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Supporting the Research Feedback Loop - Why and how library and information professionals should engage with altmetrics to support research.

Abstract

Purpose The purpose of this paper is to explore the opportunities altmetrics offer to library and information professionals as part of their research support provision. This paper examines what altmetrics are and how they can offer another useful metric to help academics engage with a variety of interested parties over the web.

Design/methodology/approach The paper considers the emergence of altmetrics as a research measurement and scholarly communication tool and the impact on academic libraries. Identifies existing metrics and explores their shortcomings as well as how these can be bridged by altmetrics.

Findings Altmetrics offer a wealth of opportunities for library and information professionals to make better strategic decisions, explore their own institution's research output and provide scholarly communications intelligence to their research community.

Originality/value The value in this paper lies in encouraging academic librarians and information professionals to explore altmetrics for themselves and align any new knowledge with existing services and skills, in particular around metrics and digital media.

Keywords Altmetrics, Alternative indicators, Social media, Impact Factor, Citation, H index, Scholarly communication

Paper Type Viewpoint

Introduction

Librarians and information professionals have long been interested and involved in metrics, whether those being bibliometrics such as citations, impact factor scores or h indexes. Yet these metrics have more than anything served the journal publisher and have only given us part of a picture around scholarly communications. Citations are slow to accrue, impact scores are more beneficial to publishers, journals and editors and arguably are there to maintain some kind of status quo. Finally, the h index tells only part of the story, one deletion 'of' which that can be very misleading. Yet in a research world that is being increasingly driven by impact, online communities and social media, altmetrics can help researchers understand how their work is being used on a single artefact basis. These artefacts are no longer the single journal issue as was the case for most publication metrics, there can now be viewed at article-level. Now libraries and academics can discover a wide range of metrics for a diverse set of outputs such as the journal paper, book, conference poster, research data set or even a piece of software. The application and use of altmetrics extends beyond the researcher with article-level metrics increasingly used by publishers, funders, universities and researchers (Fenner, 2013).

Academics are increasingly being told to increase their impact, with much of that agenda pushed over social networks and the web, yet there is little support for discovering and measuring these scholarly communications. This paper argues that the library and information professional is best placed to explain what the altmetric data means and how researchers can access it and where possible act on it. Altmetrics is just part of a greater change alongside other related initiatives including open research and access, data citation and sharing. There are many opportunities for librarians to engage with altmetrics and this paper explains the reasons, benefits and potential barriers as well as ways of getting involved and the wider implications for research as a whole.

What are altmetrics?

Traditional metrics

Before I explain what altmetrics are it is important to give some background as to existing metrics, as these make up part of the foundation of altmetrics that has been made possible in a digital and social web environment. There had been various research metrics, some of which underpin how we assess the quality of research and its impact within academia. Metrics aid the career progression of researchers and are featured on a typical academic CV, they are evidence of a person's research influencing further work. (Brown, 2014) found that altmetrics do have the potential to become powerful tools for demonstrating the impact and value of one's scholarly work. Citations remain the most important of metrics as the more a paper is cited the more we assume it is of high quality. This is only an assumption as poor quality research can also be cited, especially from more prestigious journals (Nieminen, Carpenter, Rucker, *et al.*, 2006). On occasion a paper can receive multiple citations in a journal before it is retracted following a review of the paper's quality or integrity. A good example of this is Andrew Wakefield *et al.*'s retracted paper on the MMR vaccine for *The Lancet* (Rao & Andrade, 2011). The main problem with citations is that they are slow to accrue as they require another piece of research to be written and published citing the original research. Given that despite the growth of the web and digital publishing, journal articles still can take several months to write, review and publish, that is in addition to the time spent conducting the actual research. So a paper may take several months to gain just a single citation, whereas altmetric data can start appearing even before the paper is published.

All of the above is part and parcel of the research cycle and has been like this for as long as most can remember. Citations, impact scores and h indexes among others remain the important benchmarks for academic rigour, whether that be the paper, the publication or the person. They are not perfect but they do offer an insight into how a piece of research is being received, the quality of the journal and the citation impact of the researcher. Nevertheless there has been an increasing number of articles written that have found serious flaws in all of these models. A *Research Policy* editorial wrote that: "in the light of ever more devious ruses of editors, the JIF indicator has now lost most of its credibility" (Martin, 2016). Citations are open to bias as authors can self-cite their own work (Ophhof, 2013) or feel pressure to cite papers from the journal they are publishing (Wilhite & Fong, 2012) as an attempt by the editorial staff to increase the impact factor score for that publication. The h index is an author level metric where it attempts to measure the citation impact and productivity of an author. So if an author publishes twenty papers and each paper has a minimum of twenty citations their impact score is twenty. This model also has inconsistencies in the way it ranks researchers (Waltman & van Eck, 2012) For example an early career researcher publishes their fifth paper in a very high profile journal and receives 500 citations, they are limited by the fact they only have five papers and their h index is limited to at best a h index score of just five. This index does not capture a potentially exceptional piece of work in a high end journal. Altmetrics, although themselves not infallible, can present data that gives a more rounded picture of the person, the research and the platforms.

A new metric

The Altmetrics Manifesto (Priem, Taraborelli, Groth, *et al.*, 2010) was established in 2010 as a response to the growing amounts of scholarly papers and data being published on the web. The founders of altmetrics believed that traditional metrics were excluding a wealth of new data relating to communication, reach and impact.

The Altmetric Manifesto says at the top of its home page (Priem, Taraborelli, Groth, *et al.*, 2010): "*No one can read everything. We rely on filters to make sense of the scholarly literature, but the narrow, traditional filters are being swamped. However, the growth of new, online scholarly tools allows us to make new filters; these altmetrics reflect the broad, rapid impact of scholarship in this burgeoning ecosystem. We call for more tools and research based on altmetrics.*"

The term 'altmetrics' was first publicly shared across social media in a Tweet by Priem (Priem, 2010) when he wrote: "I like the term #articlelevelmetrics, but it fails to imply *diversity* of measures. Lately,

I'm liking #altmetrics". Over the course of the last five years that definition has changed slightly with some aware of how the term can be misleading and as a result be misinterpreted. Much of this misinterpretation has been around the notion that altmetrics wholly exist to replace traditional metrics. Certainly, with many new innovations in research technology, there was some notion of being unhappy with this status quo and attempt to change that. The altmetrics community never intended to remove existing metrics but instead offer complimentary analytics. This has led to adaptations of the term with 'alternative indicators' of research being one such useful descriptor.

Altmetrics has many benefits that can support traditional metrics. In simple terms these are focused on the areas of appropriateness, timeliness, inclusivity and reach. The appropriateness is that altmetrics works at article level, so helps the author or reader to break down an artefact to several different statistics. The article level metrics focus mostly on views, downloads, shares and comments. Previously metrics focused on journal level metrics so were not always appropriate for the author, department, funder and reader. Timeliness of altmetrics is crucial, it allows interested parties to get a real-time snapshot of how a piece of research is being interpreted and shared. A high profile piece of research if communicated properly can see via altmetric analytics how far and wide their research is being communicated, by whom and where to what response. Finally traditional metrics are not very inclusive as they focus on journal outputs. In recent years there has been a growth in the amount of research data that is being created and shared on the web. In addition there are books, chapters, posters, conference proceedings, software and other outputs that for the most part were not measured or cited. Altmetric tools like Figshare and Mendeley allow for the uploading and sharing of research outputs such as data, something in the past which was hard to dissect from the literature. The application of a Digital Object Identifier (DOI) now allows such as data sets and other research artefacts to be tagged and therefore discovered online. This ability to discover research artefacts by these identifiers means that we can now apply altmetrics to them. The ability to share a piece of research is one thing, but finding out what peers, the media and general public are saying about the research or doing with it is a step in the right direction for open research.

The research cycle is changing

The current model

The research cycle is a simple process for most academics, win funding to carry out research, carry out the research, publish it and then present it at a conference. The published research is then measured through a combination citations and impact scores. It is interesting to note that in some cases the number of citations a paper receives can vary depending on which database you refer to. Yet that model is becoming increasingly fractured and broken down into a variety of new models. Some of the newer platforms such as *Research Ideas and Outcomes* (RIO) have launched totally transparent models that treat the whole research process as wholly transparent, from funding to dissemination.

A new model

The core elements of the research cycle still remain and will continue to do so for the foreseeable future. Newer models are emerging where the dissemination aspect is spreading across the whole cycle, not just at the end of it. Researchers can now communicate their research beyond traditional platforms such as meetings and conferences but real time across the web to experts and the general populace. In addition they can receive real-time feedback to their research, whether it is a formal journal article, blog post, data set or poster to name but a few. The feedback comes from the many academic and non-academic platforms such as Twitter, post-publication peer review, Slideshare and YouTube among dozens of other technologies. The aforementioned platforms themselves are the conduits for such scholarly and non-scholarly communications. How they are captured and in turn measured is done by the growing number of altmetric tools. One criticism of the traditional model was that once a journal article was published and started to accrue citations it would almost be forgotten

by the authors once the paper was complete. Yet with an increasingly communicative online academic world that should not be the case. Some published research has a long tail and can continue to resonate through discussions, reviews and saves in reference management packages such as Mendeley. All of this data is useful to the authors, especially if there is a conversation taking place that is about their research and of interest to them. Whilst another problem with the research cycle and its subsequent outcomes was that it mostly focused on the single journal article or publication. The new model with the aid of altmetrics looks at other outputs including data sets, posters, books and blog posts.

It is important to remember at this point the importance of the library and information service as an integral part of existing and future research cycles. For the librarian and information professional aligned with researchers they are active throughout various parts of the cycle depending on their role and relationship with the research. Library and information professionals may be involved in the initial research funding search, including scoping literature searches. This may extend to a formal literature search and supporting reference management should funding be acquired. Advice and help with publications is also part of the librarian's role, with an increased emphasis on open access options, self archiving and subsequent research data management.

Beyond the journal article as sole academic output

There is some confusion within the academic community as to what altmetrics do along with some greater need for clarity around the difference between article level metrics (altmetrics) and journal level metrics (impact scores). Historically academics have engaged with metrics on a purely need to know basis, such as citation counts for CVs, impact scores for choosing prospective journals to publish with. Metrics matter when there is an actual use for them that leads to some kind of decision or information. Altmetrics are somewhat different as they are much more dynamic than traditional metrics. They can react to changes in a person's research and how it is received much quicker than citation counts and impact scores. A new piece of research can be communicated before formal publication and therefore start to accrue altmetric data should it have a unique identifier. Whilst altmetric data is immediate it may not be widespread in terms of metric impact for a publication over the course of its first year. (Costas, Zahedi & Wouters, 2015) found in 2012 that 24% of publications they sampled with a DOI presented altmetric scores whilst 26% had at least one citation in the same year. Added to the confusion around altmetrics is that the data comes from a variety of mostly third party tools, of which some are alien to many in the academic community. Altmetric data can be drawn from a variety of sources such as Twitter, Mendeley, Facebook, Reddit, Faculty1000, Wikipedia and blogs for example. If the academic does not use most of these tools then they can be at a loss to what the data is, where it is coming from and what it actually means.

Extracting the article from the journal and treating the data from the article as a separate entity for metric purposes has taken some time in coming. When academia moved much of its business over to the digital sphere and the web it was slow to maximise the benefits of such technologies for scholarly communications and subsequent metrics. This was to some extent exacerbated at the start of the period we refer to as Web 2.0 in 2004 when communication and interaction with and on the web was made much easier. Research outputs have long gone beyond the journal paper, conference proceeding and book. Data sets, presentations, computer software, video, academic blogs and many other outputs have been created long before Web 2.0 but the sharing, storing and citing of such outputs was not always so practical. Now it is possible to share and measure research across the web, the real problems lie in the collection of this data and what importance we give to each bit of it.

Why librarians and information professionals should engage with altmetrics

(Malone & Burke, 2016) research concluded that there is little hard data in the literature showing if and how librarians are using altmetrics. This paper proposes there are two main drivers why librarians

should engage with altmetrics. The first is a mixture of historical factors and existing areas of expertise. The second reason is the response to a widespread change in how research is being published and the response to support this by the academic library.

Historical circumstances

Historically bibliometrics and scientometrics have long been closely aligned with the field of library and information science (Showers, 2016). Much of the early work was carried out in the information science community and has been overseen by an active library and information-based community. Within academic libraries there are specialists who focus on bibliometrics and whose job is to explore and analyse publication and citation patterns for their institution. Altmetrics have been explored in varying degrees by the bibliometric community for some time (Haustein, Peters, Bar-Ilan, *et al.*, 2013). Institutional altmetric dashboards as offered by the likes of Altmetric.com provide internal research intelligence with dissemination of this data usually overseen by the academic library or research office.

Response to the change in needs from library support services

In academic libraries we have seen the emergence of new roles around open access, scholarly communications and research data management. Their remit is to act as facilitators and experts in engaging academics to make their content legally, securely and easily discoverable and shareable. This is as a result of changing research assessment, requirements from fund holders and to maximise impact.

Libraries have been at the forefront of the open access movement and continue to advocate and facilitate it for a variety of reasons. Mostly because it is the remit of academic libraries by their institutions to support the facilitation of open access but also as a result of being at the brunt of journal subscriptions and paywalls. Alongside open access there has been an increase in interest and a demand for support by libraries around open data and research from dissemination to measurement. As more research is published open access through the gold or green routes it is inevitable that it will become more discoverable and accessible. Some of this change is reflected by altmetrics as articles and datasets are shared using unique identifiers such as a Digital Object Identifiers (DOI) or PubMed IDs (PMID). These IDs can then be tracked using altmetric tools such as Altmetric.com. Librarians are able to track any such outputs themselves and share this data with the research community they serve. It offers another route to connect the academic library with researchers as they see their open access publications shared and discussed across the web. This increases the value of the library and librarian and can help bridge any gaps between the academic and the library. Whilst altmetrics can aid the library and information professional in selling the idea of open access to the researcher. The benefits of open access have been documented showing that research published via this route reaches a wider audience than subscription based publications (Davis, Lewenstein, Simon, *et al.*, 2008).

Making better informed strategic decisions around journal subscriptions

Libraries have always had to adapt to meet the needs of an increasingly diverse and demanding user base. One area this is quite prominent is the provision of sufficient academic journal subscriptions for their institution. Libraries annually feel the brunt of rising journal subscription costs and as a result have been left to make many challenging financial and strategic decisions. Given that university libraries have a remit to support a wide and demanding customer base, deciding which journals to subscribe to and which ones to cancel means not everyone gets what they want. Altmetrics does offer additional business intelligence and can be used to support such decisions. Which journal a library subscribes to is usually as a result of picking the prominent and popular titles alongside those included in reading lists and personal requests from staff. That in itself is very useful data, and with other previously mentioned metrics, altmetrics can offer supplementary information to help the decision process. The Altmetric.com institutional dashboard can show which journals a group within the institution is

publishing in. It can help identify whether a borderline journal that the library subscribes to is worth retaining or whether your academics are publishing in a journal that you do not currently subscribe to.

Engaging with academics in using altmetrics

Lecturers have learning technologists, what do researchers have?

The teaching side of academia since the advent of Web 2.0 has increasingly looked to digital tools to deliver learning fit for the 21st Century. This has been made achievable thanks to a few factors. Firstly because of the development of commercial and specialist digital platforms that have continued to grow at an increased pace are easily adaptable to a university teaching setting. Secondly the adoption of these technologies could only be applied on such a wide scale level as they have thanks to support from learning technology specialists and active, inquisitive teaching staff. Thirdly the growing community of learning technologists have maintained a strong connection with the pedagogy when prescribing a technology to a university teacher or lecturer. This part is incredibly important as like researchers, teachers need to know why exactly they are using a technology. Naturally there are technologies that most on campus are expected to use, such as email, the virtual learning environment and office based tools for databases and word processing. Whilst many other technologies for aiding tasks such as presenting, screencasting, curation and communication are not compulsory. Many of the new and emerging learning technologies require investigation, testing and then if deemed fit for purpose, transferred from the learning technologist to the teacher with a pedagogical case for doing so. Finally there is an external driver for embracing a new technology which can vary. It may be the demand to deliver students new ways of learning based on their own circumstances. This may be a desire to expand on one's skills and technological knowledge and aspiration to do things differently. It may also be pressure from colleagues to conform to new ways of working or their teaching community as a whole. Whilst much of academia operates in silos, whether those be individual, departmental or institutional so it therefore becomes increasingly necessary to share new technologies and any implications for their use.

The research community has many different demands to their teaching counterparts but nevertheless both find their roles increasingly disrupted by technology and metrics. Compared to the teaching community, the researcher's need to find new ways of working using technology, are not as essential for their inward facing research office compared to the outward facing lecture theatre. This however is changing with the impact agenda, increased demand for public engagement as well as growing exposure to new and innovative ways to produce and disseminate work. (Stuart, 2015) points out that understanding the differences in how technologies are used to find, share and cite resources become particularly important as research becomes an increasingly attention-based economy. As with teaching and technology, the best system for research technology transfer, whether that be social media, altmetrics or video remains the same. This being a system where academics are supported through various stages of, learn, understand, change and adoption. The emotive language often associated with research has not always been one to encourage dynamic change in how an academic conducts their research. 'Publish or perish' and the fear of failure, evidence based, are some reasons why academics fear engaging with the post Web 2.0 technologies. Some of these technologies are still very new and can require a leap of faith whilst clutching at what evidence you have at hand. If we also consider the rapid growth of social media, pre and post publication open peer review alongside the impact agenda, then it is understandable why many academics have become guarded to such new developments. Whilst no such equivalent role to the learning technologist such as a research technologist, or digital research specialist have appeared in any good number, there remains much opportunity for librarians to explore these areas. In a modern academic setting researchers are supported by a number of professionals including finance, marketing, communications, library, research data, open access specialist. All work in close proximity to researchers and on the basis of giving support when required. Making research and data open and

accessible alongside social media, new media and open commenting are instrumental to modern scholarly communications, impact and altmetrics. All of these fall within the footprint of many library and information roles. This connection is made even stronger by the early altmetric books by (Holmberg, 2015), (Roemer & Borchardt, 2015) and this author (Tattersall, 2016) by focusing attention on the library angle of new metrics. The opportunities to engage with research communities in the application and understanding of altmetrics are there for the taking.

Opportunities for engagement

Academic librarians and information professionals have always looked for new ways to engage with their research communities. Areas of support have traditionally included but are not exclusive to, literature searching, document supply, reference management, book and journal acquisition, information and copyright literacy. Yet despite all their best efforts librarians can experience many problems in supporting the diverse research community. There are a variety of reasons for this, firstly, researchers often work on the simple basis of they only come to the library service when they need something. That might be a research paper, to solve a problem with their reference management software or to discover which database they need to search. In between those requests librarians invest large periods of time in creating training and awareness materials, improving their own knowledge and deal with large amounts of administration. Altmetrics may feel like another piece of work that for now can be left alone due to existing time and work pressures. Yet altmetrics offers a superb opportunity for the academic library to connect with the research community (Lapinski, Piwowar & Priem, 2013). (Lapinski, Piwowar & Priem, 2013) paper mainly focused on the platforms ImpactStory and PlumX Metrics, but over the last three years other platforms have established themselves therefore creating the need for experts to help others navigate this changing landscape. Altmetrics remain something that most academics are still fully unaware of, so there is much scope for improving services (Konkiel, 2013) and increasing awareness. A study by (Reed, McFarland & Croft, 2016) found that aligned with this that many academics and students did not know that their work was already represented online. Whilst academics may have heard of the term 'altmetrics', in the same way they have heard of MOOCs, big data and social media; it does not mean they fully understand their true meanings and therefore the real benefits of engaging with them. The representation of their work and measurement online are just part of a new ever-evolving academic eco-system. With that of course comes the negative effects, none of the aforementioned technologies are without fault, so again this is an opportunity for the librarian to negate many of these problems.

For librarians working at universities with institutional altmetric accounts with tools such as Altmetric.com and Figshare the job is much easier. The fact that their institution has taken out an account with these platforms gives them credibility. In addition there is more of an institutional desire to make use of the technologies when subscribed to. Often they may be just a one year trial licence to test the software, but that does not mean they should be treated any less important. Who initially controls the altmetrics platforms can vary from institution to institution, it may be the research office or the library, nevertheless it is important that strong ties bond together any such complimentary departments when providing new services.

Whilst adding altmetrics to a library or information professional's duties may seem like additional work, we have to remember the rewards can be achieved with minimal effort. Tutorials and workshops about altmetrics and scholarly communications do not have to be onerous. For they can be dovetailed into existing training workshops around research data management and open access. Screencasts can be recorded that teach academics how to access and analyse their own altmetric data. There are also a wealth of training materials created by altmetric platforms such as Altmetric.com, Kudos and Plum Analytics that can be repurposed and shared by the library or information professional. These include slides, video tutorials, social media, webinars and blog updates. As with many technology start up companies, altmetric platforms are keen to gain traction and will on occasion supply promotional and learning materials to aid their greater use. For the busy librarian there is no need to

reinvent the wheel, so where possible efforts are best made using every available resource to help educate academics and peers as to what altmetrics offer.

Share with academics their research impact and successes

One of the boundaries that everyone faces within a changing digital academic setting is the increasing demands on their time. Academics have increasing amounts of pressure placed on them to write, publish, win research grants, attend meetings and generate impact. Added to that there are pressures to comply to a greater number of demands from fundholders, employers and colleagues. This can be anything from information and data security and governance, open access, public engagement, health and safety; equality and diversity. Whilst the niggling pressure to engage with social media and digital technologies also adds existing burden. As a result academics have to pick and choose more carefully where they invest their increasingly fractured time. An opportunity to support the researcher and highlight the value of altmetrics is to run regular reports on their individual scholarly communications. Work by (Bornmann, 2015) found some promise as to the use of altmetrics for measuring the broader impact of research. This broader impact could be for example, coverage in the media, on a blog or a discussion around their research on such as Facebook or Reddit. Given that altmetrics are not tied to specific time periods, compared to the impact factor score, altmetric data can also highlight older, forgotten research that receives new mentions. Such as an old paper that is cited in a new policy document or a data set that has been cited due to it having its own DOI. Provision of such awareness services could potentially enthuse the researcher to explore the data for themselves. It could also open the door for researchers to explore the many tools available to facilitate their own scholarly communications. Ongoing support can be provided as many working in central and liaison library roles have developed their own set of skills including social media, scholarly communications and marketing as part of continuing their own professional development and support their services. This knowledge can be transferred to researchers who take an active interest in scholarly communications especially when introduced to altmetric data, such as blog, social and news media posts about their research. For academics to understand and exploit altmetrics better they require a more rounded knowledge of what these tools do and which ones they should invest their limited time in. We cannot automatically assume an academic knows what a blog is, or what Reddit does. In the same way we cannot assume that because an academic is using Twitter that they are getting the most from it. A skilled and tech savvy library and information professional can aid their ongoing development whilst forging strong links.

Conclusion

Altmetrics are just part of an ever-changing landscape, one that is helping shape academia but also the library world. For altmetrics to become established and maximise its use to all interested parties it needs champions to help others explore their own data. These champions must be critical and work with the platforms in providing feedback whilst staying up to date with developments. Whilst technologies such as social media and initiatives like open access and research data management continue to evolve, altmetrics will hopefully evolve to reflect these changes. This is state of change is inevitable for the foreseeable future. Therefore it is essential if the academic is to stay abreast of these changes that they receive continued levels of support.

The impact agenda, media and public understanding of research is increasingly becoming important as is the methods for measuring those communications. Altmetrics give useful insights into this online activity, whether it be data downloads, social media shares or global news coverage. In a post Web 2.0 world, academics, institutions, fund holders and publishers are looking for new opportunities to communicate, share and measure their research. The communication of research is without doubt worthwhile, but somewhat devalued if there is no or little effort to explore where these conversations lead and what influence and impact they create. Citations remain the most prominent measure for an academic paper and that is unlikely to change in the foreseeable future. Yet it is evolving as other

research artefacts we previously ignored in measurable terms such as datasets are now being treated as citable entities. Nevertheless citations and impact scores does not tell us the whole picture in a digital academic ecosystem. A system that is increasingly complex, changeable and diverse and that can be explored, made sense of and mapped out with the aid of the library and information professional.

- Bornmann, L. (2015) Usefulness of altmetrics for measuring the broader impact of research: A case study using data from PLOS and F1000Prime. *Aslib Journal of Information Management*, [Online] 67 (3), 305–319. Available from: doi:10.1108/09574090910954864.
- Brown, J.D. (2014) Citation searching for tenure and promotion: an overview of issues and tools. *Reference Services Review*. [Online] 42 (1), 70–89. Available from: doi:10.1108/RSR-05-2013-0023.
- Costas, R., Zahedi, Z. & Wouters, P. (2015) Do 'altmetrics' correlate with citations? Extensive comparison of altmetric indicators with citations from a multidisciplinary perspective. *Journal of the Association for Information Science and Technology*. [Online] 66 (10), 2003–2019. Available from: doi:10.1002/asi.23309.
- Davis, P.M., Lewenstein, B. V, Simon, D.H., Booth, J.G., et al. (2008) Open access publishing, article downloads, and citations: randomised controlled trial. *BMJ (Clinical research ed.)*. [Online] 337a568. Available from: doi:10.1136/bmj.a568.
- Fenner, M. (2013) What Can Article-Level Metrics Do for You? *PLoS Biology*. [Online] 11 (10), 1–4. Available from: doi:10.1371/journal.pbio.1001687.
- Haustein, S., Peters, I., Bar-Ilan, J., Priem, J., et al. (2013) Coverage and adoption of altmetrics sources in the bibliometric community. *Scientometrics*. [Online]. pp.1–19. Available from: <http://www.scopus.com/inward/record.url?eid=2-s2.0-84891454734&partnerID=40&md5=e3c3cfb94a91b5095d605b26f70c164c>.
- Holmberg, K.J. (2015) *Altmetrics for Information Professionals: Past, Present and Future*. First. Oxford, Chandos Publishing.
- Konkiel, S. (2013) Altmetrics a 21st century solution to determining research quality. *Online Searcher*. [Online] 37 (4), 10–15. Available from: <http://www.scopus.com/inward/record.url?eid=2-s2.0-84884361245&partnerID=40&md5=6873d33f551fdf1d78f4bc6b227f526b>.
- Lapinski, S., Piwowar, H. & Priem, J. (2013) Riding the crest of the altmetrics wave: How librarians can help prepare faculty for the next generation of research impact metrics. *College and Research Libraries News*. [Online] 74 (6), 292–294+3300. Available from: <http://www.scopus.com/inward/record.url?eid=2-s2.0-84879349278&partnerID=40&md5=206eefe7dad72dabfbc09841cdb251fa>.
- Malone, T. & Burke, S. (2016) Academic Librarians' Knowledge of Bibliometrics and Altmetrics. *Evidence Based Library and Information Practice*. [Online] 11 (3), 34–49. Available from: doi:<http://dx.doi.org/10.18438/B85G9J>.
- Martin, B.R. (2016) Editors' JIF-boosting stratagems - Which are appropriate and which not? *Research Policy*. [Online] 45 (1), 1–7. Available from: doi:10.1016/j.respol.2015.09.001.
- Nieminen, P., Carpenter, J., Rucker, G. & Schumacher, M. (2006) The relationship between quality of research and citation frequency. *BMC medical research methodology*. [Online] 6 (3), 42. Available from: doi:10.1186/1471-2288-6-42.
- Ophof, T. (2013) Inflation of impact factors by journal self-citation in cardiovascular science. *Netherlands Heart Journal*. [Online] 21 (4), 163–165. Available from: doi:10.1007/s12471-013-0384-0.

- Priem, J. (2010) *I like the term #articlelevelmetrics, but it fails to imply *diversity* of measures. Lately, I'm liking #altmetrics.* [Online]. 2010. Twitter. Available from: <https://twitter.com/jasonpriem/status/25844968813> [Accessed: 23 August 2016].
- Priem, J., Taraborelli, D., Groth, P. & Neylon, C. (2010) *Altmetrics: A manifesto.* [Online]. Available from: <http://altmetrics.org/manifesto/>.
- Rao, T.S.S. & Andrade, C. (2011) The MMR vaccine and autism: Sensation, refutation, retraction, and fraud. *Indian Journal of Psychiatry.* [Online] 53 (2), 95–96. Available from: doi:10.4103/0019-5545.82529.
- Reed, K., McFarland, D. & Croft, R. (2016) Laying the Groundwork for a New Library Service: Scholar-Practitioner & Graduate Student Attitudes Toward Altmetrics and the Curation of Online Profiles. *Evidence Based Library and Information Practice.* [Online] 11 (2), 87–96. Available from: doi:10.1016/j.acalib.2010.05.004.
- Roemer, R.C. & Borchardt, R. (2015) *Meaningful Metrics: A 21st Century Librarian's Guide to Bibliometrics, Almetrics, and Research Impact.* First. Chicago, ALA Editions.
- Showers, B. (2016) The evolution of library metrics. In: Andy Tattersall (ed.). *Altmetrics - A practical guide for librarians, researchers and academics.* First. [Online]. London, Facet Publishing. pp. 49–65. Available from: <http://www.facetpublishing.co.uk/title.php?id=300105>.
- Stuart, D. (2015) Metrics for an increasingly complicated information ecosystem. *Online Information Review.* [Online] 39 (6), 848–854. Available from: doi:10.1108/OIR-06-2015-0174.
- Tattersall, A.E. (2016) *Altmetrics: A practical guide for librarians, researchers and academics.* First. Andy Tattersall (ed.). [Online]. London, Facet Publishing. Available from: <http://www.facetpublishing.co.uk/title.php?id=300105#.Vp5CbnhCM8>.
- Waltman, L. & van Eck, N.J. (2012) The inconsistency of the h-index. *Journal of the Association for Information Science and Technology.* [Online] 63 (2), 406–415. Available from: doi:10.1002/asi.
- Wilhite, a. W. & Fong, E. a. (2012) Coercive Citation in Academic Publishing. *Science.* [Online] 335 (February), 542–543. Available from: doi:10.1126/science.1212540.