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Understanding the value of social media metrics for research evaluation

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Summary

The availability of indicators based on social media has opened the possibility to track the online interactions between social media users and scholarly entities. Indicators derived from these online interactions reflect aspects such as *how often*, *by whom*, and *when* are scholarly publications mentioned and discussed on social media platforms. These new indicators, popularly known as *altmetrics* and more technically referred as *social media metrics* are usually proposed as potential alternatives to citation-based indicators to inform research evaluation. The main aim of this PhD thesis is to explore the possibilities of social media metrics for informing research evaluation. The main ambition is to increase the knowledge and understanding of the limitations, challenges, and actual possibilities of social media metrics for research evaluation. The main research question that this thesis addresses is *what is the potential usefulness and added value of social media metrics for informing research evaluation?*. The research presented in this PhD thesis provides both empirical and conceptual answers for the consideration of social media metrics in research evaluation. The thesis is structured in seven chapters.

Chapter 1 presents a general introduction to social media and scholarly communication. It discusses the origins, definitions, and data availability (through different altmetric data aggregators) of social media metrics. It reviews the challenges, limitations, and possibilities of social media metrics for research evaluation. It describes different social media metrics data sources, particularly focusing on Mendeley as a specific relevant data source for research evaluation. Finally, this chapter introduces the main aim and research questions of this thesis.

Chapter 2 provides a general overview of the presence and coverage of publications presented in social media platforms and the distribution of social media metrics across fields, publication years, and document types. This chapter gives some important insights into the extent to which scientific publications are covered across social media platforms, the amount of social media attention received by them, and disciplinary differences in their social media metrics reception. This chapter also describes the relationship between social media metrics and citation indicators. Considering all the results presented in Chapter 2, the high coverage, density, and correlation of Mendeley readership with citations support the conclusion that readership indicators capture a more scholarly type of impact, while other social media metrics such as Twitter, Facebook, or Wikipedia capture a more social media type of impact.

Chapter 3 provides a thorough analysis of the most important data quality challenges and issues regarding social media data provided by the major altmetric data aggregators. This chapter discusses how the data collection and reporting approaches of these altmetric data aggregators influence both technically and conceptually the metrics provided. Main findings show that the same social media metrics collected for a same set of DOIs at the same time exhibit a substantial variability across different major altmetric aggregators. The most

important challenges regarding data quality of social media metrics can be related to the following methodological choices adopted by the different altmetric data aggregators: *data collection choices*, *data aggregation and reporting choices*, and *updating choices*. Based on the results of this chapter, some recommendations for altmetric data aggregators are put forward. These recommendations include increasing the transparency around the methodological choices in data collection, aggregation, and calculation of their metrics by the altmetric data aggregators. Altmetric data users, researchers, and data aggregators should be aware of the unintended effects that these methodological choices can have in the valid use and application of social media metrics data. Understanding how methodological and technical choices can influence the analytical reliability and validity of social media metrics is a crucial element in the future development of the social media studies of science.

Chapter 4 describes the disciplinary differences in the relationship between Mendeley readership and citation counts with particular documents' bibliographic characteristics across a dataset of 1.3 million publications from the Web of Science. The association between Mendeley readership, citation counts, and document characteristics (i.e., document types, number of pages, length of titles, length of reference lists, number of authors, institutes and countries) has been investigated using Ordinary Least Square (OLS) regression analysis. The findings reveal that document types like editorial materials, letters, news items, book reviews or meeting abstract have a much higher coverage in Mendeley as well as a much higher readership density than citations. Publications with relatively higher Mendeley readership counts are also related to the same bibliographic characteristics as those observed for publications with relatively higher citation counts. The chapter contributes to the identification of document-related differences between Mendeley readership and citations. This information is useful for the future construction of appropriate and meaningful indicators based on Mendeley readership.

Chapter 5 presents the results of a large-scale analysis of the distribution and presence of Mendeley readership scores over time and across disciplines across 9.1 million publications from Web of Science from the years 2004-2013. The results of this chapter show that Mendeley readership counts are indeed more effective (in terms of precision/recall values) than journal-based indicators in filtering highly cited publications across all fields of science and publication years. It is concluded that Mendeley readership indicators are a more effective tool to filter highly cited publications than journal-based citation impact indicators. This conclusion opens the door to incorporating Mendeley readership as a valid and relevant indicator for the prediction of future citations.

Chapter 6 focuses on the different user types in Mendeley and their thematic orientations. A dataset of 1.1 million Web of Science publications from the year 2012 are analyzed. The disciplinary differences in the reading (saving) patterns of different Mendeley user types are depicted using VOSviewer maps. Topics of interest of different user types in Mendeley are

analyzed. The results of this chapter indicate that different user types have relatively more attention for publications related to their roles and the purpose for which they use Mendeley. The results point to the idea that publications saved by different user types can be related to different contexts of use, such as education, (self) training, research, or practical and applied uses. These results suggest that the analysis of the readership by different Mendeley user types can be used for the identification of the *scientific, educational, or professional* interests of different sets of publications. The results in Chapter 6 also emphasize the potential role of readership indicators for capturing the usage of scientific documents by a wide range of audiences.

Finally, **Chapter 7** includes the discussion and conclusions of the main results of this PhD thesis. It presents the summary of findings and the implications of the results obtained for informing research evaluation, together with some perspectives for further research. The different results presented in this thesis clearly demonstrate that Mendeley readership is the social media metric source with the strongest usefulness and added value for research evaluation. This is justified based on the large coverage, density, correlation, document characteristics, and conceptual proximity of Mendeley readership with citation indicators. This stronger added value of Mendeley readership for research evaluation becomes specially clear when compared to other social media metrics (e.g., Twitter, Facebook, or Wikipedia counts) with a more marginal coverage and density, much lower correlation, and more fundamental conceptual differences with citations. Some possible directions for further research based on the result of current work are presented and discussed, particularly in the direction of developing more advanced readership indicators (e.g., by incorporating more detailed information on the Mendeley users' interactions with scholarly outputs) together with the development of *readership theories* to better understand the behavior of online readers.

