with google scholar and the web of science citation counts for 1613 Nature and science articles. They found that Mendeley was more suitable than CiteULike for research evaluation in the contemplated test. The Mendeley readership insights reûect the effect of research on the specialists as well as on the experts and non-publishing users, who are assessed to establish 33% of the scientific network and the scholarly world (Ruan et al., 2018; Zahedi et al., 2017).

OBJECTIVES OF THE STUDY

The main aim of the study is to evaluate the association between citations from the Web of Science Core Collection database and the Mendeley Readership from Altmetric.com, whereas, to achieve the purpose, specific objectives were framed accordingly:

1. To find whether Mendeley readership is in positive correlation with citations.
2. To find whether Mendeley readership is greater for articles than those published earlier and;
3. To find out whether Mendeley readership can be used for research evaluation work similar to other bibliometric indicators.

THE SCOPE OF THE STUDY

The scope of the study is confined only between 2012 and 2017 to allow enough time to gather the Mendeley Readership and citations. The study is also limited to only E-Learning area (e-learning field is selected because, in the present digital environment, there is more emphasis on the e-learning mechanism along with classroom teaching).

LIMITATIONS OF THE STUDY

The limitations of the study is that the study does not establish cause and effect relationship due to use of correlation analysis, besides this, the study is limited to E-Learning area during 2012 - 2017 period only. Although, it is the study based on the Mendeley Readership collected by the use of Altmetric aggregator and the data collected by using this is dynamic.

METHODOLOGY

The data were collected using Web of Science Core Collection (included SCI-Expanded, A&HCI, and SSCI) on 05th Oct 2018. The top 25 highly cited publications in the area of E-Learning between 2012 and 2017 were selected for the research study. The 2012 and 2017 periods were considered intentionally to allow enough time to gather the citations and readership in the mentioned area of the study. The Mendeley readership for each publication extracted from WoS core collection was collected manually using Altmetric.com aggregator. To the established relationship between Mendeley readership and citations received for the publications, Pearson's correlations were calculated using the NCSS statistical software.

DATA ANALYSIS AND INTERPRETATION

The analysis of received citations for the publications and the Mendeley readership reveals that the top 25 highly cited publications in

E-Learning in 2012 received a total of 1051 citations according to Web of Science database, whereas, Mendeley readership statistics showed the sum of 1504 readership for the same publications (Table 1). The average citations per publication were also computed for the same top 25 publications in E-learning in 2012, which was 42.04, whereas, average Mendeley readership per publications were found to be 60.16. The Pearson correlation between the Citation received and the Mendeley Readership was found to be 0.235 at 95% confidence level (Figure 1).

Table 1: Citations and Mendeley Readership received by Top E- Learning Publications

Sl. No.	Citations received in 2012	Mendeley Readership received in 2012	Citations received in 2017	Mendeley Readership received in 2017
1.	137	0	13	0
2.	73	188	10	150
3.	60	267	10	0
4.	60	256	9	0
5.	58	0	9	201
6.	55	0	8	0
7.	55	183	8	161
8.	55	0	7	25
9.	47	0	6	36
10.	39	0	6	0
11.	38	0	6	0
12.	36	0	5	0
13.	34	105	4	73
14.	33	206	4	33
15.	29	67	4	0
16.	28	0	4	0
17.	27	0	4	0
18.	25	45	3	4
19.	25	0	3	0
20.	25	0	3	17
21.	24	55	3	0
22.	24	0	3	0
23.	22	132	3	0
24.	21	0	2	12
25.	21	0	2	0
Total	**1051**	**1504**	**139**	**712**

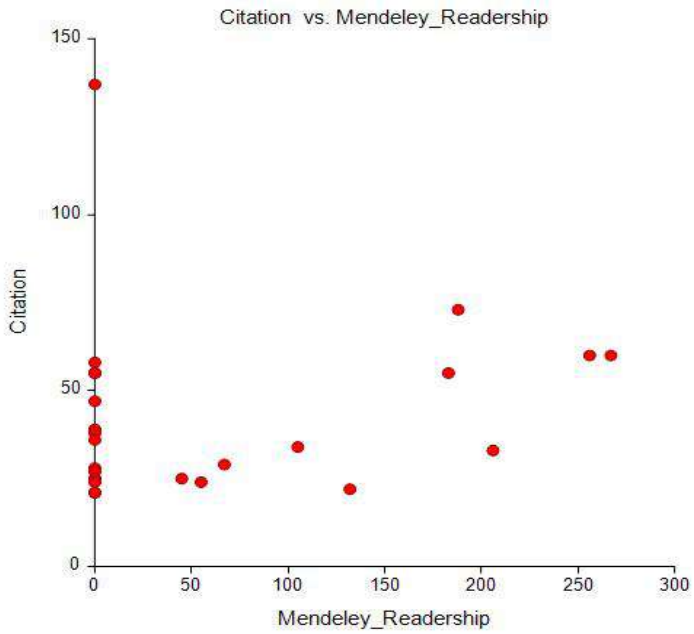

Figure 1: Citation and Mendeley Readership of Publications in E-Learning

The analysis of the top 25 highly cited publications in the E-Learning in 2017 shows that these publications had received a total of 139 citations, whereas, 712 Mendeley Readership (Table 1). Along with this, the average citation per publication was also computed, which was 5.35 and average Mendeley readership per publications was found to be 26.38. The Pearson correlation between citation received and the Mendeley Readership was found to be 0.1842 at 95% confidence level (Figure 2).

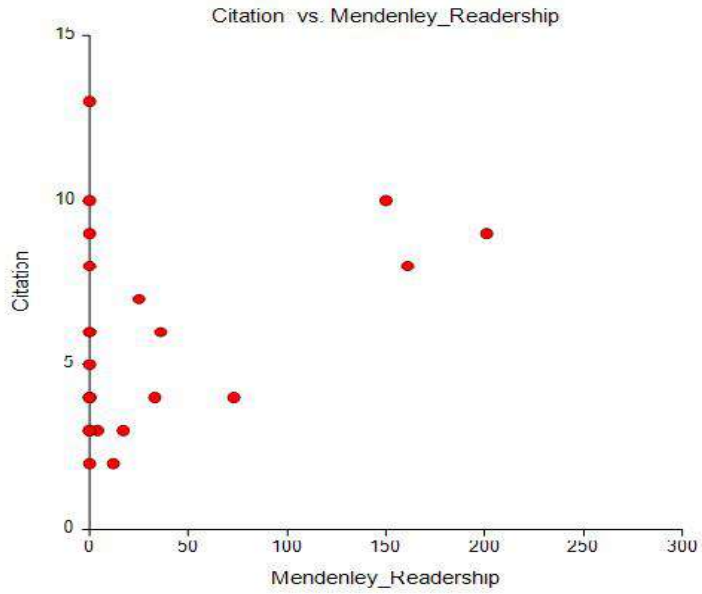

Figure 2: Citation and Mendeley Readership of Publications in E-Learning

The analysis of the data of top 25 publications of e-Learning reveals that whether we are computing the publication for 2012 or 2017, the Mendeley readership is found to be higher as compared to the citations received for that particular period. When we use to compare the citations received during 2012 - 2017, it was found that the articles published in 2012 have high citations as compared to those published in 2017, whereas, Mendeley readership is higher in both the years as compared to the citations received. The Pearson correlation found for 2012 publications was 0.235 which is slightly positive, and through this, it could be depicted that there is a relationship between citations received and Mendeley Readership. The reason for the high readership could also be that Mendeley has a large coverage of readership and measures readership in different variables such as Geographic readership, Professional Readership, and Discipline wise readership. Many of the students have their account on the Mendeley and they used to follow their professors on the account and they may be used to save the articles in their library without reading them. The Pearson correlation found for 2017 publications was 0.1842, which is slightly positive and it also shows the relationship between citations received and Mendeley Readership. The top 25 highly cited publications in both the years 2012 and 2017 reveal the high Mendeley Readership as compared to the citations received for the same publications in the respective years.

CONCLUSION

Mendeley is a reference management software which provides the Mendeley readership data across various disciplines, professional bodies, and geographic distribution. The study is carried out to identify the relationship between citations received and Mendeley Readership for the top 25 publications of E-Learning in 2012 and 2017 (These years were considered intentionally to provide them sufficient time to have citations for the publications). The Pearson's correlation was carried out using the NCSS statistical software and found 0.235 for 2012 and 0.1842 for 2017 publications (collected by using Web of Science Core Collection), which were slightly positive and establish the relationship between the Mendeley Readership and Citations. In the Analysis part, it was found that Mendeley Readership was higher as compared to citations received for the publications in both the year and the main reason for this is that it has a large coverage for measuring readership. One of the most important things of the Mendeley that it does not provides statistics for zero readerships unlike the citations because if the publication does not have a single citation, the citational database shows that statistics also. Mendeley readership scores are an effective tool to filter highly cited publications and there is also a moderate association between Mendeley Readership and Citations of a web of science. Mendeley readership is also an alternative index to measure the publication impact along with citation number, it also reflects the potential future(Ruan et al., 2018). Therefore, the study recommends that Mendeley Readership counts can be used as complementary indicators for research evaluation.

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