

---

## Altmetrics in Social Sciences and Humanities: Possibilities, Challenges, and Experiences

**Johanna Lahikainen**

Helsinki University Library, Research Services, University of Helsinki, Helsinki, Finland

E-mail address: johanna.lahikainen@helsinki.fi



Copyright © 2016 by Johanna Lahikainen. This work is made available under the terms of the Creative Commons Attribution 4.0 International License: <http://creativecommons.org/licenses/by/4.0>

---

### Abstract:

*This paper discusses altmetrics and describes the results of Helsinki University Library's altmetrics pilot using the PlumX software by EBSCO. The term 'altmetrics' comes from 'alternative metrics' and it has been offered as an alternative to or rather extending traditional bibliometrics. Scholars and other representatives in the sciences worldwide have found traditional bibliometrics and research assessment increasingly problematic. Journal impact factors, commonly used in research evaluation, do not tell us anything about the quality of a single article in a journal, only of the impact and reputation of the journal in question. Moreover, bibliometric tools are not always used in a transparent nor research field appropriate way, as they should.*

*Altmetrics focuses on the publication itself, not the journal or publisher. Citations take time to build, but altmetrics shows current discussion and societal and economic engagement. It tells us how the publication is discussed and liked in social media and other online services, for instance blogs, Twitter, Facebook, Mendeley, etc.*

*In Helsinki University Library's altmetrics pilot with PlumX (EBSCO) in 2015, we found that altmetrics tools often work better in fields such as medicine and natural sciences. Because many subjects important to social sciences and humanities are local and publications are written in local languages, not in English, the tools fail to serve social sciences and humanities as well as medicine and natural sciences.*

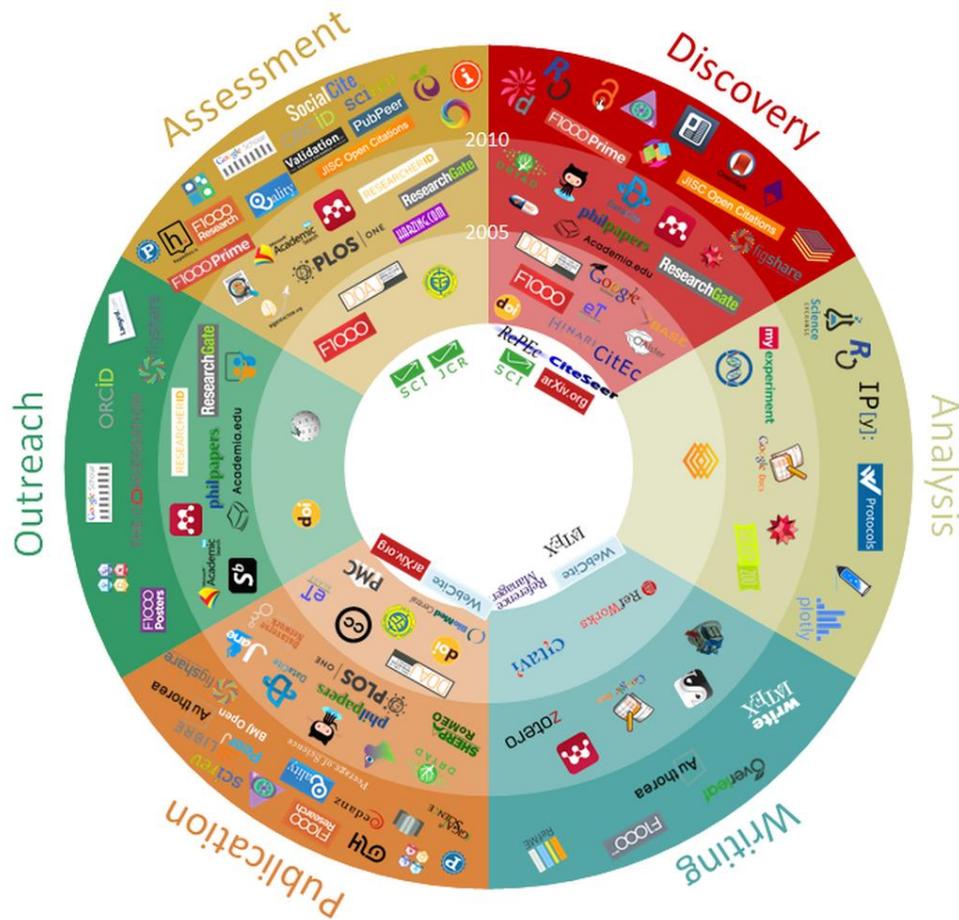
*Academic libraries should take part in developing and using altmetrics tools in collaboration with other libraries and researchers. As always, it is important that research field differences must be taken into account.*

**Keywords:** altmetrics, bibliometrics, social sciences and humanities, PlumX, Helsinki University Library

---

## Introduction: Bibliometrics and Altmetrics

Due to the digital revolution, scholarly communication and publishing has changed profoundly. This visualization, “101 Innovations in Scholarly Communication”, by Jeroen Bosman and Bianca Kramer from Utrecht University Library describes the current digital world of researchers:



Jeroen Bosman and Bianca Kramer: “101 Innovations in Scholarly Communication”, <https://innoscholcomm.silk.co/>.

This new working environment changes the way researchers work and how they publish. It also demands a new way of assessing the impact of their publications.

In the academic world, bibliometric tools are used to evaluate and assess the impact of research publications. In bibliometric analyses h-indices, journal impact factors, and citations are measured and counted. Academic institutions and research funding bodies use bibliometric tools when they evaluate whether a person should get tenure, promotions, or funding.

Scholars and other representatives in the sciences worldwide have found traditional bibliometrics and research assessment increasingly problematic. As writers behind *Leiden Manifesto for research metrics* state, “[i]n many cases, researchers and evaluators still exert

balanced judgement. Yet the abuse of research metrics has become too widespread to ignore” (Hicks et al. 2015).

Alongside *Leiden Manifesto*, *Altmetrics: A manifesto* (2010) and *San Francisco Declaration on Research Assessment DORA* (2014) have declared that research evaluation indicators, such as h-indices and journal impact factors, are often misleading and vulnerable to gaming. Journal impact factors, commonly used in research assessment, do not tell us anything about the quality of a single article in a journal, only of the impact and reputation of the journal in question.

As *Altmetrics: A manifesto* crystallises:

- Peer-review has served scholarship well, but is beginning to show its age. It is slow, encourages conventionality, and fails to hold reviewers accountable. [...]
- Citation counting measures are useful, but not sufficient. Metrics like the h-index are even slower than peer-review: a work’s first citation can take years. Citation measures are narrow; influential work may remain uncited. These metrics are narrow; they neglect impact outside the academy, and also ignore the context and reasons for citation.
- The JIF [journal impact factor], which measures journals’ average citations per article, is often incorrectly used to assess the impact of individual articles. It’s troubling that the exact details of the JIF are a trade secret, and that significant gaming is relatively easy. (Priem et al. 2010.)

Bibliometric tools are not always used in a transparent nor research field appropriate way, as they should. Disciplines should not be compared or mistakes can be made: the analyses must always be made within a discipline or within similar disciplines. As *Leiden Manifesto* argues, “no single evaluation model applies to all contexts”. Instead, one should remember to “[m]easure performance against the research missions of the institution, group or researcher” and “account for variation by field in publication and citation practices” (Hicks et al. 2015).

Due to the financial scarcity, funding bodies and other parties ask for proof of societal impact of research. Scholars have increasingly started using web services in communicating their research. Traditional bibliometrics is not up to date with these developments. (See e.g. Holmberg 2015.)

Traditional bibliometric tools, such as journal impact factors and h-indices, do not capture the research connected artefacts in the web, such as

- Open datasets
- Infographics
- Slides
- Videos (e.g. recorded lectures)
- Podcasts
- Blog posts
- Conference posters
- Wikipedia posts and mentions
- Press coverage
- Bookmarking in reference managers, such as Mendeley, Zotero, CiteULike etc.
- Social media: Twitter, Facebook etc.
- Research networks: ResearchGate, Academia.edu, Mendeley, Social Science Research Network

- Social news sites. (See e.g. Priem & Piwowar 2016; Priem et al. 2010; Romer & Borchardt 2015).

As we can see, bibliometrics has shortcomings and problems. Instead of abandoning bibliometrics altogether, there is demand for a “broader, more diverse, more nuanced metrics” and view of impact (Priem & Piwowar, 2015, vii). Altmetrics is often seen as an answer to this need.

### **What is altmetrics?**

The term ‘altmetrics’ comes from ‘alternative metrics’ and it has been offered as an alternative to or rather *augmenting* traditional bibliometrics.

At its largest, altmetrics is not only an effort to find new way to measure the impact of publications online, but as Romer and Borchardt put it, “invention of a whole new set of tools and scholarly practices” (Romer & Borchardt 2015, 101). In their manifesto, Priem et al. state that:

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. (Priem et al. 2010.)

While altmetrics can be seen as this grand project, it is also a new way of doing bibliometrics and for the purposes of this paper, this smaller scale definition is more practical. As Kim Holmberg notes, altmetrics cannot replace traditional bibliometrics and research assessment, but it can complement them (e.g. Holmberg 2015). According to Romer and Borchardt, altmetrics is “less “alternative” than it is an extension of the same impulse to measure, track, and analyze scholarly activity as befits the practices and tools of the current age” (Romer & Borchardt 2015, 100).

Romer and Borchardt discern three distinct qualities:

- 1) [A]ltmetrics is inseparable from the Internet, and more specifically, from the social aspects and areas of the Internet known as the social web. [...]
- 2) [A]ltmetrics is driven by the new, both in the sense of the necessary creation of new metrics and the availability of new data related to the social web.
- 3) [A]ltmetrics is always tied back in some way to scholarship. (Romer & Borchardt 2015, 99.)

Unlike traditional bibliometrics tools, altmetrics focuses on the publication itself, not the journal or publisher. Citations take time to build, but altmetrics shows current discussion and societal and economic engagement. It tells us how the publication is discussed and liked in social media and other online services. Altmetric tools, such as PlumX, collect the following data of the publication’s (be it slides, video, podcast, book or article) life in the Internet:

- Usage metrics
  - Clicks / Views
  - Downloads
  - Sales / Holdings (Amazon sales, WorldCat library holdings etc.)

- Capture metrics
  - Bookmarks
  - Forks (for instance GitHub, online Open Access code repository)
  - Favourites
  - Saves / Readers
- Mentions
  - Blog posts
  - Comments
  - Reviews
  - Attributions
- Social media metrics
  - Likes
  - Shares and tweets
- Scores and rankings
  - Altmetric's altmetric score
  - Impactstory's Altmetrics Percentiles (data from Mendeley, Scopus, Delicious, Twitter, Figshare). (Rohmer & Borchardt 2015, 106-116.)

There are also venue specific altmetrics: Public Library of Science (PLOS) and Wiley Journals have incorporated altmetrics tools to their platforms.

### Altmetrics Milestones by Year

- ▼ 1990: Tim Berners-Lee writes the first web browser as part of the World Wide Web.
- ▼ 1994: Social Science Research Network (SSRN) launches.
- ▼ 1997: Tomas C. Almind and Peter Ingwersen coin the term *webometrics* in a published paper.
- ▼ 1998: International DOI Foundation (IDF) is created to develop the digital object identifier (DOI) system.
- ▼ 2003: Social bookmarking service Delicious (now known simply as Delicious) is founded.
- ▼ 2004: Online social networking service Facebook launches at Harvard University.
- ▼ 2004: Richard Cameron begins developing academic social bookmarking site CiteULike.
- ▼ 2006: The first full version of Twitter becomes available to the public.
- ▼ 2006: Open access peer-reviewed journal *PLOS ONE* is established.
- ▼ 2008: Academic networks Academia.edu, Mendeley, and ResearchGate launch online.
- ▼ 2008: The ResearcherID author identification system is introduced by Thomson Reuters.
- ▼ 2010: The Open Researcher and Contributor ID (ORCID) nonprofit is founded.
- ▼ 2010: Dario Taraborelli launches ReaderMeter.
- ▼ 2010: Jason Priem coins the term *altmetrics* via Twitter.
- ▼ 2010: Jason Priem, Dario Taraborelli, Paul Groth, and Cameron Neylon publish "Alt-Metrics: A Manifesto."
- ▼ 2011: Mark Hahnel launches the online digital repository Figshare.
- ▼ 2011: Andrea Michalek and Mike Buschman start altmetrics-focused Plum Analytics.
- ▼ 2011: Euan Adie founds Altmetric, an altmetrics aggregator site.
- ▼ 2012: Jason Priem and Heather Piwowar launch Total-Impact (later renamed Impactstory).
- ▼ 2012: Elsevier partners with Altmetric to add altmetrics data to Scopus.
- ▼ 2013: Elsevier acquires Mendeley.
- ▼ 2014: EBSCO Information Services acquires Plum Analytics.
- ▼ 2014: Wiley officially partners with Altmetric to add altmetric data to its journals.
- ▼ 2014: Impactstory announces a new individual subscription model.

History of altmetrics, (Rohmer & Borchardt 2015, 104.)

In the World Wide Web, the discussions of scholarly work are no longer only academic; indeed they more often are done by people outside academia. In social media, anyone can and do take part in conversation about research. (See e.g. Holmberg 2015.)

Altmetrics is often connected with concept of Open Science and Open Access. The artefacts discussed in the web are mostly freely available. It is hoped that altmetrics would advance Open Science by showing the researchers the attention and visibility their research gets in the digital world (Holmberg 2015; Holmberg 2016, 71).

### Helsinki University Library's PlumX Pilot

Helsinki University Library was the first academic library in Finland to use PlumX. The software was licenced in 2015 and the first researchers added were from medicine. (Englund et al. 2015.) The negotiations with university and EBSCO's lawyers took months during

summer and autumn, causing frustration within the library staff: when can we start testing the software? When can we make it open to the public?

EU regulations make it more complex to import publication information to outside EU than within EU (with PlumX, the information must be sent to USA). University lawyers found it necessary to work with every researcher to give individual consent to take part in our pilot due to the information importation regulations.

PlumX was tested on all four campuses of University of Helsinki. The website was opened to the public in November.

In Helsinki University Library's medical campus library, the researchers have been very interested in this new service and their feedback has been positive. They publish mostly articles, in English, and in international journals. Thus their publications work well with PlumX. Even though researchers have been positive about the pilot, altmetrics is a new and unclear concept for most of them. (Englund et al. 2015.)

At the City Centre Campus, which houses the research fields of social sciences and humanities, library made PlumX profiles for 11 researchers. The group in question, 11 researchers, were from two disciplines: Media and Communication Studies (seven scholars) and Gender Studies (four scholars). Most of these scholars write especially books, popular articles, and blog posts in local languages Finnish and Swedish. However, PlumX would work best with material written in English. (Englund et al. 2015.)

Scholars in social sciences and humanities have been more sceptical about the new software, asking us questions such as:

- Why should I consent to this pilot?
- How will my information be used?
- Who benefits from this?
- Will this information be used in research assessment?
- Can I remove my profile whenever I want to?

These are excellent questions and we have been trying to answer them as well as we can. At least in Finland, it appears that researchers in social sciences and humanities often have critical attitudes towards new research assessment related projects. When discussing the pros and cons of for instance ORCID ID (Open Researcher and Contributor ID), some of the researchers have seen the identifiers' potential use of controlling people instead of only helping them.

### *The Visibility of Local Research*

In Helsinki University Library, there was a hope that altmetrics would be helpful for social sciences and humanities, which do not benefit from traditional bibliometrics as well as medicine and natural sciences. This, however, at least in our pilot, does not seem to work as wished: PlumX works best with medicine and natural sciences, and fields that are close to them, but is less compatible with social sciences and humanities and fields reminiscent of them.

Because many subjects important to social sciences and humanities are local and publications are written in local languages, not in English, the tools fail to serve social sciences and humanities as well as medicine and natural sciences. (Englund et al. 2015.)

It would be important to create altmetric tools for researchers who publish in local languages. *Leiden manifesto* urges us to remember the importance of national and regional research:

In many parts of the world, research excellence is equated with English-language publication. [...] The impact factor is calculated for journals indexed in the US-based and still mostly English-language Web of Science. These biases are particularly problematic in the social sciences and humanities, in which research is more regionally and nationally engaged.

This pluralism and societal relevance tends to be suppressed to create papers of interest to the gatekeepers of high impact: English-language journals. [...] Lost is the specificity [...] Metrics built on high-quality non-English literature would serve to identify and reward excellence in locally relevant research. (Hicks et al. 2015.)

One of the participating researchers hoped that PlumX could follow the hashtags they give to their conferences, seminars and meetings. She would enjoy being able to follow the digital discussion from one place.

Many Finnish journals do not yet give Digital Object Identifiers (DOI) to articles they publish. DOI would be helpful in using PlumX: the software finds and recognizes the digital discussion of articles with DOI identifier much easier than the articles' that do not possess the identifier. (Englund et al. 2015.)

Even though the pilot was not as successful in social sciences and humanities as it was in medicine and natural sciences, the library staff participating in the pilot found it important to continue working with the software, and especially to try to find new ways to make it work better with these research fields. At present, at least in the Finnish context, it is not possible to have reliable and extensive altmetrics results regarding social sciences and humanities publications in local languages.

### *Challenges in Publication Registers*

One of the problems our project encountered was the limits in our publication register: researchers do not always keep their profiles' publication lists up to date, so there is demand for librarian handwork in order to improve the coverage. In social sciences and humanities, importing from Web of Science and Scopus does not work as well as natural sciences and medicine. Either the scholars themselves or the library staff has to replenish the publication lists.

The pilot has shown the need to be automated as much as possible. When the softwares (for instance PURE and PlumX) do not work together as desired, the needed handwork makes it impossible to extend the service.

### *Importance of Accurate Researcher Identification*

The importance of researcher identification has become poignant during the altmetrics pilot. The ORCID research identifier especially would be very useful. (Englund et al. 2015.)

During their careers, people often change their names or institutions, and tracking their publications becomes more difficult. This makes metrics and altmetrics difficult. Many commercial operators, like Elsevier and Thomson and Reuters, have created their own researcher IDs in order to distinguish authors with similar or reminiscent names. However, it became soon necessary to have an universal ID, offered by a non-profit organization. ORCID (Open Researcher and Contributor ID) started in 2012.

ORCID ID has been seen as important in the national level, too. In 2015, the Finnish Ministry of Culture and Education gave national IT Center for Science (CSC) a mandate to form a national ORCID collaboration group with those higher education institutions, who are interested in using ORCID. CSC, on behalf of the collaboration group, has negotiated a consortium with ORCID and several Finnish higher education institutions, including University of Helsinki. The consortium agreements were signed in May 2016.

In Finland, the recommendation is that libraries should not create an ORCID ID for researchers, they have to do it themselves. Many librarians would find it easier if we could do it for our customers and add it to our publication registers. Now, it is a question of marketing and recommending.

### *Future Plans*

In 2016, several Finnish university libraries have purchased the PlumX software through our national FinELib consortium. It is too early to say whether it will prove to be useful enough and will the participating institutions want to continue the contract.

The Finnish Ministry of Education and Culture has asked the national IT Center for Science to create a new national education register, a data warehouse, for higher education. This new service is called VIRT.A. In the near future, all higher education institutions in Finland will start reporting their publications to the Ministry through VIRT.A. This national register will start operating during 2016 and there is an ongoing project, which will try to integrate altmetrics data from Altmetrics.com to it.



## Interaction of Music and Technology: The Music and Musical Instruments of Erkki Kurenniemi

Publication Year: 2015  
Researchers: Mikko Ojanen

USAGE	12	MENTIONS	12	SOCIAL MEDIA	309
Clicks	12	Comments	11	Likes	218
		Links	1	Shares	47
				Tweets	44

BOOK CHAPTER SUMMARY

TWEETS

WIKIPEDIA

This book chapter has 44 twitter interactions. It has received 14 tweets and 30 retweets.

14 TWEETS

30 RETWEETS

FULL ARTIFACT URL  
<https://mitpress.mit.edu/writing-unwriting>

The image shows a grid of 8 tweets from various users mentioning the book chapter. Each tweet includes a profile picture, name, handle, text, a link to the book chapter, a date, and a preview image of the book cover. The tweets are arranged in two rows of four.

- Samir Bhowmik** (@samir\_bhowmik): Writing and Unwriting (Media) Art History [mitpress.mit.edu/writing-unwriting](https://mitpress.mit.edu/writing-unwriting) 3:46 PM - 21 Apr 2016
- Jussi Parikka** (@juspar): A warm thanks to all who attended our #Kiasma event - and special thanks to Erkki Kurenniemi himself for coming!! [mitpress.mit.edu/writing-unwriting](https://mitpress.mit.edu/writing-unwriting) 2:15 PM - 5 Mar 2016
- Iikka Oramo** (@ioramo): Writing and Unwriting (Media) Art History [mitpress.mit.edu/writing-unwriting](https://mitpress.mit.edu/writing-unwriting)... Erkki Kurenniemi's pioneering work has been documented. 8:55 PM - 22 Feb 2016
- Michael Allan** (@faunheim): Writing and Unwriting (Media) Art History | The MIT Press [mitpress.mit.edu/writing-unwriting](https://mitpress.mit.edu/writing-unwriting)... 5:06 PM - 7 Jan 2016
- Jussi Parikka** (@juspar): 4.3. Kiasmassa - Erkki Kurenniemi-kirjämme (MIT Press) Suomen julkkarit! [mitpress.mit.edu/writing-unwriting](https://mitpress.mit.edu/writing-unwriting)... (Lisätietoja tilaisuudesta tulossa). 4:29 PM - 7 Jan 2016
- Rasmus Vuori** (@rasmusvuori): Writing and Unwriting (Media) Art History | The MIT Press [mitpress.mit.edu/writing-unwriting](https://mitpress.mit.edu/writing-unwriting)... 12:55 AM - 17 Nov 2015
- Jussi Parikka** (@juspar): Montreal at 3 pm - our book launch of the Erkki Kurenniemi-book! [mitpress.mit.edu/writing-unwriting](https://mitpress.mit.edu/writing-unwriting)... Join us at Media Art History 2015 at UQAM. 8:41 PM - 7 Nov 2015
- munter** (@munterluggauer): that's an interesting one: "self-archivist" | [mitpress.mit.edu/writing-unwriting](https://mitpress.mit.edu/writing-unwriting)... 4:33 PM - 6 Nov 2015

Example from musicology scholar and librarian Mikko Ojanen's profile: PlumX shows the tweets, which have mentioned his book article.

## Conclusion

Though it is difficult to say what altmetrics tools will look like in five years' time and what role they will play in research assessment and academic libraries, it is presumable that they will improve and thus the data and results will become more reliable also in social sciences and humanities.

As traditional bibliometrics, altmetrics has its flaws and shortcomings, too. Although the potential is certain, this new world of altmetrics is also a vulnerable one. As Holmberg writes:

The greatest potential of altmetrics is also its greatest disadvantage, namely diversity of data and data sources. The serious critique for altmetrics is mainly related to the data and the current lack of understanding of what the data actually represents. A methodological problem with altmetrics comes from the very dynamic nature of the web in general and social media in particular. Websites may disappear without a warning, while new sites enter the field. (Holmberg 2016, 71.)

The quality of data is essential: in order to produce good metrics, data must be good, and the metrics need to be as good as the data used to provide the results. Metrics are only helpful when the data they start with are high quality. (see e.g. Hicks et al. 2015.)

There are critics who see altmetrics as too easy to manipulate. If you want to cheat, you can: by creating, for instance, false Twitter accounts and using “automated social bots”. However, the means to find out this gaming are continuously improving. The temptation to manipulate the results can increase if the importance of altmetrics grows in research funding. (Holmberg 2016, 74.)

At present, it appears that altmetrics is at its most useful when used to prove the societal impact of researchers. It can be used to show current discussion of publications and topics. It has its problems and does not give definitive answers. With some researchers and research fields it works better than others.

Academic libraries should take part in developing and using altmetrics tools in collaboration with other libraries and researchers. In addition to using commercial software, it would be beneficial to incorporate their data into universities’ own or national publication registers.

National and international cooperation and connections would be necessary in order to add altmetrics tools into research publication databases. Libraries should try to develop altmetrics tools, for example, in their institutional repositories, in order to strengthen their community and proactively help researchers, for example, to prove their societal and cultural impact to funding agencies and increase their online visibility.

Creating academic libraries’ own altmetrics tools would be – if possible in the era of budget cuts – one solution. It is possible that this kind of experimenting on our own might give us the best results. Of course the commercial software is continuously improving due to feedback and criticism libraries give to the providers.

Even though altmetrics tools used by libraries are taking their baby steps, academic libraries should take part: we should test the software available to us, discuss the viewpoints important to us and scholars, give feedback and help the providers to develop their software.

Maybe the best results can be achieved through co-creation: academic libraries working together with commercial developers.

It should be remembered, that impact, the concept behind bibliometrics and altmetrics, is highly complex and ever-intriguing. As Romer and Borchardt write:

The first thing to know when it comes to measuring impact is that it is, strictly speaking, totally impossible. As an abstract human concept—like power or worth or cool—impact is inherently immeasurable. Still [...] impact is stubbornly viewed in academia as a question that must be answered (Romer & Borchardt 2015, 5).

## Acknowledgments

I am deeply grateful to IFLA Social Science Libraries Standing Committee Member Jennifer Ward for her invaluable help with this paper. I am privileged to have Service Director Pälvi Kaiponen as my superior: thank you for your support and all the wonderful opportunities you have given me. I am indebted to University Librarian Kimmo Tuominen and my colleagues in Helsinki University Library, especially Jukka Englund, Eva Isaksson, Susanna Nykyri, Valtteri Vainikka, Katja Kunttu, Taina Kettunen, Mikko Ojanen, Service Director Kirsi Luukkanen and my former colleague Maria Forsman. I wish to thank Mikko Tirronen, as always, for his support and help.

## References

- Englund J., Kaiponen P., Kettunen T., Kunttu K., Lahikainen J., Nykyri S., Vainikka, V. (2015) PlumX-altmetriikkapilotti Helsingin yliopiston kirjastossa – kokemuksia eri tieteenaloilta [”PlumX altmetrics pilot in Helsinki University Library – experiences from different research fields”]. Verkkari, Helsingin yliopiston kirjaston verkkolehti 4 / 2015. <http://blogs.helsinki.fi/verkkari-lehti/plumx-altmetriikkapilotti-helsingin-yliopiston-kirjastossa-kokemuksia-eri-tieteenaloilta> [Accessed in May 28th 2016]
- Hicks, D., Wouters, P., Waltman, L., de Rijcke, S. & Rafols, I. (2015) The Leiden Manifesto for research metrics. *Nature* 520, 429–431, (23 April 2015) doi: 10.1038/520429a [Accessed in May 28th 2016]
- Holmberg, K. (2015) Avoimen tieteen yhteiskunnallisen vaikuttavuuden mittarit. ”[Measuring the Societal Impact of Open Science”.] Portti-verkkolehti. <http://portti.avointiede.fi/yleista/avoimen-tieteen-yhteiskunnallisen-vaikuttavuuden-mittarit> [Accessed in May 25th 2016]
- Holmberg, K. (2016) *Altmetrics for Information Professionals. Past, Present and Future.* Chandos: Kidlington & Waltham.
- Priem, J. & Piwowar, H. (2016) Foreword. In Romer R. C. & Borchardt, R. (2015) *Meaningful Metrics. A 21-st Century Librarian’s Guide to Bibliometrics, Altmetrics, and Research Impact.* Association of College and Research Libraries. A division of the American Library Association: Chicago, pp. v-vii.
- Priem, J., Taraborelli D., Groth P., Neylon C. (2010) *Altmetrics: A manifesto*, 26 October 2010. <http://altmetrics.org/manifesto> [Accessed in May 25th 2016]

Romer, Robin Chin & Borchardt, Rachel (2015) Meaningful Metrics. A 21-st Century Librarian's Guide to Bibliometrics, Altmetrics, and Research Impact. Association of College and Research Libraries. A division of the American Library Association: Chicago.

San Francisco Declaration on Research Assessment. Putting science into the assessment of research. <http://www.ascb.org/dora/> [Accessed in May 29th 2016]