Report on Open Access Analytics for the SONAR-repository

Version 1.0

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1. Context

The SONAR repository (Swiss Open Access repository) aims to build a hub for Open Access (OA) publications in Switzerland (a) by harvesting existing institutional repositories of Swiss universities and (b) by providing an "Institutional Repository as a Service (IRaaS)" for Swiss academic institutions still lacking such an infrastructure. In the ideal case this repository will assemble all OA publications issued by Swiss academic or research institutions, or with participation from Swiss-based researchers. With this ideal case in mind it is only self-evident that one should also watch out for potential additional benefits from this collection. One of those bonuses could be the analysis of those data.

This report was produced with the intent to explore the possibilities and limits of such analytics. It is necessary to state at the beginning, that the field of "OA analytics" is quite vague: It could mean and include different things, different research questions, different methods, and different actors. This report is focused on the possibilities of OA analytics within the SONAR project, not across the whole field. Nevertheless it must be mentioned that the topics of OA and Open Science, at least concerning analytics, tend towards coalescence. Therefore, this report will use literature on "Open Science Analytics" as well.

It is important to underline that every institutional repository and every study or project on OA today has to deal with imperfect and incomplete data. It is not sensible to expect the SONAR repository to produce better data, as it deals with the same institutions, possibilities and so on. But, SONAR will be able to draw on proposed solutions to this problem, e.g. the ongoing collection of article processing charges (APCs) in the Open-APCs project (https://github.com/OpenAPC/openapc-de).

2. Aims of OA Analytics

OA Analytics is an umbrella term for all possible forms of analytics of data concerning OA. As every form of analysis, the concrete aims of analyses and questions asked are dependent on the stakeholders who define their areas of concern. OA as a topic is of concern for different stakeholders with sometimes conflicting interest. While OA is usually described as a form of scientific publication, it is not only scientists who are interested in analyses (or progress) of OA itself.

2.1 Stakeholders

Concerning OA analytics in the SONAR project, we can identify the following stakeholders:

- Research funding bodies (the SNF, swissuniversities, EU research and others) have established OA strategies
- Academic and research institutions, especially the management of those institutions
- Actors of science politics
- Researchers themselves
- Libraries (which, not only in the Swiss case, run most of the existing infrastructure for OA, including OA offices)
- Publishing houses
- The public
- Research on public communication, science studies etc. (OA as a research topic)

While e.g. the funding bodies are mostly interested in the impact of their strategies and policies, researchers are primarily interested in the concrete practices of OA in their everyday work. In the case of SONAR it is important to identify which actors with which interests exist. (See chapter 4-6.) Only then will it be sensible to define the questions that could be tackled by OA analytics itself.

2.2 Terms and open questions

OA analysis is not an established field of inquiry, but a relatively new and still versatile one. Concepts, terms, definitions, and boundaries are all still in flux. One indicative example is the fact, that the field still has no unifying name. This report uses the term “OA Analytics” (borrowed from the grant application for SONAR), but others use the name “Open Science Analytics” (Schöpfel & Prost 2019) or “OA monitoring”. Projects also run under the header “OA indicator” (Denmark) or “OA monitor” (Germany, Netherlands). As such, core concepts tend to be discussed and defined again and again, mostly using pragmatic technical solutions in the actual projects while theoretical debates are still continuing.

Three topics come up time and again.

- *What is OA? What forms of OA do exist?* There are discussions about the different forms and “flavours” (colours) of OA. Points of discussion are different licences, versions of publications, conditions of OA, and others. (Piwowar et al. 2018) Recently two different schemes of OA types have been presented, one from Austria (Danowski 2019), one from Germany (Taubert et al. 2019). It is too early to judge which typology of OA will outlive the others. Recently, projects on OA analytics tend to use the definitions of unpaywall (https://unpaywall.org), mainly because this data is available, but this could change very easily e.g. with new datasets becoming available, or a change in the way unpaywall defines forms of OA.
- All projects in the field of OA Analytics discuss *what should be counted as a scientific publication and what not*. While there seems to be an uneasy consensus – particularly under the umbrella term “Open Science” – that every form of publication can be a scientific one (ranging from peer-review articles to conference papers and presentations, reviews, pamphlets, to software and datasets), most of the projects limit themselves to published articles. This seems to be a pragmatic solution, because data for those kinds of publications is available while data on others forms of publications is not, at least today. But, criticism of the constraints of this solution is numerous and justified. (E.g. Schöpfel & Prost 2019 ; Shivaram & Biradar 2019).
- As will be discussed below, most of the projects on OA analytics are concerned with compliance with national or other policies. *What does compliance mean?* This again is not easy to determine. E.g., the Danish OA indicator is calculated with one year lagging behind reality to include publications with long embargo periods, but this is not common in other solutions. Also, the question remains which version of a publication should be counted to determine if there is a compliance or not. (See e.g. Kipphut-Smith et al. 2018)[1]

[1] “Many OA policies provide sufficient direction for authors, but less clarity for those charged with implementing and assessing the policy.” (Kipphut Smith et al. 2018: 10)

3. Solutions in other European Countries

Looking for precedence on OA analytics in other European countries we find two main forms of such analytics: singular analyses as one-shot studies and continuous analytics. The first form prevails, although it is not the preferred solution for SONAR.

3.1 One-Off Analytics

Many examples of OA analytics consist of one-off studies of OA rates of scientific publications and the like, commissioned by funders or actors in the field of science politics. Such studies almost always use the same data as basis for their analyses and almost always deliver results for one specific point in time. As such, their purpose is always limited.

The common data basis for such reports are data provided by Clarivate Analytics (Web of Science) or Elsevier (Scopus). The underlying data is, therefore, always limited to the publications included in those services, which for example excludes a lot of OA publications outside of the big publishing houses, e.g. scholar led OA journals (Ganz et al. 2019), or publications other than journal articles. This data is also biased towards English-language publications. Noticeably, nearly every study includes a chapter on the normalisation of the data purchased from those companies. It seems that the quality of these data sets is never good enough for direct analysis. As both of these providers are commercial companies, access to their data has to be paid for every time a study is conducted. However, as of today no viable alternative has been put forward.[2]

Most often the studies answer – based on the incomplete and biased data – questions like these:

- Percentage of OA publications (of different forms and licences) of the total of scientific publications in one country. (E.g. Jeangitard 2019; Melero et al. 2018; Mikki et al. 2018)
- Forms of participation of scientists and / or institutions based in the respective country on such OA-publications. (E.g. Baquero et al. 2019; Olsbo 2017)
- Comparisons with other countries and / or institutions and / or fields (E.g. De Filippo & Sanz-Casado 2018; Walters & Daley 2018).
- Comparisons within the respective countries (e.g. between universities, research institutions, and universities of applied sciences). (E.g. Baquero et al. 2019)
- Compliance with OA policies. (E.g. Kipphut-Smith et al. 2018)
- Since APC have been established as business model, the cost of OA publishing have also become a common question. (E.g. Sotudeh et al. 2019)

Some of those studies try to establish timelines, e.g. trends of the percentage of different forms of OA over time. But, as every study acquires the data anew and normalise it anew, the numbers are hardly comparable between those studies.[3]

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[2] WikiCite has been put forward as “an initiative to create a bibliographic database based on Wikidata.” (http://wikicite.org, 14.11.2019) In the future this project – or others – could develop into better – and free – data-bases for analytics of scientific publications. It would be suitable to monitor their progress. There is a clear need for a better, non-commercial solution for publication data. (See Herb 2018 who discusses the project of “Open Access Statistics” for Germany. The project failed due to legal requirements.)

[3] Data is always acquired for the specific purpose of one study, always with specific limitations. As such, it is not possible to verify that the data at any one point in time is compiled following the same policies than at another point in time. This adds to the problem of reproducibility of results form previous studies. (Laakso 2019)

3.2 Continuous Analytics

It is obvious, that singular studies of OA have limits, especially the data basis and the impossibility to deliver consistent claims on trends. Three solutions have been proposed to overcome these limitations by establishing systems for continuous analysis.

3.2.1 Using Current Research Information Systems

A number of European nations (mainly smaller ones like the Czech Republic, Slovakia, and The Netherlands[4]) and a growing number of individual academic institutions have established Current Research Information Systems (CRIS) or comparable structures. In some cases the use of such systems is mandatory for researchers in the respective nations and / or institutions. Every publication by any researcher based in such a country or institution should be recorded into the respective CRIS, following pre-defined metadata schemes, either by the institution or the researcher itself.[5] In the ideal case, such systems than provide a timely and complete overview on the scientific publications in the nation and / or institution.

Although this ideal case seems not to have been achieved anywhere (Azeroual & Schöpfel 2019), there are several proposals to use the data in those systems as a better data base for OA analyses. (E.g. Olsbo 2017) If the metadata includes the licences of every publication and if every publication is entered, this could be a more comprehensive database. Especially the question of the percentage of different forms of OA on the whole number of scientific publications would be easy to answer.

CRIS are usually run by academic or national research institutions itself, not commercial organisations like publishing houses. This could be a huge advantage. Those systems could be transparent concerning their data, the methods used and data structures. Researchers, research funders and other stakeholders could influence the data-gathering, e.g. by establishing what counts as publication or what counts as OA.[6]

Switzerland does not have a national CRIS, and at least as yet nearly no academic institution in Switzerland runs a CRIS. (Ribeiro, de Castro, Mennielli 2016) If this situation changes, it would be appropriate to explore the possibilities of CRIS for OA analysis.

3.2.2 Semi-automatic systems with input form universities and researchers (Denmark, France)

A growing number of European countries established or are in the process of establishing systems for monitoring their research output and OA, including Denmark and France.

The system of the Danish Open Access Indicator (see https://www.oaindikator.dk/en) is based on continuous input by universities and automatic data analysis: The indicator itself is calculated every year since 2018, following an annual production cycle, by the Danish Agency for Science and Higher Education (part of the Ministry of Higher Education and Science Denmark). While different sources of data are used, the main source is data provided by university repositories themselves. Those collect data on OA publications in their institution and submit these to the agency. Additionally, they contribute knowledge to a list of other data sources and of authors with

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[4] https://www.eurocris.org/DRISListAll.php?order=cfTitle

[5] In practice this could also mean that somebody does the data entry for the researcher, like a research assistant or a clerk. Those would act on the instruction of the researcher but maybe do not know enough about a publication to complete the whole set of desirable metadata.

[6] For one possible analysis with such data from Finland – although the quality of this data is described as not perfect , either – see Ilva, Laitinien, Saarti (2016).

affiliation to Danish universities, which then are used by the agency to gather more data and produce an annual report.[7]

The French Open Science Monitor (https://ministeresuprecherche.github.io/bso/) is produced by a comparable system. (Schöpfel & Probst 2019; Jeangirard 2019) Data is collected in a laborious three-step method: (1) identification of French authors using a publication database, (2) enrichment of this database, (3) detection of accessibility and OA status. The two main databases for this monitor are unpaywall and HAL (https://hal.archives-ouvertes.fr), a national OA repository for France. For detecting "French authors" the input of universities seems necessary. The HAL repository is filled by universities as well.[8]

Regarding the process behind the Dutch OA monitor there does not appear to be a transparent description, but it seems to follow a similar method. (https://www.openaccess.nl/en/in-the-netherlands/monitor)

3.2.3 Open Access Monitor Deutschland (Germany)

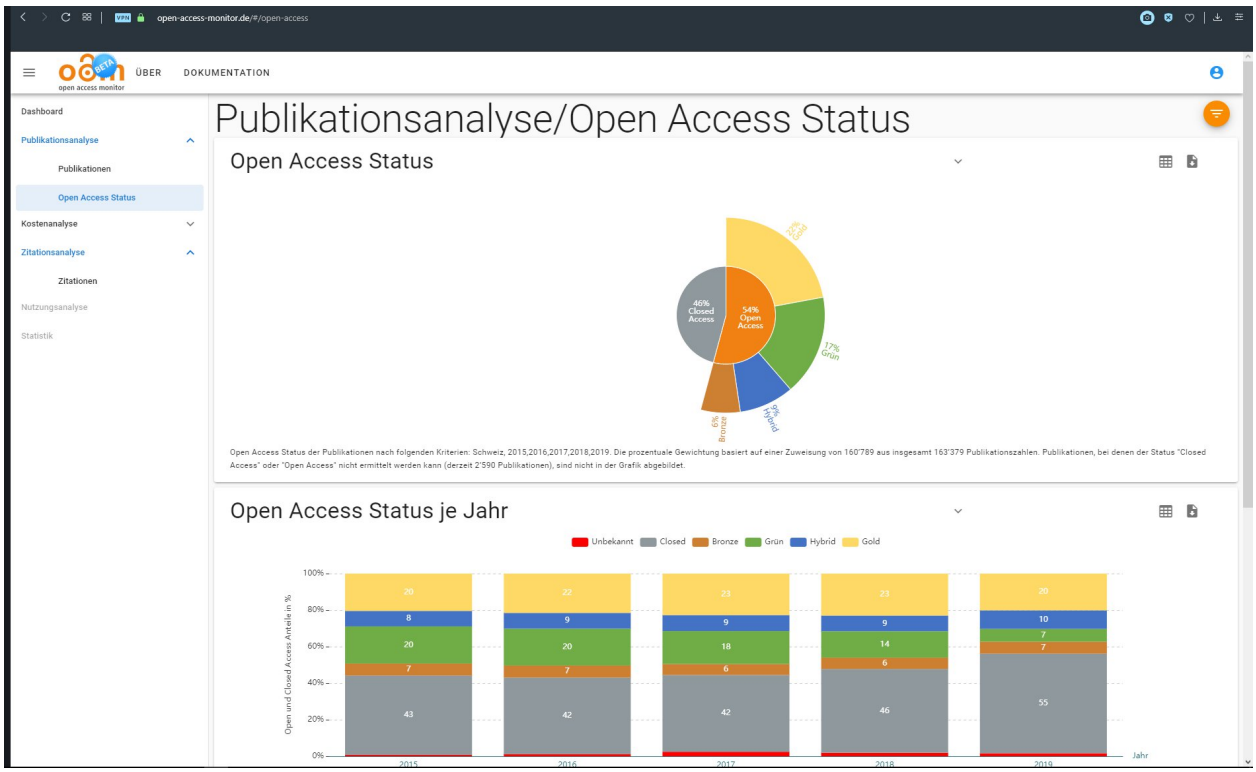
Since 2017, the Forschungszentrum Jülich has been developing the Open Access Monitor Deutschland (Germany), using different datasets, because of a lack of alternatives only some of them open. (Mittermaier et al. 2018) This monitor aims to give a comprehensive overview of the percentage of different forms of OA publications and their costs, calculated from the most recent data available. This is possible for single institutions, states or countries, and for several years. The analysis is only as good as the underlying data, therefore the results delivered have to be perceived with due care.

Nevertheless, the OA monitor uses different forms of graphical design to deliver its results, gives access to its database, and delivers results on the most frequently asked questions concerning OA.

As far the database permits it, the monitor does also deliver data for Austria and Switzerland. It is still under development and lacks a sustainable budget. (See Bauer et al. 2018, which describes deliberations to basically use the monitor for Austria as well.)

[7] Ministry of Higher Education and Science Denmark 2018, Danish Agency for Science and Higher Education n.d., 2019a, 2019b.

[8] Schöpfel & Prost (2019) criticise existing OA and Open Science analytics as being "article centric", as only journal articles are being covered, while excluding all other academic publication types, such as reports, presentations, books, book chapters, data, and software. This holds true for nearly every OA analytics attempt so far.



OA-Monitor Deutschland: OA-Status for Swizerland, 2015-2019 (Date: 14.11.2019)

3.3 OA Analytics as Research

While the aforementioned forms of OA-analytics are usually sponsored and requested by funding agencies or actors in the field of politics of science, a number of analyses of OA is carried out by researchers following their own projects and questions, e.g. in science studies or bibliometrics. They usually use subsets of the same datasets by Clarivate Analytics (Web of Science) or Elsevier (Scopus) or build their own sets. It always involves a lot of work normalising and examining the actual data. While all of this research is limited to its respective data and research questions, it shows the possibilities of more in-depth and precise analyses.

Some questions examined are:

- Compliance with different OA-policies (E.g. Melero et al. 2017)
- OA and grey literature (E.g. Shivaram & Biradar 2019)
- Different influence of self-archiving vs. APCs (E.g. Sotudeh et al. 2019)
- The open access citation advantage (E.g. Copiello 2019)
- Percentage of citations in different social media for different disciplines (E.g. De Filippo & Sanz-Casado 2018)
- Suitability models for the evaluation of science (e.g. Hecking & Leydesdorff 2019)
- Workflows of OA repositories and their effect on the actual publications and metadata (e.g. Bernal 2013)
- Developments of scientific publications concerning OA (e.g. Matthias et al. 2019)

4. Survey of the Data in the SONAR Repository

SONAR as a repository aims to aggregate OA publications from Swiss academic institutions, including relevant metadata. Given what has been shown up to this point, this seems not enough

data to do any OA analysis for relevant stakeholders. Both, the one-shot studies and the continuous reporting, uses different and bigger datasets for a reason: Most of the research questions frequently asked require a different data-basis than the one SONAR is collecting.

SONAR will deliver some data for some of the specific questions asked by researchers for research on OA (not as authors of OA publications), e.g. on co-authorship in OA. SONAR should explore ways the data in the repository can complement or replace existing data, especially from commercial organisations. On its own, the data in the SONAR-repository will not be of much use for OA analysis itself.

5. Alternatives for SONAR

5.1 Define Stakeholders and their Interests

All solutions and studies on OA analysis have to deal with unclear expectations. Stakeholders and their interests on such analyses are seldom clear. Sometimes it seems that all that is needed is a number (percentage of OA on scientific publications), sometimes much more is expected.

SONAR should define the expected stakeholders and their needs and interests, then do a cost-analysis for delivering to meet these demands. Some off them are unrealistic, given the quality of data. (E.g. there seems to be the wish to automatically gather insights into the costs of APCs, while the only existing base on costs – OpenAPC – is dependent on data from those institutions itself.) Some of them will be deliverable, if these stakeholders at least pick up the cost of the analysis. SONAR could then provide “OA Analytics as a Service (OAaaS)”.

5.2 Build an Dedicated System

In theory SONAR could build a system from scratch, paralleling the German or the French OA-monitor. Concerning the technical side, this would probably be possible using Open Source Software. Data-wise the data collected by SONAR alone will not be sufficient – e.g. it would it not be possible to give a percentage of OA-publications, because the basis – a figure of the total of scientific publications – would be missing.

Such a system would – if one takes the experience from the OA monitor Germany or the French system seriously – need funding to licence other data and personnel to clean, merge and normalise data on a continuous basis.

5.3 Participate in the OA Monitor Germany

Another possibility would be an active participation in the aforementioned OA monitor Germany. As has been stated, this monitor already provides analyses for all Swiss (and Austrian) institutions for which data is available. The monitor still is under development and still needs sustainable funding. This means SONAR could participate in the development of the monitor and help establish a sustainable funding stream, while at the same time profiting from the work already done.

SONAR could explore the usage of the data it will collect as a better or additional data-base for the monitor.

It should be mentioned again, that the Austrian project Austrian Transition to Open Access (AT2OA) seems to move in this direction as well. (Bauer et al. 2018) The monitor could easily be transformed into on OA-monitor DACH (Germany – Austria – Switzerland), paralleling the collaboration of the other institutions from those three countries, e.g. the national libraries.

5.4 Establish a Periodical OA Analysis

If one assumes a continuous interest on OA analysis by one or more stakeholders (e.g. the SNF or actors of science politics) it would also be suitable to establish a continuous reporting on OA from SONAR. It would be possible to publish, e.g. every six months or annually, a report, conducted with the same method and the best suitable data. This way chronological reporting could be established.

This would require establishing a team of one or more staff to deliver the ongoing reporting. (The Danish OA indicator could be a model.) This team should then perform more profound analysis as well, using methods for science studies or bibliometrics, e.g. those listed in chapter 3.3. As such, SONAR would establish a (small) centre for OA analytics. The cost for such a centre would have to be covered by one or more stakeholders for which such analytics would be relevant. A cost analysis would be required.

5.6 Launch an Initiative to Establish a CRIS at Swiss Universities

Building on the idea to establish OA analysis on data from a CRIS, a long-term solution could be the establishment of a CRIS in all academic institutions in Switzerland. If senior management of these institutions was committed, such systems could by established as part of SLSP (https://slsp.ch/en). Sufficient funds for staff and infrastructure would have to be earmarked in every institution, and policies for providing data to these systems would have to be introduced.

Based on such data, basic OA analysis would be possible with little extra cost. SONAR could choose to introduce the concept of such a national network of CRIS through official or inofficial ways (e.g. proposals to swissuniversities, contacts within participating institutions of SLPL).

5.5 Withdraw from OA Analysis

Given today's landscape of data owners, OA analysis costs money, while it is not clear if there is a continuous interest in OA analysis on part of relevant (and financially potent) stakeholders. One solution could be the withdrawal from such analysis – at least for the time being. As long as no-one is willing to absorb the costs, it would be unsustainable to maintain services in this field.

However it seems that funders in Germany and Austria are already moving into the direction of sustainable financing such endeavours. It would be reasonable to anticipate a move from Swiss funders as well.

6. Recommendations for SONAR

In the current situation, we make the following recommendations to the SONAR working group:

- SONAR should participate in the OA monitor Germany, pushing it towards a OA monitor DACH. The work done in Jülich suggests strongly, that – at least for the time being – OA

analysis will only be possible with the use of a range of databases (and not only data from SONAR alone), will require an ongoing commitment of staff time, and will not be completely automatable. At the same time it is to be expected that this monitor answers most of the common questions in OA analytics. There is no reason to establish it anew.

- SONAR should explore the possibility of employing a team who – even if only part-time – can provide continuous OA reporting. This will not be possible without using external databases. This position should only be established if a sustainable form of funding ("Open Access Reporting as a Service"), and a corresponding sustainable funding stream from one or more long-term stakeholders have been established.
- If this solution is not chosen, SONAR should – at least for now – withdraw from OA analytics. It should in due course (five to ten years) return to this topic, and explore new developments, notably the availability of data sources and the status of CRIS.

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