Normalization of Mendeley reader counts for impact assessment

Robin Haunschild [a],[*], Lutz Bornmann [b]

[a] Max Planck Institute for Solid State Research, Heisenbergstr. 1, 70569 Stuttgart, Germany
[b] Division for Science and Innovation Studies, Administrative Headquarters of the Max Planck Society, Hofgartenstr. 8, 80539 Munich, Germany

ARTICLE INFO

ABSTRACT

A different number of citations can be expected for publications appearing in different subject categories and publication years. For this reason, the citation-based normalized indicator Mean Normalized Citation Score (MNCS) is used in bibliometrics. Mendeley is one of the most important sources of altmetrics data. Mendeley reader counts reflect the impact of publications in terms of readership. Since a significant influence of publication year and discipline has also been observed in the case of Mendeley reader counts, reader impact should not be estimated without normalization. In this study, all articles and reviews of the Web of Science core collection with a publication year of 2012 (and a DOI) are used to normalize their Mendeley reader counts. A new indicator that determines the normalized reader impact is obtained –the Mean Normalized Reader Score (MNRS) – and compared with the MNCS. The MNRS enables us to compare the impact a paper has had on Mendeley across subject categories and publication years. Comparisons on the journal and university level show that the MNRS and MNCS correlate larger for 9601 journals than for 76 German universities.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

Estimating the citation impact of scientists, research groups, and institutes in different disciplines and time periods faces the problem that discipline and time period influence the citation impact of publications independently of the quality of the publications. Normalization for both factors started in the mid-1980s (Schubert & Braun, 1986). Only since normalized values were obtained did it become possible to assess the citation impact of entities such as researchers or universities across disciplines and time periods. In the calculation of a normalized impact value for a publication, the total number of citations of the publication is counted (times cited). The number of times cited is compared with the citation impact of publications with the same publication year, subject category, and document type (expected impact of the reference set). This technique is referred to as cited-side normalization. Although other methods have been developed in recent years (e.g., normalization on the side of the citing publications, Zitt & Small, 2008), this method is the most established and used in bibliometrics.

In recent years, impact evaluation in scientometric research has been done not only on the basis of citations but also based on alternative metrics (altmetrics) (Borrego, 2014; Mohammadi & Thelwall, 2014; Torres-Salinas, Cabezas-Clavijo, & Jimenez-Contreras, 2013; Priem, 2013, 2014). Altmetrics open the possibility to assess the impact of research faster than with

citations. Moreover, altmetrics seem suitable to determine the impact of research in a broader manner than with citations (Aguinis, Shapiro, Antonacopoulou, & Cummings, 2014; Bar-Ilan et al., 2012; Bornmann, 2014; Dinsmore, Allen, & Dolby, 2014; Hammarfelt, 2014; Priem, Taraborelli, Groth, & Neylon, 2010). While citations quantify only the impact of research on science, altmetrics could be able to quantify the impact of research on all aspects of society, including science. Current scientometric research studies if this hope is more than a working hypothesis.

2. Literature overview and research questions

Data from Mendeley are among the most important sources for altmetrics: "Mendeley is both a citation management tool and social network for scholars with over two million users" (Rodgers & Barbrow, 2013, p. 12). One basic assumption behind the use of such data in an evaluative context is that Mendeley readers who add a publication to their library can be counted as readers of the publication. Indeed, the results of Mohammadi, Thelwall, and Kousha (in press) show that "82% of the Mendeley users had read or intended to read at least half of the bookmarked publications in their personal libraries." Therefore, Mendeley counts are seen as a very promising possibility to quantify the size of the readership of a paper inside as well as outside of science. Furthermore, a Mendeley reader can be seen as a precursor to a citer, as Mendeley users include a publication into their library when they intend to cite it in a forthcoming manuscript. However, each Mendeley user is counted as *one* reader, while it is possible that they will cite the publication multiple times or not at all.

Several studies have shown that the Mendeley reader impact – similar to the citation impact, although there are differences between the two – varies across scientific disciplines (Jeng, He, & Jiang, 2015; Thelwall & Maflahi, 2015; Zahedi, Costas, & Wouters, 2014; Zahedi & van Eck, 2014). In one discipline, papers are read more often on average (or papers are more frequently included in the user' Mendeley library) than in other disciplines. These variations are not only specific to Mendeley data but also to other altmetric sources, e.g., Twitter counts (Haustein, Costas, & Lariviere, 2015). Moreover, publications with different document types and publication years receive different average numbers of Mendeley readers (Haustein & Lariviere, 2014). Therefore, in almost the same manner as for citation counts, Mendeley reader counts should be normalized with respect to publication year, document type, and scientific discipline before an interpretation is attempted.

The aim of this study is to apply the most established method of normalization (cited-side) in bibliometrics to the field of altmetrics and propose a normalization scheme for Mendeley reader counts. Independently from and coincidental with our efforts (Haunschild & Bornmann, 2015) a similar approach has been suggested by Fairclough and Thelwall (2015), which focuses on country comparisons only. The possibility of defining an indicator similar to the MNCS but based on reader counts instead of citations constitutes our first research question. The second research question addresses to which extent the MNCS correlates with the indicator based on reader counts on the journal and university levels.

3. Data set

It is common practice in scientometrics to evaluate the impact of articles and reviews. Other document types are usually not included in evaluative bibliometrics (Moed, 2005). We retrieved the Mendeley reader statistics for articles and reviews published in 2012 and having a DOI (n_A = 1133,224 articles and n_R = 64,960 reviews) via the Mendeley API made available in 2014. The DOIs of the papers from 2012 were exported from the in-house database of the Max Planck Society (MPG) based on the WoS and administered by the Max Planck Digital Library (MPDL). We used R (http://www.r-project.org/) to interface to the Mendeley API. DOIs were used to identify papers in the Mendeley API; 1074,407 articles (94.8%) and 62,771 reviews (96.6%) were found at Mendeley.

In total, the articles were registered in Mendeley 9352,424 times and the reviews were registered 1335,764 times. For 118,167 articles (10.4%) and 4348 reviews (6.7%), we found the paper at Mendeley but without a reader. Papers without any readers indexed by Mendeley may originate from former readers who removed the paper from their library or closed their Mendeley account. If Mendeley users include too little bibliographic data for a paper in their library, they are not counted as readers either, because there is insufficient information to link them to a Mendeley database entry. Also, Mendeley adds papers to the database without any reader in the first place from publisher feeds. Therefore, papers with zero reader counts should be excluded in this study, or, if they are included, the papers not found at Mendeley should also be counted as papers with zero readers. We tested both approaches and found no significant differences regarding the scope of this study. In the end, we decided to include the papers with zero readers as well as the papers we did not find in the Mendeley API. This is consistent with the way citations are handled in bibliometric databases. The requests to the Mendeley API were made from December 11–23, 2014. All data in this study are based on a partial copy of our in-house database (last updated on November 23, 2014) supplemented with the Mendeley reader counts.

4. Results

4.1. Differences in reader impact between subject categories

Like the citation distribution (Albarran, Crespo, Ortuno, & Ruiz-Castillo, 2011; Rodriguez-Navarro, 2011; Seglen, 1992), the reader distribution is skewed across subject categories, as shown in Fig. 1 for articles and Fig. 2 for reviews.