Altmetrics - on the way to the "economy of attention"? Feasibility study Altmetrics for the German Ministry of Science and Research (BMBF)

Dirk Tunger[1]

[1] *d.tunger@fz-juelich.de*
Forschungszentrum Jülich GmbH, Project Management Jülich, Center of Excellence Analyses, Studies, Strategy, 52425 Jülich (Germany)

Abstract

Altmetrics is still under development and testing. They are still far from making a regular contribution to quantitative science evaluations in the near future. But: Altmetrics represent communication, which is very important in science and which increasingly goes beyond scientific journals. This paper contains the results of a feasibility study on Altmetrics on behalf of the German Ministry of Science and Research (BMBF), highlights application maturity and expressiveness and gives an overview of possible application scenarios.

Introduction

With regard to the communication of research within the scientific community and beyond into society, the Altmetrics approach is controversially discussed. The introduction of so-called alternative metrics (Altmetrics) is at the centre of the current debate as to whether the focus on classical bibliometric indicators in the Internet age still reflects the true impact of research work. In the course of this discussion, the term "Altmetrics" was introduced as a collective term for alternative indicators that takes into account the perception of web-based communication outside the traditional peer review process. It becomes visible who quotes, discusses or forwards scientific publications in national press, social media, policy documents and other web-based sources and who deals with publications within and outside the scientific system.

Altmetrics Research

Since the introduction of the term Altmetrics by Priem et al., the Altmetrics community can look back on about eight years of research on this topic. On the one hand, "the visibility and presence of Altmetrics is quite impressive" (Haustein, 2016a), because it is used by many scientific publishers as a marketing tool, several hundred publications on the subject have already been published, an own journal has been introduced and in the meantime even an Altmetrics conference is being held. On the other hand, there is a lack of a uniform definition and consensus on what Altmetrics is used for and what conclusions can be drawn from it (Haustein, 2016b; Franzen, 2017; Butler et al., 2017).

The Altmetrics Attention Score is currently used by many scientific publishers and institutions as a marketing tool in the form of the so-called "Altmetric Donut. The donut has been implemented on the websites of the journals Nature and Science, as well as in the repositories of the Universities of Cambridge and Zurich. The composition of the Attention Score is based on an algorithm that adds up the attention of scientific output in the various sources differently weighted.

This trend is viewed critically in science (Franzen, 2017). A simple summation of counts to a single metric (composite indicator) is "problematic" (Meier & Tunger, 2017a; Meier & Tunger, 2017b; European Commission, 2017a). In an overall view, the attention score does not reflect the impact of scientific achievement, but is suitable for filtering out publications that generate a high degree of perception in the media (Warren et al., 2016; European Commission, 2017b).

Tension between altmetrics and bibliometrics

Due to the fact that the base communities are the same, there is a certain tension between altmetrics and bibliometrics. Both (sub-)disciplines are intended to fulfill the same purpose, to generate a picture of scientific impact, but based on different influencing factors. Almost like a reflex, the two fields are often set in relation to each other, compared, or set up as an either/or selection.

In contrast, within the community itself, there is a general consensus that both disciplines complement each other instead of one excluding the other (Wouters, et al., 2015). Altmetrics are not intended to replace the peer review process or bibliometrics; rather, they should be viewed as a second opinion (Butler et al., 2017) and a “new perspective on communication by and about science in social media” (Tunger et al., 2017). A report by the expert group on altmetrics on behalf of the European commission also argues for classical bibliometrics that they “offer complementary approaches to evaluation” together with alternative metrics (Wilsdon et al., 2017). The expert group furthermore sees potentials for including a wider audience beyond the closed science system and for collecting information considerably faster than with conventional metrics. Furthermore, the idea of this approach is not limited to conventional scientific publication formats but offers the perspective of making data sources such as software and data sets accessible (e.g., as part of research data management).

The big difference between bibliometrics and altmetrics is the aspect that scientific publications are the traditional and indispensable main output of science. Thus, bibliometrics measures something that is at the center of the scientific reward system. The communication of science to society—that is, what is measured by altmetrics—is not part of the scientific reward system as yet. Creating incentives and expanding this reward system at this point would likely lead to increased use of social media by science and thus also strengthen altmetrics (Tunger et al., 2018).

Attention as a currency in science

It can be assumed that a scientist publishes not only because of the progress of knowledge, but also to enhance his reputation: he does not necessarily have to publish much, but with his publications he has to achieve the highest possible perception in order to achieve the best possible reputation: For every scientist, it is an expression of recognition if his or her work is perceived, assessed as relevant and quoted by a colleague. This applies both to the classical publishing process and to publications on the web: "In the media society it is no longer enough to be rich, you also have to be prominent" (Franck, 1996).

Franck calls this development the "economy of attention" (Franck, 1996). Although this approach cannot be applied identically to science, many scientists also try to achieve a certain degree of familiarity or prominence in the specialist community in order to strengthen their own position. This can also be described by the term "visibility": Anyone who has something

to say cannot avoid it. In social media, one goes beyond the pure specialist community and communication in the science system and appeals to a wider audience. The more media society and science move closer together, for example through the use of social media in science, the more the maxim described by Franck is transferred to science.

Results of Feasibility study Altmetrics

This Section represents the main part of the study and comprises the key results from independent quantitative data analyses and qualitative expert interviews. The quantitative analyses combined with a workshop with data partner Altmetric.com form the basis of the interviews. Impulses and ideas from the interviews were echoed in the subsequent talks and reflected in the fine-tuning of the data analysis.

Quantitative data analysis

The data analysis presented below not only makes it possible to evaluate the use of altmetrics in research policy based on literature and qualitative analyses but also to verify these analyses by means of concrete assessments of available data. The complete Web of Science publication years 2013–2015 were matched with the data basis of Altmetric.com. To this end, the Web of Science data basis was requested from the local database instance of the Competence Centre for Bibliometrics, which is the basis of all analyses in this section. The advantage of this data basis is not only in its local availability but also the existing unambiguity of affiliations. This permits analyses to be conducted on the level of science organizations, similar to the annual pact monitoring indicator report (Mittermaier et al., 2017).

Each analysed year (2013–2015) featured around 1.6 million publications (which have a DOI) in WoS. These publications registered in WoS represent close to 70 % of the entire publication output of these years and form the basis of our subsequent investigations. There were no restrictions in terms of document types in WoS, meaning that the entire data basis was analysed. Matching the WoS data to the data basis of Altmetric.com revealed that the percentage of WoS publications on Altmetric.com rose from 33.4 % in 2013 to 42.2 % in 2015 (see Tab. 1). This means that the proportion of publications for which altmetric data are available is drawing ever closer to the 50 % mark. A logical conclusion is that the significance of scientific publications on social media is growing and therefore also the opportunities for, interest in, and necessity of analysing these data in a meaningful way. At this point, it must be noted that questions concerning, for example, the impact of science on society have so far not been answered using bibliometric methods. This is where altmetrics come in and might lead to new opportunities.

Tab. 1: Number and proportion of DOIs in WoS and on Altmetric.com (2013–2015)

	2013	2014	2015
WoS publications with DOI	1,586,101	1,625,593	1,635,465
Publications with Altmetric.com feedback	529,392	596,484	690,535
Proportion	33.4 %	36.7 %	42.2 %

The uneven distribution of the original publications across the feedback of the analysed altmetric data set means that distortions may occur in the representation of science organizations. This is comparable to different citation rates in various bibliometric disciplines. While bibliometrics corrects this by means of normalized indicators, such a model is not yet conceivable in altmetrics since no indicators or corresponding interpretation have been determined to date.

A differentiated consideration, according to disciplines, reveals potential distortions in multimedia resonance. Engineering sciences are generally less active on social media while this proportion is very high in medical science compared to other disciplines. This is shown clearly in Fig. 1: The distribution of DOIs for the year 2013 (proportion of WoS DOIs) is shown in red, based on the allocation of publications to WoS subject categories and subsequent aggregation using a classification according to the main disciplines. The respective proportions of altmetric resonance (proportion of Altmetric.com DOIs) are depicted in blue. The disciplines are allocated according to the underlying scientific publication and the allocation is absolutely comparable to the proportions of DOIs in WoS.10 The statistical population is formed from all WoS publications from the year 2013 that have a DOI as well as the resulting proportion of feedback with corresponding data in the data basis of Altmetric.com. Multiple classifications can lead to values over 100 % when added up.

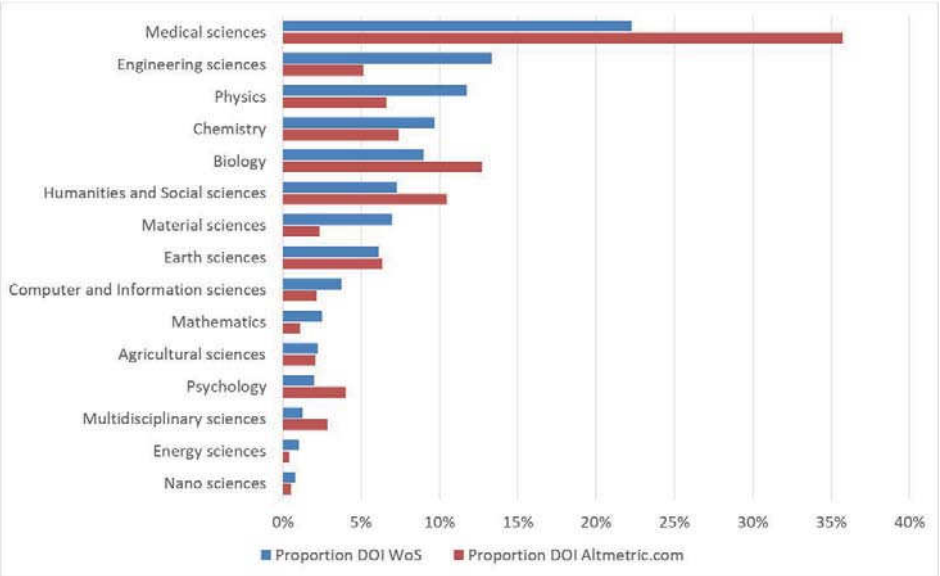

Fig. 1: Comparison of the proportions of the disciplines in WoS (upper line) and on Altmetric.com (lower line, based on DOIs, 2013); sorted by the proportion of DOIs in WoS

In addition to medicine, the humanities benefit greatly from altmetrics. While this discipline has a relatively low proportion in WoS, the proportion of publications mentioned on Altmetric.com is higher. This result also reflects the perception of Hammarfelt (2014). The observation that DOI coverage varies between disciplines was confirmed by the analyses of Altmetric.com and the University of Cambridge. Some disciplines (e.g. engineering sciences) are rarely discussed on the social media platforms covered. This reveals parallels to the discipline-specific distribution of output and citations in WoS, which are described in more

detail by Haustein and Tunger (2013). Mechanisms of the news values theory also underlie this observation.

Qualitative statements based on interviews

The following results are based on five guideline-supported interviews and a two-day workshop with data partner Altmetric.com. In selecting the interviewees, particular attention was paid to covering heterogeneous perspectives of scientific discourse as well as the user side. This selection represents the subject area from different points of view.

Interviewee perspectives of altmetrics

The individual perspectives compiled by means of an exploratory approach divert from each other with regard to the interviewees' estimates of the validity and applicability of altmetrics. Within the scope of the interviews, however, sufficient overlap was achieved to gain a comprehensive overall picture from the various points of view. For illustration and summary purposes, the interviewees are arranged according to their estimate of the significance and application maturity of altmetrics in the figure below.

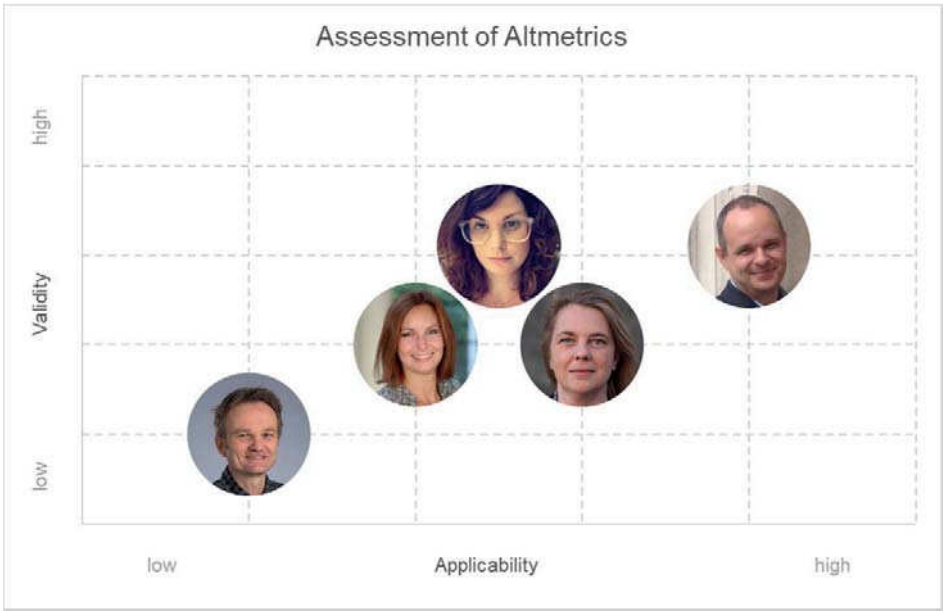

Fig. 2: Significance and application maturity of altmetrics (arranged by the authors)

From left to right: Lutz Bornmann, Isabella Peters, Stefanie Haustein, Martina Franzen, and Jürgen Wastl. Brief profiles of the interviewees can be found in Tunger et al., 2017

Significance of altmetrics

In summary, it should be noted that the opinions on significance differ less than the opinions on application maturity. The significance is estimated to be in a low to medium range. Isabella Peters explicitly emphasized that "high expectations have been consolidated [with regard to the developmental state]." The initial euphoria in the field, focusing on the far-reaching potential – including measuring the social impact and performance evaluation of science – seems to have abated. A multitude of scientific investigations have contributed to this trend, introducing a wide range of problematic issues concerning the significance of altmetrics.

There was seeming consensus that altmetrics should not be seen as an alternative to bibliometrics; instead, they represent a new perspective on the communication of and about science in social media. Perception and "popularity" are emphasized in this context. In contrast, the scientific quality or excellence is reflected poorly, as just one factor amongst many, which only partly has a positive correlation with perception. This contradicts the principle of bibliometrics, which is based on an inherent and peer-review-based approach to evaluating science.

Comparisons between bibliometrics and altmetrics can thus be considered inappropriate. Several interviewees mentioned the need for other [science-reflective] disciplines, such as science sociology or philosophy (cf. Franzen), and in-depth analyses of the motivations underlying social media activities. This view matches the perception expressed by Altmetric.com, which explicitly emphasized that the data basis reflects only the perception, and therefore represents an initial starting point for more thorough analyses. How significant the data are, however, can only be determined in a subsequent step.

On the one hand, several interviewees stressed that the "instruments used in bibliometrics (normalization etc.)" can be transferred in a targeted manner (Bornmann). On the other hand, the bibliometric focus in the analyses was criticized because altmetrics are more of a "window into another world beyond the citation system and the science community" (Peters) and should be used as such. Although the peer-review process remains central to science, altmetrics only cover "what is not visible for bibliometrics" (Haustein). Against the backdrop of current research projects, whose main objectives are comparisons of bibliometric analyses with altmetrics, for example using Mendeley counts, it should also be questioned what added value could thus be created (Franzen, Haustein). On the basis of the "ample data" (Bornmann), the objective is to specifically achieve communication beyond that within the science system.

Application areas in research policy and science management

The association with research policy and science management also represents the primary pillar in the interviews. Furthermore, guiding principles are addressed with regard to the extent to which, and the manner in which, politics can and should support developments. A key to gaining relevant insights in the long run is primarily based on the extent of the experience that can be exploited by this application.

Application maturity of altmetrics

In contrast to the significance of altmetrics, the expert opinions differ more widely between each other with regard to their application maturity. To some extent, this can be attributed to the more widely differing expectations: should altmetric characteristics be a purely quantitative indicator, or do they represent a starting point for qualitative analyses? Furthermore, the fields of application are very wide-ranging and also include marketing activities which currently have less significance for research policy.

Against the backdrop of these heterogeneous perspectives on the topic, there is, however, a consensus concerning one key issue: altmetric characteristics cannot currently be interpreted as stand-alone and quantitative indicators. In particular, the interviewees agreed unanimously that altmetrics do not represent a scientific data basis, which is a prerequisite for evaluating science. Lutz Bornmann also hypothesized that it is the responsibility of science to advise against such applications. With regard to control effects, Isabella Peters also stresses that "no one [...] [should] receive funding because his post was (re-)Tweeted 5,000 times".

Performance cannot be assessed using such conclusions (Haustein), although altmetrics can contribute an initial indicator to qualitative evaluations (cf. Wastl). In their current form, all experts interviewed advised against using altmetrics in research evaluation.

In terms of drawing conclusions from this hypothesis, however, opinions differ greatly over what role politics should play and in what way altmetrics can be used for research policy: in four of the five interviews, politics was accorded an active – if varying – role in shaping this process. Jürgen Wastl attributed the most active role to politics: He says the essential objective is that politics "fix demands and articulate research issues", i.e. to create an overarching and binding framework for application. Subsequently, Wastl sees implementation as the responsibility of the science organizations, which would have a corresponding mandate through political requirements. Due to the exploratory developmental state, however, he views politics as being responsible for showing an openness and sensitivity in terms of reacting to the insights that can be gained through altmetrics.

From a sociological point of view, Martina Franzen stressed that this would be an experimental system and that learning through trial and error would be important. She thinks that actively dealing with the topic would lead to a gradual opening of the "black box". Similarly, all interviewees agreed that scientific reflection, theory development, and in-depth analyses are an integral and indispensable part of the process of generating insights. This particularly includes openness to results which may indicate that altmetrics are not, in fact, usable for research evaluation in the long term.

When examining the application options, a major aspect was to actively shape the process, for example by establishing data concerning relevant issues. These data are "established according to users' priorities" and represent "an important push factor" (Franzen). This was also confirmed during the workshop with Altmetric.com: customer requests and availability are a key orientation for developments, but also particularly for the resource-intensive expansion of sources such as policy documents and news items. Isabella Peters also stressed resulting requirements from a systemic point of view: "Politics and funding play a major role because science tends to maintain long-established traditions" and no system change is possible without such stimuli.

At the other end of the spectrum, Bornmann promoted a comparatively technocratic approach. He said that politics should refrain from application as long as the scientific knowledge gained is yet to reach a sufficiently advanced stage. Science has the responsibility to first investigate whether altmetrics can be used as a quantitative indicator in research evaluation, and if so, to what extent.

Conclusions

To what extent altmetrics will establish themselves in research policy depends fundamentally on empirical values from practical application in the sense of a learning experimental system. Therefore, potential fields of application are briefly outlined in the following paragraphs.

Science evaluation, performance assessment, and measurement of social impact

Due to the explorative development stage of altmetrics (as described above), they must be used carefully with regard to their application in the performance assessment of institutions and single scientists, for example within the scope of scientific evaluation. In particular, there

is a lack of studies investigating how valid and reliable the evaluation of science based on altmetrics is. In the scientific discourse, a deeper understanding of the heterogeneity and the significance of the data must be achieved. In addition, useful indicators must be developed and benchmarking studies have to be conducted. According to current opinion, altmetrics will in the near future be more of a complementary component rather than an independent indicator for the assessment of scientific performance.

In addition, some research topics are more in the focus of society than others without necessarily displaying a larger social impact. In this context, attention should be drawn to the news values theory: it describes factors why some topics are reasonably sure to be reported and some are unlikely to become objects of journalistic reports in mass media [Warren et al., 2017]. Against this backdrop, altmetrics can be viewed as an incomplete indicator for social visibility. To what extent this circumstance will change over time cannot currently be predicted and depends more on the social discourse on science and the opening of the science system than on further methodological developments.

Public relations, visibility, and advertising of activities

A part of communication on science and its visibility in the public sphere is represented by altmetrics. In any case, it should be noted that there is a rising trend in social media activity measured by the frequency of contributions and the number of people involved. Thus, it is becoming increasingly important to use social media platforms in order to proactively draw attention to research, that is, advertise it.

As an example in this context, institutional efforts such as those undertaken by universities or the European Commission, can be observed, which strategically position their own publications and activities. Against the backdrop of the explorative state of these efforts, altmetrics could serve as feedback, for example, to test various approaches aimed at new target groups in society. With regard to research policy, particularly activities with a strong social relevance and their visibility could represent an interesting field of application complementing current evaluation approaches for analyzing media feedback. Initial network analyses are already delivering promising results and their application to research policy issues could be examined. Using specific issues associated with communication propagation, attention could be focused, for example, on the identification of relevant multipliers—for example, science journalists and representatives from politics, industry, and interest groups—in the dissemination of information. Identifying such mechanisms and transmission channels in pilot studies would be promising research priorities in this respect in addition to medial feedback already addressed through established investigation designs. Publishers already use the altmetric score as feedback on articles, albeit in a strongly aggregated and simplified form. Similar efforts are also apparent at universities and research institutions, which are testing the implementation of the Altmetric Donut both with and without the score, although the added value of these efforts has yet to be clarified. As part of a pilot measure, the OECD is currently investigating to what extent the altmetric explorer and the implementation of the altmetric score are suited to determine the social range of policy documents.

Science institutions can also use altmetrics within the scope of science marketing: it is conceivable that altmetrics could be used to focus attention on those publications by an institution that is widely discussed, shared, tweeted, or used in news pieces. This would permit the interface between science and society to be better addressed.

Whether there is any benefit from altmetrics in economics or politics beyond science has not yet been verified. From our viewpoint, there would be benefits if more sources of economic or policy-relevant sources were covered by the altmetrics databases. In this case, it would be possible to regard or measure the contribution of science in economy or policy. With bibliometric instruments, such as publication or citation analyses, it is not possible to measure this contribution since the economic or political world does not publish articles in scientific outlets. With altmetrics one would be able to have a look at, for example, mentions of scientific publications in documents, which influence politics or discussions on the application of scientific research in economics or companies. Generally, it would be worthwhile to identify the impact of scientific contributions on individual groups more easily, if one could associate contributions on social media platforms to particular fields of application.

Reporting reputation

For scientists, the visibility of their publications is essential. The reputation resulting from the use by others of their scientific output in the form of ideas, statements, calculations, and findings is an essential part of the science system. Only the use of the generated output creates sustainable value for an individual scientist, be it in other scientific publications or in web-based communication, social media, or news pieces. Bibliometrics and altmetrics help scientists document the visibility of their work. Thus, the majority of the almost 700 scientists who participated in a survey on the RG platform stated that it is important to them to have a high RG score.

Altmetrics permit scientists to record, regulate, and document their own visibility to a greater extent than was previously possible. Particularly for early-career scientists, there is thus a great opportunity to increase attention and reputation independently from the traditional publication system. In the longer term, altmetrics could assume the function of documenting the mediation of science to society and of making it more transparent.

Support from libraries

Academic libraries are usually where contacts can be found within a scientific institution for issues related to publication data and bibliometric processes/indicators. Librarians' clean data, compile publication profiles, and collect data within the scope of evaluations. They are thus specialists for handling data, particularly data related to publications, user statistics, and stock management.

This is where altmetrics represent a connecting element as they illuminate the use of publications in social media. Thus it is plausible for libraries to be directly involved whenever the issue of altmetrics is addressed at an institution. This makes sense because librarians are in contact with many areas of a scientific institution and offer advice on using information products. Roemer and Borchardt (Roemer & Borchardt, 2015) identified this central role of libraries and summarize:

"[…] librarians serve as natural leaders when it comes to altmetrics […]" (Roemer & Borchardt, 2015). They argue that this is due to the resources and data knowledge of libraries as well as their central position as contact partners for various target groups (Gimpl, 2017).

Outlook

Altmetrics is still under development and testing. They are still far from making a regular

contribution to quantitative science evaluations in the near future. But: Altmetrics represent communication, which is very important in science and which increasingly goes beyond scientific journals. This is where we should start and think about incentives for how new forms of communication can be used profitably for science. This is all the more true if the incentives to bring science into society through social media are increased and integrated into the scientific reward system.

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