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Leibniz-Informationszentrum Wirtschaft Leibniz Information Centre for Economics

# Coping with Altmetrics' Heterogeneity – A Survey on Social Media Platforms' Usage Purposes and Target Groups for Researchers

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#### Abstract

As the online platforms used as sources for altmetrics are highly heterogeneous regarding the usage purposes they fulfil, aggregating altmetrics from different platforms to conflating scores means to amalgamate the results of actions with possibly completely different meanings and intentions. This impedes the informative value and complicates the interpretation of altmetric scores. To arrive at a more differentiated understanding of the motivations under which interactions with research products on platforms that are potential sources for altmetrics take place, we surveyed 1,018 researchers about the usage purposes that 18 popular social media platforms serve for them, as well as about the target groups they aim to reach by being active on these platforms. By performing hierarchical clustering on basis of the response data, we reveal similarities and differences between the examined platforms regarding the goals they help to fulfil and the communication partners they are used to address. Our findings contribute to a better differentiation between altmetrics derived from different sources and thus aim to increase the informative value of different web-based metrics for research evaluation.

### Introduction

The utilization of altmetrics for the evaluation of research is still impeded by severe gaps of understanding regarding what they truly mean. One central challenge in this regard is posed by the heterogeneity of the various sources that are used to acquire altmetric data, i.e. the online platforms on which interactions with scientific outputs are observed and counted (Haustein, 2016). Sources of altmetric data include a variety of platform 'classes', e.g., social networks, microblogging platforms, literature management services, news outlets, blogs, and more. And even if one was to compare two instances from the same class of platforms, for example Facebook and LinkedIn as representatives of the class 'social network', anyone somewhat familiar with both examples could most likely quickly point out substantial differences in the goals they usually help their users to fulfil.

The motivations for which stakeholders of science – especially researchers – use a certain online platform affect the meaning of their interactions with research products on it: a mention of a scientific article on a platform that is predominantly used by most of its users to promote the own research projects for instance will likely have a different meaning than a mention on a platform that is first and foremost used for entertainment purposes. In altmetrics, which are often reported as conflated scores that comprise indicators derived from a variety of different platforms, these nuances are usual indiscernible. Such aggregations of regarding their underlying motivations possibly deeply heterogeneous indicators reduce the altmetrics' informative value and make their appropriate interpretation more difficult.

One way of arriving at less ambivalent altmetrics would be to group altmetric sources regarding their similarity and only perform aggregations for sources that do not reach a certain threshold of dissimilarities. There are various possible ways how one could define such similarity: one could for example strive for similarity of sources regarding their technical affordances, their data volume, or their user demographics (see also Lemke, Mehrazar, Mazarakis, & Peters, 2018). In this article however – for the reasons stated above – we suggest to compare potential sources for altmetric data on basis of the purposes they usually fulfil for their users. As we are interested specifically in the usage of online platforms in relation to scholarly publications, we focus on the group of researchers, which we assume to be the user group most commonly interacting with research products online (see also Tsou, Bowman, Ghazinejad, & Sugimoto, 2015; Vainio & Holmberg, 2017).

To better understand the motivations with which researchers use various online platforms during their work, we aim to answer the following research question using response data from an online survey: *Which purposes do different social media platforms (that are potential sources for altmetrics) serve for researchers?* To additionally identify how researchers use different platforms to communicate with different stakeholders of science, we also aim to answer a second research question: *Which groups do researchers try to reach by being active on different social media platforms?* 

Several studies have been investigating on researchers' usage of social media, although rarely specifically focussing on platforms which are potential sources for altmetrics. Van Noorden (2014) surveyed researchers who reported to regularly visit social media sites in detail about the purposes for which they use six popular social media platforms, revealing that *Mendeley*, Facebook, Twitter and LinkedIn all differ considerably from each other regarding the ways they are used by researchers, while *ResearchGate* and *Academia.edu* fulfil widely similar sets of purposes. In a follow-up survey, Harseim (2017) asked over 3,000 researchers about the tasks they do on social media in relation to their work, finding the discovering/reading of content to be the overall most prevalent of seven examined tasks. Focussing on sciencespecific social networking services, Nentwich & König (2014) identified communication and cooperation, public relations and self-marketing, e-teaching and job exchange to be main usage practices for researchers. LaPoe, Carter Olson, & Eckert (2017) interviewed 45 media scholars about their usage of social media in their professional lives, identifying the promotion of academic work and the use of social media as a communication and mentorship tool to be common motives for scholars. In a survey with over 20,000 responses, Kramer & Bosman (2016) suggested a set of 17 research activities from six areas in which online platforms and tools provide support to the work of researchers.

# Methods & Data

To collect data to help us answer our research questions we designed an online survey questionnaire of 14 questions about the use cases 18 popular social media platforms fulfil for researchers. The platforms to include were largely based on the most popular online tools among researchers according to the \**metrics*-project's survey from 2017 (see also Lemke et al., 2018). From the ranking established in that survey we removed all platforms that were either used by less than 100 survey respondents or did not match the social media definition by Kaplan & Haenlein (2010), which describes social media as "Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content", leaving us with 16 platforms. To this set we added *Xing* and *Quora*, which both had been mentioned frequently as free text answers to an "Other" field in 2017's survey. The full list of the 18 platforms included in this study can be seen in Figure 1 and Figure 2.

Due to the *\*metrics*-project's disciplinary focus, a primary goal during dissemination was the recruitment of a representative number of researchers from the social sciences and economics. The call for participation was sent to about 27,000 mail addresses of researchers, ~6,000 of those addresses stemmed from a mailing list administered by the *ZBW Leibniz Information Centre for Economics*, which primarily contained mail addresses of economists from the German-speaking parts of Europe. The remaining ~21,000 mail addresses belonged to authors of recent publications from the fields of social sciences or economics found on *RePEc* and *Web of Science*. The dissemination of the survey took place from June 25<sup>th</sup> to July 14<sup>th</sup> 2018, a wave of reminders was sent out in the second week of August 2018. The survey was then kept

open till August 27<sup>th</sup> 2018. As an additional incentive, participants could enter a drawing of  $25 \ 10 \in Amazon.com$  vouchers at the end of the questionnaire.

To investigate on the usage purposes that individual platforms fulfil for our respondents, we first asked them which of the 18 platforms included in our survey they had used at least once for work till now. All the platforms selected this way were then presented to the respective respondent on the y-axis of the subsequent matrix question *"Why do you use the following services for your work?"*. The x-axis of that question included 25 usage purposes for social media in the research workflow. To come up with this list of purposes we reviewed existing literature on scholarly use of social media (see above) to identify as many purposes as possible, which we then merged and reduced to the aforementioned 25 cases to keep the questionnaire reasonably short. The full list of purposes can be seen in Figure 1.

In a similar fashion we later in the questionnaire asked our respondents in a matrix question "Whom do you want to reach by being active on the following services?" to answer our second research question. The y-axis of that question again included the platforms the respondent previously had ticked as used, the x-axis showed 10 groups of stakeholders in scholarly communication, as can be seen in Figure 2.

The responses to both questions were transformed into heat maps by calculating for every pairing of platform and purpose (or platform and target group) the share among the users of the respective platform that had ticked that purpose (or target group) as complying with their usage behavior. To more easily identify similarities between platforms regarding both research questions a hierarchical clustering was performed on the data using *R*'s package *gplots*. Clusters were built with the complete-linkage method using Euclidean distances.

#### **Results & Discussion**

In the following section we will present survey demographics and the findings from our cluster analyses of the survey responses.

#### Survey Demographics

A total of 1,018 researchers responded to the survey, meaning a response rate of ~4%. Of all respondents stating a gender 69% identified as male, 31% as female, and <1% as another gender. The majority of respondents stated Germany (28%) as their current country of affiliation, followed by the USA (14%), the UK (6%), Italy (6%), and France (4%). In total respondents stated 70 different countries of affiliation.

Discipline-wise, the vast majority of respondents reported to primarily work in economics (70%), followed by social sciences (18%), other disciplines (7%), engineering/technology (2%), arts/humanities (1%), life sciences (1%), medicine (1%), physical sciences (<1%), and law (<1%). Regarding their current career stage most respondents stated to be professors (28%), followed by associate professors (17%), research assistants/PhD students (17%), postdocs/senior researchers (15%), assistant professors (12%), and other career stages (11%).

#### Research Question 1 – Researchers' Usage Purposes of Social Media

Figure 1 shows to which degrees individual platforms fulfil various purposes for their respective users. Each cell reflects the percentage of users of that specific platform among our survey respondents who stated that they would use it for that respective purpose – the darker the cell, the higher the share. The area on the left of the heat map shows the dendogram resulting from a hierarchical clustering of the data, the lines of the heat map are ordered respectively. The column on the right of the heat map shows the share of survey respondents who reported to have used the respective platform for work purposes before.

Through a first visual examination of the platforms' distribution over the heat map, a concentration of social networking services in its lower half becomes apparent. This group of

six platforms is united by prevalently serving the purposes of facilitating *networking* as well as *maintaining a personal profile*. Moreover, all six platforms commonly help with *receiving updates/news from the scientific community, self-promotion, discovering/announcing job opportunities,* and *personal communication,* although it can be seen that more specialized networks like *Academia.edu* or *Xing* seem to be slightly less versatile regarding their use cases than the more general platforms *Facebook* or *Twitter*.



Figure 1: Usage purposes fulfilled by social media platforms for researchers.

The remaining 12 platforms in the upper area of the heat map mostly appear to be more specialized in that each of them tends to serve only few usage purposes for large shares of its users. For many of them the reported fulfilment of usage purposes is very low in general, which could indicate that the response options in our survey did not cover the true usage purposes these platforms fulfil. The groupings resulting from the cluster analysis for these platforms should therefore be interpreted with caution.

Looking at the clusters on the lowest levels, we see some expectable pairings regarding served purposes in the lower half of the diagram: to probably little surprise *LinkedIn* behaves similar to its German counterpart *Xing*, both being used much for *networking*, *discovering or announcing job opportunities*, *maintaining a personal profile* and *personal communication*. In a similar fashion the academic social networks *ResearchGate* and *Academia.edu* form one cluster. Interestingly, one level higher *Facebook* forms a cluster with the two employment-oriented platforms, as all three services share particular emphases on the purposes of *personal communication* and *networking*. The two academic social networks on the other hand form a cluster with *Twitter*, shared focuses lying on *updates/news, self-promotion, discovering interesting research* and *alerts about new publications*.

Examining individual lines of the heat map, especially Twitter's outstanding role as a platform with high versatility sticks out. Almost every purpose is for a considerable share of users fulfilled by Twitter, primarily except the most specific purposes that only highly specialized platforms cater to, e.g., project management or reference management.

### Research Question 2 – Audiences Targeted by Researchers on Social Media

The heat map in Figure 2 shows the shares of users of respective platforms among our survey respondents that stated that they would aim to reach the respective target group on this platform. Dendogram and user shares are arranged in a way analogous to Figure 1.



Figure 2: Audiences targeted by researchers on social media platforms.

Examinations of the platforms' order in the dendogram as well as the highest level of clustering suggest a rough subdivision of the platforms into two groups: first, platforms that are prevalently used to reach out to other researchers (*LinkedIn, Xing, Scholarly Blogs, Twitter, ResearchGate, Academia.edu*) and second, platforms on which this is not the case. Among the latter are platforms which are at least fairly commonly used to reach the general public (e.g., *YouTube, Vimeo, Facebook*) but also those on which most users do not try to actively reach anyone at all (e.g., *Wikipedia, SourceForge, Zotero*). A particular use case is fulfilled by *Facebook*, which is prevalently used to communicate with friends and family.

# Conclusion

We conducted an online survey to get to a better understanding of which usage purposes several popular social media platforms serve for researchers, in particular regarding the task of scholarly communication. Our analysis revealed distinct clusters of platforms that behave similar regarding the communication goals they fulfil for researchers. These insights contribute to the aim of achieving a more evidence-based foundation for the reasonable interpretation and aggregation of altmetrics measured on these platforms by indicating which services cater to similar communication needs and might therefore be aggregated with comparatively little loss of information. The findings also help to characterize the scholarly information we can expect to find on different platforms regarding its amount and complexity. On *Facebook* and *Twitter* for example it seems to be more common for researchers to address non-academic audiences than on other social media, suggesting that mentions of research products on *Facebook* and *Twitter* will to a higher degree reflect efforts of disseminating research to the general public, compared to mentions on for instance scholarly blogs,

academic-, or business-oriented networks. These hypotheses will have to be backed up by further research though.

Moreover, regarding its usage purposes especially *Twitter* stood out as a particularly versatile platform for researchers. This suggests that on *Twitter* an especially varied and complex interplay of user motivations might affect the scholarly communication taking place, underlining the need of its thorough exploration to fully enable *Twitter* as a source for informative altmetric data.

A limitation of this study lies in its sample's bias towards social scientists and economists, which impedes its validity to other disciplines. And – as is typical for online surveys – our sample will be subject to self-selection bias, meaning a likely overrepresentation of researchers with a comparatively high interest in the topics of social media or research metrics. Also, although it might be reasonable to assume that researchers are the user group most actively citing research online, there are other stakeholders interacting with scientific products on the Web – and therefore affecting altmetrics – whose user behaviour is not captured by our survey. Future work should go into addressing these limitations as well as into the discussion of this study's implications for the construction of indicators.

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