

Altmetrics - useful way for scientific communication

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Abstract: Altmetrics is defined as the creation and study of new metrics based on the social web for analyzing, and informing scholarship. Against well defined classical bibliometric indicators, based of number of citations (IF, h-index, g- index, Eugene factor etc.) which are criticized a lot for decades, from 2011 announces new way – alternative metrics (altmetrics). Actually, altmetrics give us broader aspects of state and development of science in informal manner. Altmetrics currently tracks sources from web 2.0 like Online reference managers (Mendeley, CiteULike social media (Twitter, Facebook, Google+) other online sources (Wikipedia ,YouTube) and many others. Four main Altmetrics services are: Altmetric, ImpactStory, PLOS and Plum Analytics. Altmetrics can measure scholarly output from variety of different resources on the web and give broader impressions about strictly defined scientific publications and results. For classical bibliometric analysis we used Leiden Ranking for five scientific disciplines and cumulative results for Serbian science and in last decade improves and we were in 2008 “raising star” in Europe on SCImago Journal & Country Rank. In this paper we show state of sciences and scientific disciplines in Serbia and some European countries. Altmetrics is certainly impetus for us, because we found some interesting, unexpected results about our science generally. Using PLOS which count downloads and from PLOS, PubMed including Wikipedia mentions, some of conclusion is that Medicine and health sciences are dominant. We aware that our further mission is

giving lectures about altmetric tools, social networks, references managers and many new achievements.

Keywords: Almetrics, bibliometric analysis, scientific evaluation, research output.

Introduction

Altmetrics is alternative metrics based on web metrics, which measures impact of different sources on the web and it gives more detailed information than classical bibliometric indicators. Every country measures impact of its science, researchers, scientific institutions and laboratories through official bibliometric indicators, but the prominence of papers becomes higher if alternative metrics is used.

Bibliometrics

Scientists worldwide publish their research in scientific publications or on web pages (digital repositories). Before publication the majority of scientific results has to be peer reviewed by experts in specific fields. After publication, scientific results are available to wider scientific community which uses them in a usual ethical way which is obeyed in scientific circles, i.e. it correctly cites these results.

The established evaluation method for scientific work is bibliometric indicators which determine productivity, quality or structure of a scientific network.

A bibliometric quantitative indicator which determines productivity of scientists or a research group is a number of publications which is easily determined by counting publications.

Citations are considered quality indicators, and the majority of other bibliometric indicators are based on citations (h-index, g-index, journal Impact Factor). The idea of Impact Factor (IF) was created as a means to help librarians to identify which journals to purchase, but not to measure scientific quality of an article. Citations are accredited as the result of impact of a specific scientific article on a scientific community.

Bibliometric indicators which are used worldwide and in Serbia are based on citation indexes of Web of Science (WoS) operated by Thomson Reuters company. WoS is a widely used source of data on citation worldwide, but it is not the only source of relevant data. Scopus and Google Scholar are also used to a great extent. In addition, there are national citation indexes such as Serbian Citation Index in our country.

One of the key disadvantages of citation indexes is the fact that they are slow and that there are journals which are commercialized.

Altmetrics

Due to these disadvantages the initiatives to improve the value system have been developed.

An initiative for better assessment of research was introduced in San Francisco DORA (Declaration on Research Assessment) on December 16, 2012. Elsevier supported the initiative on June 3, 2013.

In a wider context, this is scientific contribution based on the activities in online environments and with online tools. Altmetrics is attention indicator in non-traditional sources. If science is valued in this way, individual work of researchers is valued and research is visible in a wider scientific community. In a nutshell, the value of researchers' individual work is restored. (2016)

New concepts are introduced. Cybermetrics or webometrics is evaluation of everything on the Internet. Bibliometrics and scientometrics are two close concepts whose aim is to evaluate scientific material on the Internet and in science overall. Naturally, bibliometrics uses specific citation bases. (Jason and Hemminger, 2010.)

Altmetrics studies evaluation of scientific papers, peer reviewed, in index bases. Generally, all these concepts overlap and can be observed together in order to obtain the best prominence of the paper at the time. (2017a)

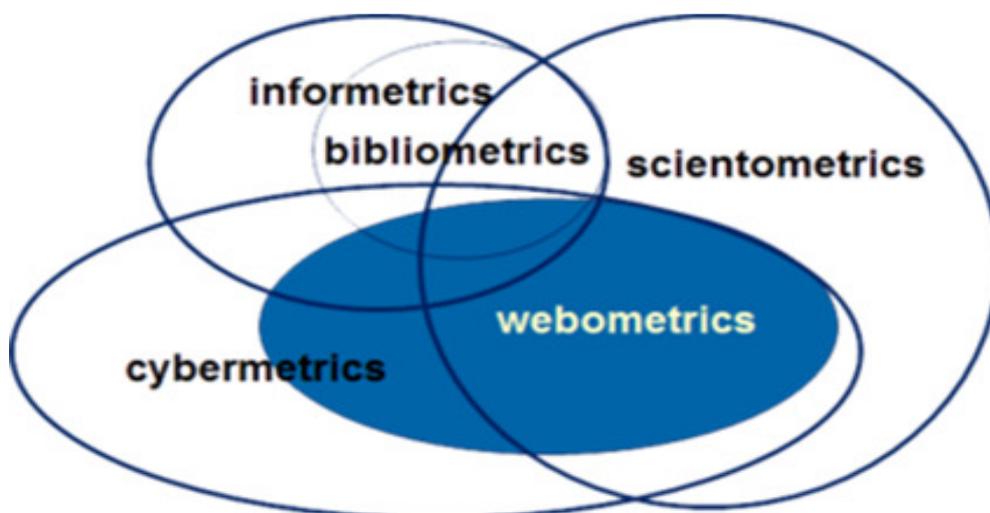


Chart 1. Correlation between different concepts for evaluation of science

Chart 1. shows overlapping of concepts for evaluation of science.

Altmetrics refers to:

1. Downloads,
2. Views,
3. Social networks mentions and discussions (Facebook, Twitter, blogs),
4. Scientific social networks (ResearchGate, Academia.edu)
5. Downloading in reference managers (Mendeley, Zotero, CiteULike)
6. Google Scholar citations
7. Wikipedia mention
8. Recommended articles

Correlation of altmetrics and bibliometrics indicators

Traditional bibliometrics attracts academic attention via IF journal, citation counting, h-index, g-index, number of publications, and altmetrics, impacts wider attention as regards number of views, downloads, Wikipedia mentions, and via readers on citation managers. Altmetrics especially influences early impact of research and helps authors to become recognized. It is especially useful for young researchers who have not become prominent in a scientific community valued by a number of citations and h-index. (Ivkovic 2017, Annarita, Gentili, and Rebuffi 2014)

Altmetrics keeps record also of the influence of work outside a scientific community. Naturally, the impact of research is higher if it is mentioned by more people, i.e. if it attracts more Altmetrics attention. Information about frequency of comments and discussion is therefore extremely important. (2017b)

Altmetrics in trainings at the University Library

For almost 15 years the University Library expert staffs organize trainings for librarians, PhD students and researchers to introduce and explain traditional bibliometric indicators which are officially used as they are prescribed by Rules for assessment of scientific research results. Last year we started training in altmetrics as nontraditional indicators of scientific work. We compared official bibliometric indicators and altmetrics which is used more in scientific circles. Unfortunately, scientists in Serbia do not use social networks to discuss scientific results, and they also do not use reference managers to the extent they are used in developed communities such as European scientific community.

Wiki Librarian at the University Library

In the last three years the University Library has successfully cooperated with Wikimedia Serbia within the project Wiki Librarian. Wikimedia Serbia is a non-

governmental, non-political, non-profit organization established as the fifth branch of Wikimedia Foundation on December 3rd 2005. The most important project of Wikimedia Foundation is Wikipedia, the most comprehensive online encyclopedia. The latest info as of May 1st 2017 shows that out of 295 Wikipedias, 284 is active.

The altmetric indicator, i.e. Wikipedia mentions, is the most relevant for this paper. Wikipedia as the secondary source of information has special value through reference articles. Every article has to cite valid and verifiable sources. In order to collect altmetric data such as Wikipedia mentions, citing references has to be done properly. Specific parameters in HTML output which enable reference management software to collect bibliographic metadata are used. General rule is to mark a particular item with one parameter.

The task of librarians in Wiki Librarian is to teach trainees to write encyclopedic articles by using wiki syntax, but also to use library sources of information (printed publications, digital repositories, e-journals, e-books and other sources on the Internet). Correct citing contributes to alternative prominence of references.(2017c)

Results

For classical analysis we use The CWTS Leiden Ranking, as for bibliometric analysis we exclusively use bibliographic data from the Web of Science database. The Centre for Science and Technology Studies (CWTS) studies dynamics of scientific research and its links to technology, innovation and society. It studies scientific and academic research from a scientific point of view. The CWTS Leiden Ranking for 2016 for Europe gives the following overview of ranking for the University of Belgrade (Figure 1).

| University | | P | P(top 10%) | PP |
|------------|--|------|------------|----|
| 51 | RWTH Aachen Univ | 5072 | 582 | |
| 52 | Charles Univ - Prague | 5046 | 306 | |
| 53 | Natl & Kapodistrian Univ Athens | 4893 | 367 | |
| 54 | Univ Belgrade University of Belgrade | 4865 | 238 | |
| 55 | Univ Bern | 4847 | 616 | |
| 56 | Univ Naples Federico II | 4844 | 427 | |
| 57 | Tech Univ Denmark | 4818 | 689 | |

Figure 1. University of Belgrade on CWTS Leiden Ranking

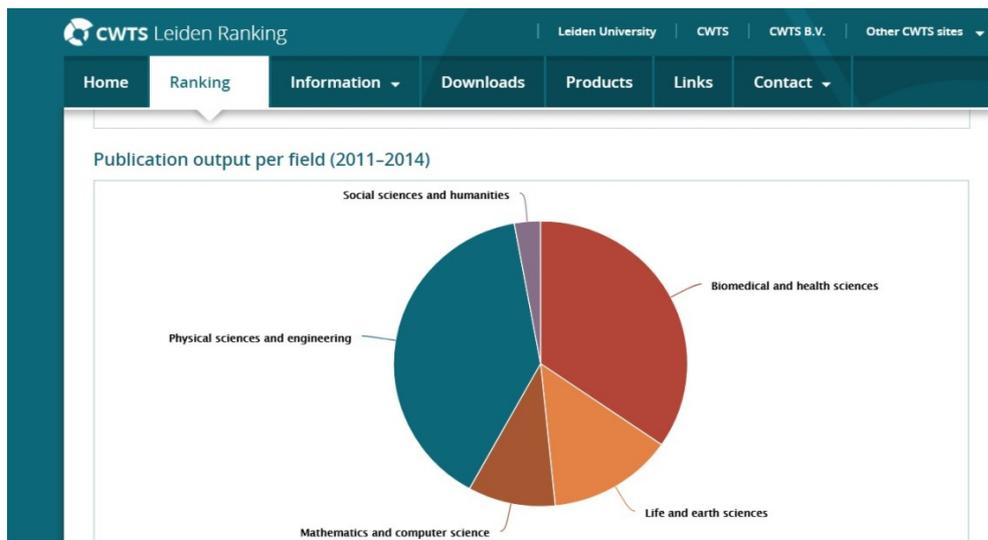


Figure 2. University of Belgrade by disciplines on CWTS Leiden Ranking

The figure 2. shows the highest output for physical sciences and engineering and Biomedical and health sciences at the University of Belgrade.

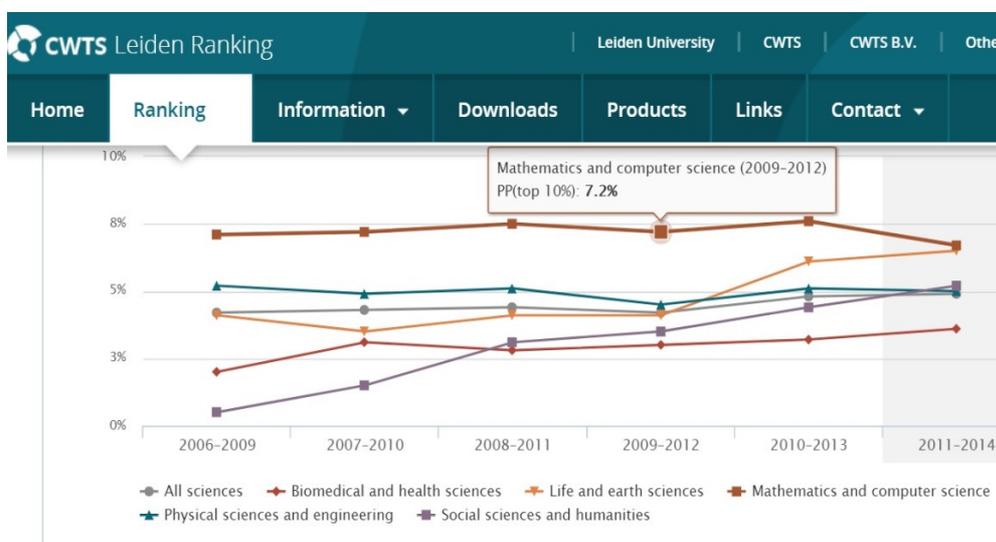


Figure 3. University of Belgrade by different disciplines on CWTS Leiden Ranking (2006 – 2014)

However, for the period between 2006 and 2014 Physical sciences and engineering, Life and earth sciences have a constantly high value, Mathematics and computer science and Social sciences and humanities have had a constant progress.



Figure 4. Charles University - Prague by different disciplines on CWTS Leiden Ranking (2011 – 2014)

Comparing results with the Charles University - Prague Biomedical and health sciences are dominant and Physical sciences and engineering follow.

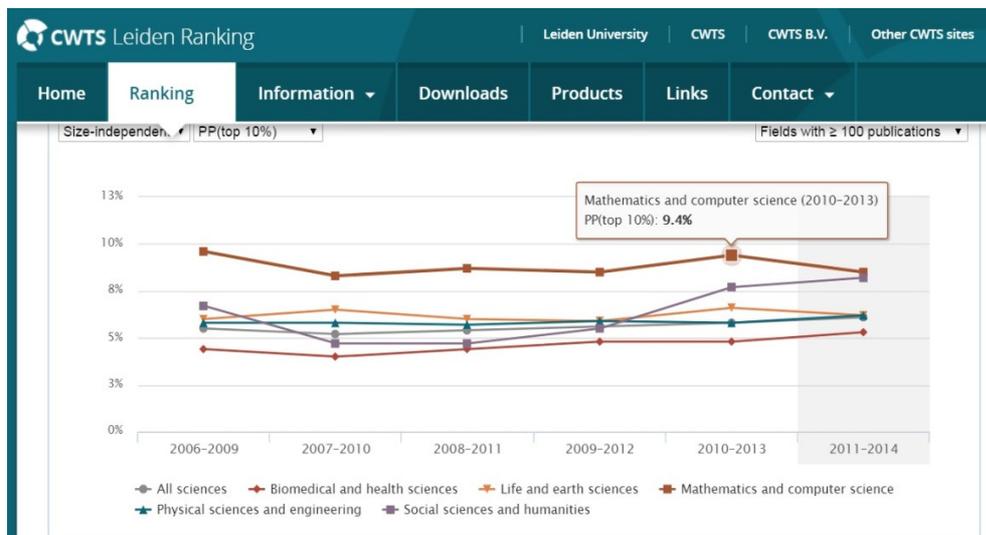


Figure 5. Charles University - Prague by different disciplines on CWTS Leiden Ranking (2006 – 2014)

However, when it comes to Charles University- Prague for the period between 2006 and 2014 Mathematics and computer science are highly ranked while other disciplines have constant ranking during this period. Oscillation of Social sciences and humanities until 2009 is interesting to note and then there is evident constant progress.

Altmetrics in practice

The following Altmetrics services are used:

1. **Altmetric** : <http://www.altmetric.com/>
2. **ImpactStory** : <https://impactstory.org/>
3. **PLOS** : <http://article-level-metrics.plos.org/>
4. **Plum Analytics Analytics** : <http://www.plumanalytics.com/>

Altmetric : <http://www.altmetric.com/>

Altmetric.com follows online activities related to academic and scientific productivity. Altmetric indicators are congregated in an altmetric donut, which shows different quantitative indicators in different colors which is very visually attractive. It follows social networks and blogs: Twitter, Facebook, Google+, then citation managers such as Mendeley, CiteULike and official documents such as Wikipedia, YouTube etc. Recently, they have started to count citations in WoS in a commercial version for institutions.



Figure 6. Altmetric donut

ImpactStory : <https://impactstory.org/>

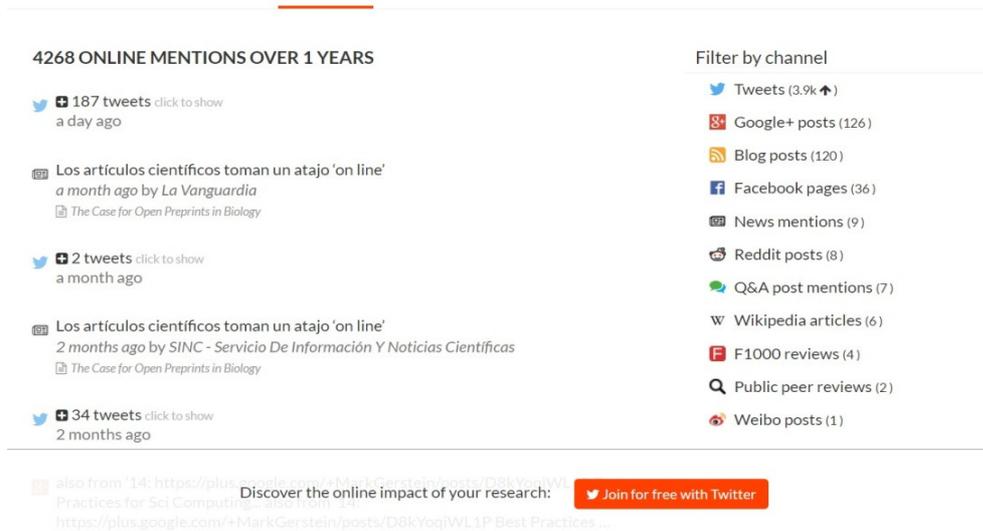


Figure 7. ImpactStory

ImpactStory is an Open source, which shows a number of citations obtained via Scopus, PubMed and CrossRef, but not via Google Scholar and Web of Science. It seems that ImpactStory differentiates between the impact of work in scholar and public metrics, while those in PLOS they considered such an approach unnecessary. In addition to usual altmetric indicators such as Facebook, Twitter and Google+ mentions, ImpactStory collects data from CiteULike and Mendeley, PLOS, and PubMed, number of comments, downloads and shares on SlideShare and YouTube.

PLOS : <http://article-level-metrics.plos.org/>

Public Library of Science (PLOS) comprises results from PLOS Journals (HTML, PDF, XML), PubMed Central (HTML, PDF), reference manager CiteULike, Mendeley, citations from CrossRef, Europe PMC, PubMed Central, Scopus, Web of Science. Also, discussions on PLOS Comments, Facebook, Reddit, Twitter, Wikipedia. The main strategy of PLOS is number of downloads. On the example 25 of the most cited papers in Serbia we got the following results.

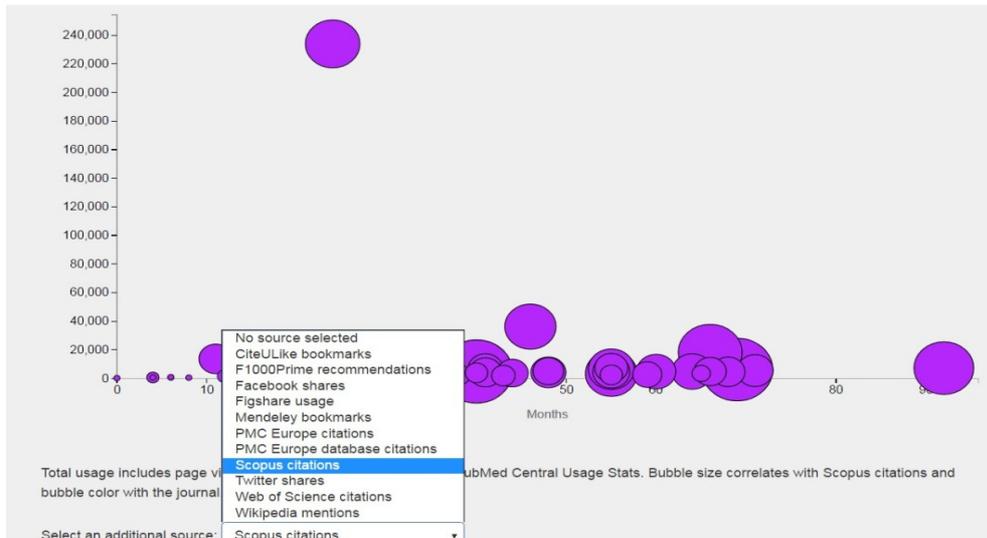


Figure 8. Scopus citation

Default search is Scopus citations, but other sources which can be seen in the picture are also searchable.

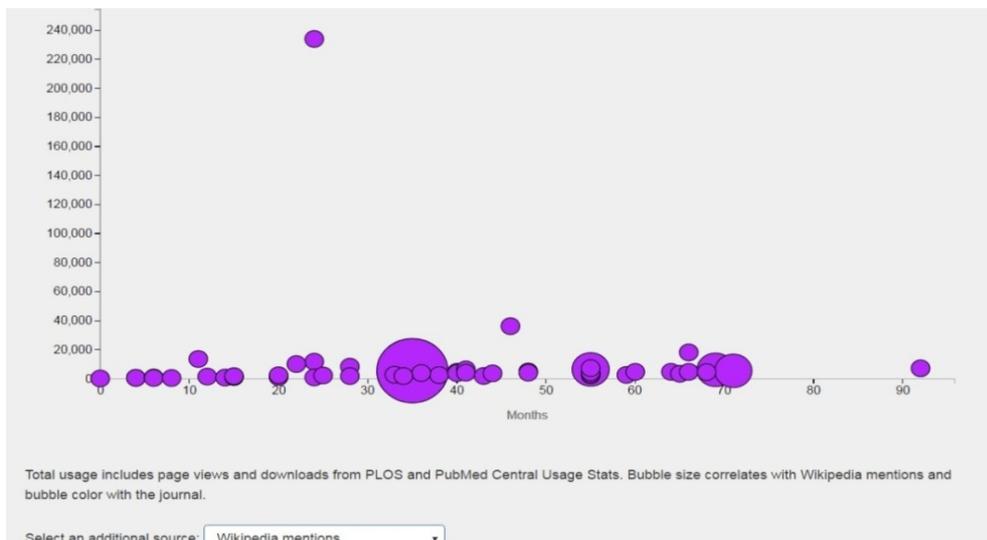


Figure 9. Wikipedia mentions

There is a significant difference if we apply Wikipedia mentions. As widely known, Wikipedia is an increasingly important source of information for many people.

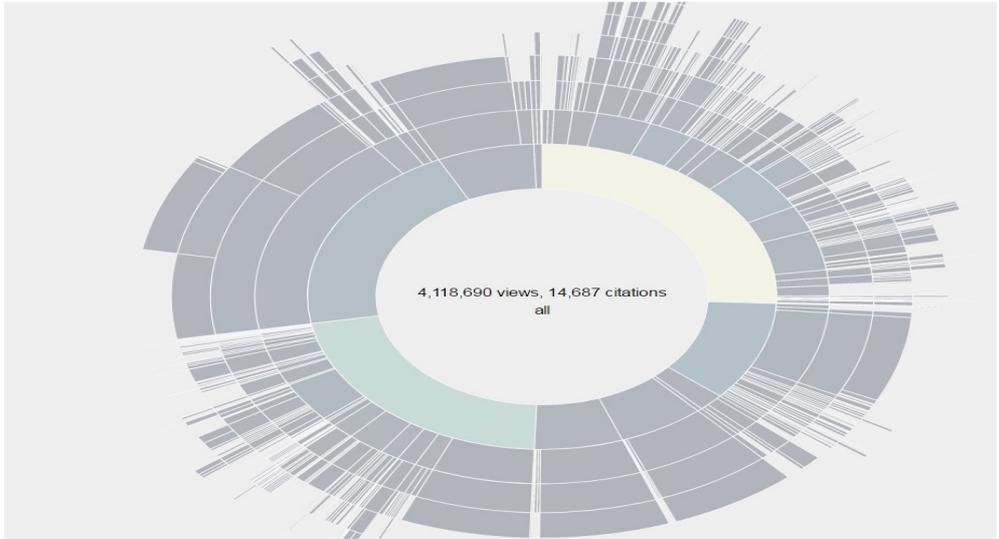


Figure 10. Number of views and citation

This picture shows somewhat different, but basically the same graphic chart.

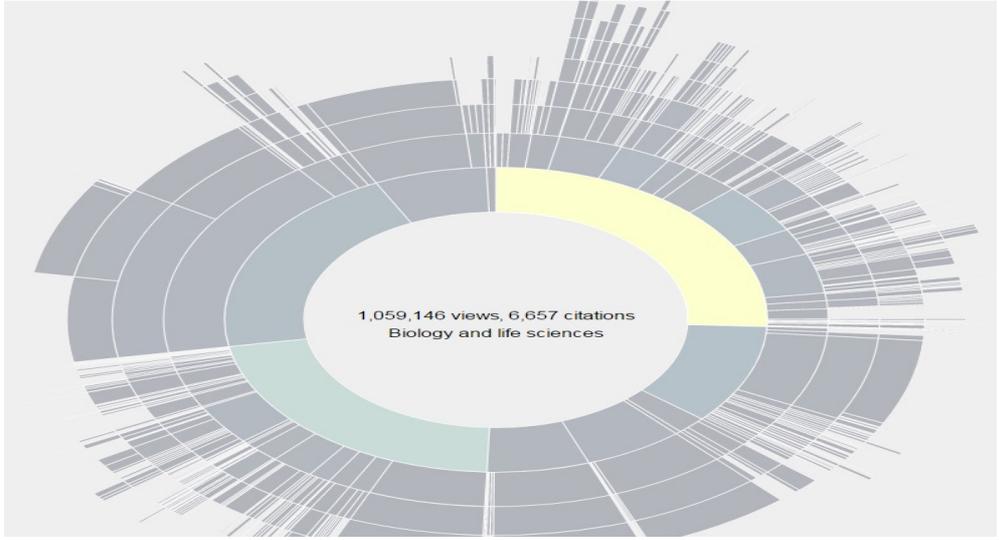


Figure 11. Number of views and citation in discipline Biology and life sciences

The analysis of all visible fields has shown that Biology and life sciences are the most representative.

Plum Analytics <http://www.plumanalytics.com/>

Plum Analytics is the most reliable service for altmetrics as it is very thorough. Their motto is: "Research output is more than articles. Measure it ALL!" The fact is that they

differentiate between a variety of publications, not just articles, books and book chapters but also video materials. The sources are also versatile in addition to the ones already mentioned such as Social Media, Wikipedia mention, You Tube. They use traditional sources such as Repository URL, DOI, ISBN, arXiv, PMID, Clinical Trial ID, PMCID and others. (@PlumAnalytics 2017)

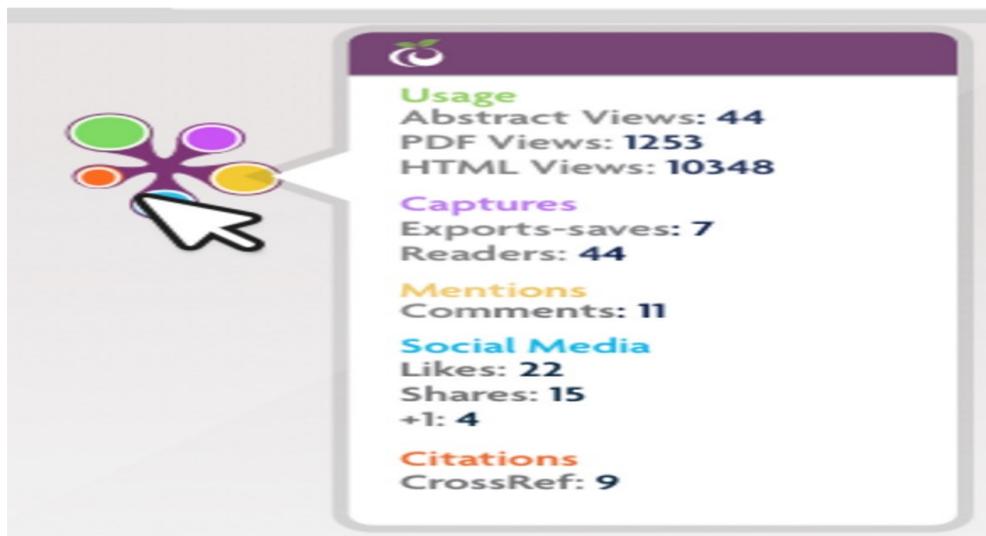


Figure 12. Plum Analytics

Plum Analytics uses a well known figure, and the picture shows meanings of some colours on it.

Conclusion

To our opinion, almetrics as alternative metrics is like an antithesis to classical metrics. The most important question are sources. For now, the sources are rather undefined and incomplete. However, following further development of almetrics it is obvious that the almetrics services are aware of it. Therefore, they have been establishing cooperation with commercial databases such as Web of Science, Elsevier, Scopus and many others. Every day through social media we follow development of almetrics, reading news like „Plum Analytics Joins Elsevier“.The increasing popularity of altmetrics shows the fact that more publishers put on their website very impressive „donut“ like BiomedCentral, Nature Publishing Group etc. The score of altmetric performance of publications by researchers in Serbia is not so visible. We are aware of that state so information specialists from the Librarians' Section of the Serbian Association of Institutes and University Library in Belgrade have regular education programs and some of many topics are Scientometrics and Altmetrics.

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