Opening up new channels for scholarly review, dissemination, and assessment

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ABSTRACT
The growing dissatisfaction with the traditional scholarly communication process and publishing practices as well as increasing usage and acceptance of ICT and Web 2.0 technologies in research have resulted in the proliferation of alternative review, publishing and bibliometric methods. The EU-funded project OpenUP addresses key aspects and challenges of the currently transforming science landscape and aspires to come up with a cohesive framework for the review-disseminate-assess phases of the research life cycle that is fit to support and promote open science. The objective of this paper is to present first results and conclusions of the landscape scan and analysis of alternative peer review, altmetrics and innovative dissemination methods done during the first project year.

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Open science, open data, open peer review, altmetrics, alternative dissemination, landscape scan, best practices, project results

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INTRODUCTION
The open science movement has changed the way researchers and society deal with the publication, evaluation and dissemination of research results. Discoverability, accessibility, re-usability, and reproducibility, the main pillars of open science, are becoming increasingly important in scholarly publications, and authors appreciate the benefits open science brings. In several cases, open science has even changed the nature of the scientific publication, as the papers and the underlying data are considered as a unity. In fact, recent studies prove the point that papers making datasets available alongside the publication receive a higher number of citations than similar studies without available data [42].

The open science trend has also nurtured the dissatisfaction with the traditional scholarly communication process and publishing practices. This critical standpoint and the increasing usage and acceptance of ICT and Web 2.0 technologies in research have resulted in the proliferation of alternative review, publishing, and bibliometric methods. Considering the growing ecosystem of platforms and channels through which these alternative dissemination/review/evaluation tools are communicated and made accessible, there is an urgency to scan existing and emerging approaches and related discourses, and gather best practices which can further guide developments in this field.

The EU-funded project OpenUP (http://openup-h2020.eu) addresses key aspects and challenges of the currently transforming science landscape and aspires to come up with

a cohesive framework for the review-disseminate-assess phases of the research life cycle that is fit to support and promote open science. The primary objectives of the project are (1) to identify ground-breaking mechanisms, processes and tools for peer-review for all types of research results (e.g., publications, data, software), (2) explore innovative dissemination mechanisms with an outreach aim towards businesses and industry, education, and society as a whole, and (3) analyze a set of novel indicators that assess the impact of research results and correlate them to channels of dissemination. The project employs a user-centered, evidence-based approach, engaging all stakeholders (researchers, publishers, funders, institutions, industry, public) in an open dialogue through a series of workshops, conferences and training, while validating all interim results in a set of seven pilots involving communities from four research disciplines: life sciences, social sciences, arts and humanities, and energy. Considering the wide range of scholarly fields to be examined and the wide spectrum of stakeholders to be involved in the analysis, a thorough landscape scan can be achieved with the identification of best tools and services.

This paper gives an overview of key interim result of the OpenUP project. Research in OpenUP concentrates on three separate but interrelated issues of scholarly communication: dissemination, peer review and impact measurement. Work carried out in these three areas runs in parallel and has the aim of identifying interrelations and dependencies in context of a common open science framework. The current paper has a more descriptive rather than analytical character because the presented results are merely the first step towards creating such a cohesive framework, which is one of the main project goals of OpenUP. This methodology is reflected in the article by providing a single narrative of common goals and by describing distinct results in the separate work packages in an integrated fashion.

The objective of this paper is to present first results and conclusions of the landscape scan and analysis of alternative peer review, altmetrics and innovative dissemination methods done during the first project year. The landscape scan was performed using a range of tools and methods: desktop research, literature analysis, an open call for contributions by the community, and small-scale validation workshops.

The presented examples of alternative methods and tools currently in use by diverse research communities show innovative ways of (1) communicating scientific results at a small, communal level or at a wider, global level, (2) evaluating each other's work, and (3) employing article level assessment tools. These new workflows and services rely on network-based solutions with the employment of digital technologies and collaborative tools. They, therefore, represent good examples of open science, in terms of methodology, tools, and networking among researchers.

ALTERNATIVE PEER REVIEW PROCESSES

Peer review in the context of scholarly communication is a concept and not a narrowly defined methodology. As such it can be unbounded from the journal paper and applied to any research product [23]. Peer review can be employed for e.g. evaluating scientific results, research data, research proposals, and the performance of projects. In all these cases, the common theme is the scrutiny of one's work by fellow workers/peers. However, although the primary goal is the same, the methods for putting peer review into practice vary across journals and disciplines [3].

In the age of the Internet and proliferation of communication channels, the printed and peer reviewed journals and books are no longer the principal vehicles by which research is disseminated [6]. New tools, platforms and services enrich the academic publishing scene, and provide functionalities to continuously revisit and reevaluate the process and the outcomes of the scholarly discourse. Depending on the dissemination channel they are connected to we can find review tools and methods from open peer review revealing the reviewer's identity and/or the review report, through post-publication review, cascading or decoupled review to collaborative review and community based commenting. The new, innovative tools incorporate the basic principles of open science by employing open, collaborative and network-based publishing and review methodology[32].

The concept of "open peer review" is rather controversial because presently it is being used for several fairly different models of peer review. In most cases, open peer review refers to the review process in which the identity of the reviewers is disclosed or the review itself is accessible for the public [36]. However, there are studies which go beyond such simplified interpretations and include in the definition additional attributes of the review process. The present analysis relies on the terminology of Open Peer Review as it has been proposed by OpenAIRE [31]. Based on a literature review seven distinct traits could be identified: open identities, open reports, open participation, open interaction, open pre-review manuscripts, open final-version commenting, and open platforms. The possession of at least one of the first three traits is considered sufficient for qualifying as Open Peer Review (Ibid.).

Alternative review methods and services provide innovative ways for researchers to communicate their scientific results at smaller, communal level or at a wider, global level, and to evaluate each other's work. Open peer review services and tools can be grouped in four categories: 1) publisher-based platforms or journals, 2) independent peer review services with openness functionalities, 3) repository-based solutions and 4) commentary/annotation tools.

Journal editors and publishers

Journal editors and publishers have been major drivers in introducing alternative peer review methods. Some moved away from the traditional method of reviewing by shortening the publication time and by making the review process partially or entirely transparent. The openness of the review process is ensured by publishing reports alongside articles and by strongly urging, but not necessarily mandating the disclosure of the identity of reviewers. The review process is turned into a collaborative effort either through the communication among editors and authors, or through initiating discussion within research communities. Publishers employ different degrees of collaboration: while eLife (elifesciences.org) ensures the discussion of the editor and the reviewers about the submitted manuscript, Frontiers (frontiersin.org) established a "Collaborative Review Forum," which unites authors, reviewers and the Associate Editor (Frontiers). Copernicus Publications allows the widest collaboration by involving the research community early on in the review process. Their "Interactive Peer Review" supplements the evaluation of the reviewers with the comments from the scientific community [25].

Independent peer review services

Independent peer review services decouple the review process from the publishing platform(s). The review service is not affiliated with a journal or publishing house, thus the evaluation is not skewed by the standards of the respective publisher. The process allows different degrees of openness and involvement from authors and reviewers. These platforms, in general, advocate a network-based approach where collaboration between authors, editors and reviewers is strongly encouraged in order to improve the paper and the overall review experience. Community interaction can further step up the quality of scientific research by enabling innovative approaches [2]. Although these review platforms operate independently from publishers, they may be connected to a chosen set of journals. The journals the platforms are working with accept articles for publishing based on the recommendations of the review platforms. Thus, besides the primary function of managing the review process for scientific outputs, the review services evaluate the fit of the paper to a variety of journals. The match between the article and the journal can be made even if the review service is not connected to the author's preference of publisher; the author is free to submit his/her peer-reviewed work to any journal with a link to the completed process (e.g. Peerage of Science). Furthermore, peer review platforms carry several benefits for reviewers. They employ a range of methods to recognize and reward review work. At Publons, the peer review and post publication activity factors into the paper's Altmetric scores (a new silver line in the Altmetric donut). Rubriq goes one step further and provides a financial compensation for the review work besides the academic reward forms. Thus, it is a common feature at these review services that both work and time of the reviewer is acknowledged.

Repository-based solutions

Repository-based solutions are gaining momentum in the publishing discourse [23]. The Internet facilitates immediate communication and dissemination of (preliminary) research results. In particular, uploading to and making preprints available in disciplinary and/or institutional repositories facilitate a rapid distribution of research findings (Ibid.). The pioneering and successful example of arXiv, which covers preprints in the field of physics, mathematics, and further quantitative disciplines found followers in other fields, e.g. BioRxiv (bio sciences), AgriXiv (agriculture and allied sciences), or SocArxiv (social sciences).

The repository-based dissemination and review forums can take a variety of forms. Platforms such as PaperRater (paperrater.com) or SciRate (scirate.com) offer repository specific discussion forums that enable commenting on preprints in arXiv. Preprint servers facilitate communication on research results on a wider scale than traditional channels of dissemination and evaluation allowed for. Some platforms like biorXiv or PeerJ Preprints have a built-in commenting or peer review function on the platform. Others allow for crowd-sourced discussion on preprints in a specific field of study (haldanessieve.org), or function as a multidisciplinary repository for articles and preprints (sjscience.org).

Preprint platforms typically do not employ much editorial functions beyond a check by moderators if content fits thematically and is scientifically sound. Additional value is added by overlay services, which enable to manage a pool of reviewers. However, they all advocate open dissemination and open peer review (while not necessarily on the same platform). This includes open identity of the reviewers, open report/commentary, and open participation from all research communities and public readers.

Commenting applications and tools

Commenting applications and tools are not identified as peer review methods per se. However, they aim to provide complementary evaluation of scientific content. They function as an application providing a layer of customized features on top of repository or journal content (e.g. paperhive.org), or on materials disseminated through academic social networks (e.g. ResearchGate OPR). These tools contribute to the network-based and collaborative aspect of research by opening up the discussion on published scientific results. This way, they can be viewed as (lightweight) post-publication review tools.

ALTERNATIVE IMPACT ASSESSMENT [12]

The term Altmetrics has recently become an increasingly discussed concept both in context of scientific and scholarly communication as well as in the realm of evaluation. The

occurrence of new modes of valorization such as Altmetrics can generate a substantial amount of turmoil on a conceptual basis but also in terms of the clash between established and new paradigmatic interpretations of what appears to be relevant. In 2010, the term has been introduced by the information scientist Jason Priem [26]. Shortly after, he and his colleagues published the Altmetrics.org manifesto in which an understanding of Altmetrics has been coined that influenced the Altmetrics community sustainably.

Up to now, its proponents regard Altmetrics as a powerful movement capable of revolutionizing the system of scientific performance measurement [9], [27]. While other observers are more careful with triggering expectations [14], [15], [20], the diffusion of the topic amongst many different research communities cannot be denied [13]. Since 2010, the literature on Altmetrics has grown enormously. Starting in open access journals such as PloS One and PloS Biology, the topic has soon been taken up by the informetric and scientometric community.

Despite its scholarly use there is no common understanding, and hence no common definition of the term. According to Erdt et al. most of the definitions differ regarding how Altmetrics can be traced, what is to be considered a relevant source, and how these sources can be handled [7]. Haustein notes that part of the terminological confusion can be related to the notion of 'alternative' or more precisely, the 'alt' in Altmetrics [15]. Some scholars hence prefer to view Altmetrics as complementing existing scholarly metrics [5], [18], while others still propose that Altmetrics are part of an alternative research and publication system [29], [30]. Consequently, Altmetrics is not one, but many terms. The recently published report of the EC Expert Group on Altmetrics reaches similar conclusions and stresses that Altmetrics need to be complemented by metrics and frameworks for use that are tailored to open science priorities [38].

Given its heterogeneity, the Altmetrics narrative has flourished among different policy and scientific communities, among which bibliometrics, information science, science communication, and library science are most important. Altmetrics are provided by platforms, which collect data from different sources. These platforms offer services that go beyond optimization of individual scholarly visibility [10]. Often they provide an application programmable interface (API) through which data collected by the platform can be publicly accessed. In informetric and scientometric studies on Altmetrics and Altmetrics aggregators [5], these are widely utilized, though their data collection might be considered inconsistent in some cases [39]. Furthermore, data collection strategies among the Altmetrics aggregators differ: while some of the Altmetrics aggregators collect their own data, others reuse previously collected data. Erdt et al. therefore distinguish between primary, secondary, and tertiary aggregators (see Figure 1) [7]. Some of these providers (e.g. altmetric.com) particularly focus on quality assurance issues contributing to the emerging community standards debate in Altmetrics [1]. Furthermore, some of the Altmetrics aggregators monitor the development in the field by providing information about data sources and trends in blogs and feeds.

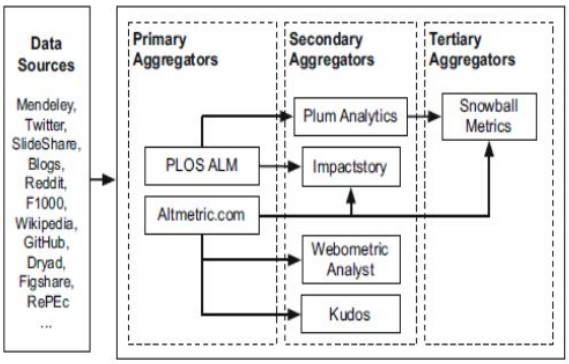

Figure 1. Altmetrics overview. Source: [7]

Altmetrics aggregators are a recent but nevertheless dynamic phenomenon. The years between 2009 and 2012 can be seen as 'landmark years' attracting millions of users and followers. Currently, there are four main providers: 1) PLOS Article Level Metrics (ALM) since 2009, 2) Impactstory 2011, 3) Altmetric.com 2011, and 4) Plum Analytics 2011. These Altmetrics providers, also referred to as 'aggregators' [7], measure different sources to provide social outreach information for scholars and institutional customers. They do not only provide Altmetrics data by utilizing various social media platforms but also bibliometric information by sourcing large scientific databases such as WoS and Scopus. The data sources - online repositories and pre-publication services like Biomedcentral - are widely covered by Altmetrics aggregators. PubmedCentral, for instance, is covered by all four dominant Altmetrics players. Altmetrics providers and online repositories share the goal of contributing to an alternative system of scholarly communication.

Strengths and weaknesses of Altmetrics

Timeliness of Altmetrics is one major strength being put forward as a strength compared to other indicators of research output (e.g. reception via citation to peer-reviewed journals). However, the argument of timeliness of Altmetrics is not universal and has to be carefully assessed in the light of each particular Altmetrics data source as well as data provider. Alternative metrics may provide complementary filters for information gathering and retrieval, which is another strength feature. The filtering will work best in cases where the actual use and valorization of dissemination channels captured by Altmetrics has reached a substantial disciplinary or thematically oriented diffusion within a community. Yet, the algorithmizations of

recommendations based on Altmetrics might produce self-reinforcing consolidations of forms of information gathering and information provision.

The open concept of Altmetrics offers both benefits and pitfalls. It can lead to responsive changes within evaluation logics or changes in established reward systems and incentives. For example, the use of new forms of dissemination could be integrated in the research assessment process as new assessment criterion. Yet, the integration of new criteria should be guided by careful reason of what may be plausibly reflected, extended or used in new forms of valuation. In general, enabling researchers to diverge their signalling, e.g. by highlighting some previously hidden benefits of their work such as the integration of their work in teaching curricula, clinical guidelines or policy documents, can led to a positive assessment by parts of the scientific community, especially by early-career scholars. Yet, initial results of a survey conducted within the OpenUp project suggest that there are still pertaining frictions between the use of social media as means of dissemination and information gathering on the one hand and the assessment of recognition respondents expect in their field of research on the other hand. Still, alternative metrics enable researchers to differentiate and to paint a more balanced picture. The way in which this will translate in valorization and positions is unclear and remains to be seen. To date, they might not have significant effect of modifying selection mechanisms or being an integral or dominant element of career-promoting.

From a more technical perspective, a substantial amount of current alternative metrics rely on the use of Digital Object Identifiers (DOI) [12]. Such a connection between metrics and a specific requirement, i.e. the use of specific communication symbols, may lead to skewed results or problems in validity of indicators. At the same time, it also promotes the use of identifiers such as DOI. This in itself can be argued to be a positive outcome in the long run, as it helps better organising and understanding the stock of knowledge. Similar arguments can and have been made for other types of unique identifiers such as author IDs.

A current issue that has been highlighted by many scholars is data integrity and quality. While in the "closed universe" of bibliometric sources items of citing and inter-linkage can be clearly demarcated, in the "open universe" approach of Altmetrics a considerable amount of Altmetrics data sources are potentially fluctuant. In a strict understanding Altmetrics may always change depending on retrospective changes, e.g. deletion or modification of the underlying data sources. Such volatilities also post a challenge to promotion and dissemination of these indicators on the level of certain stakeholder such as librarians. A second aspect of this issue are differences between data aggregators due to differences in data targeting, retrieval, and processing strategies or which events are actually recorded (e.g. inclusion or exclusion of re-sharing messages or social media posts).

ALTERNATIVE DISSEMINATION PRACTICES

Dissemination of research has changed considerably following the digitisation of science, and arguably more than many other steps in the research lifecycle. Over the years, publishers have moved journals online and transformed them to e-journals. The open access and open science movements have changed how research can be accessed and what types of outputs are being published. Most research findings are now disseminated in a way that is *born digital* [22], [8].

In the wake of this transformation, innovative forms of research dissemination have emerged: blogging has become very popular among researchers, as has Twitter. Academic social networks boast millions of users. New formats of interacting with the public, such as science slams [33] and TED talks [37] are broadcast via Youtube around the world. Some researchers have even decided to make all of their research findings public in time by keeping an open notebook. OpenWetWare, a platform where researchers can document their results in a wiki system, has over 16,500 members who have contributed some 980,000 revisions.

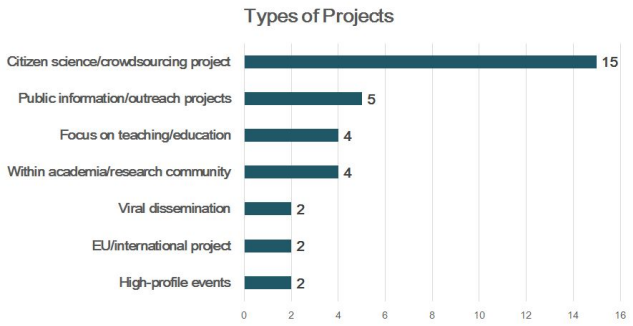

Figure 2. Types of projects

During the first project year, OpenUP has conducted a range of compact case studies to gain an understanding of the effectiveness, suitability, and impact of currently applied approaches. For that, we performed a landscape scan of existing research projects that used innovative dissemination methods. We also involved our stakeholders by asking them to provide further examples. In total, we collected 34 projects and 29 platforms/methods. The case study collection was not limited to any specific geographical region. However, it had a special focus on European examples, which is shown by the clear overrepresentation of European-based projects (65% of all leads). A breakdown of the leads for research projects is depicted in Figures 2 and 3.

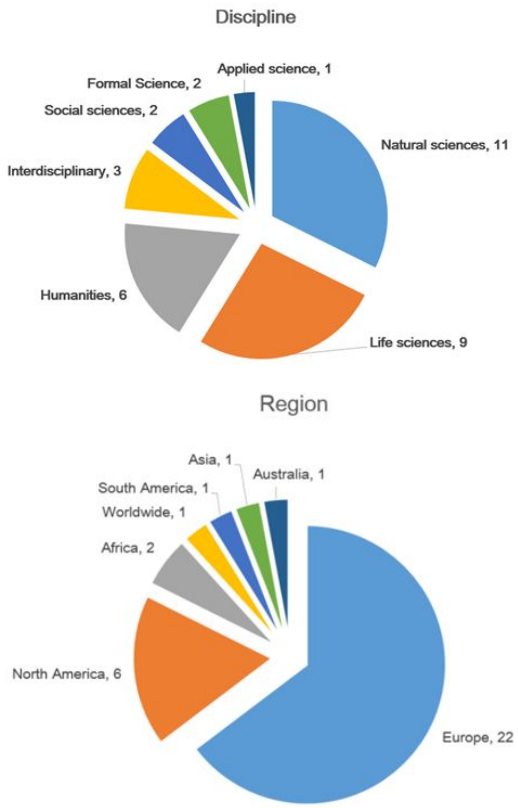

Figure 3. Distribution of the projects by discipline and region

From these leads we selected 10 cases, which we analysed in depth. The cases were selected as representative examples from the identified dissemination types (see Figure 2) and disciplines (see Figure 3). As an additional criterion, our goal was to include projects that involve engagement and participation of target audiences. The cases were analysed along the following dimensions: What was the purpose of the dissemination? What was disseminated and how? During which phases of the project was the dissemination started and done? Who initiated the dissemination? What was the target audience? Which effort did the dissemination cost? How open was the dissemination? Finally, we also looked at the gender dimension of the selected dissemination cases. The following subsections give an overview of key outcomes from the analysis of four of the case studies.

Four case studies were chosen to be presented in the paper in order to illustrate the most prevalent dissemination types identified (see Figure 2). For a detailed description of all ten case studies, please see [17].

Pluto Fly-By

In July 2015, NASA's New Horizons spacecraft completed a nearly-decade-long journey to fly by Pluto. The mission was accompanied by a high-profile dissemination campaign that was initiated by NASA [21]. The aim was to target the general public as an audience by revealing interesting facts about Pluto and presenting the conducted results in a simplified way. In this context, different dissemination activities were conducted and professional, high quality dissemination materials produced. By means of Twitter campaigns, live streams, YouTube videos, and press releases NASA shared images, videos, live streams, simulation software (NASA's Eye and FreeFlyer software) as well as blogs about the mission. A highlight are the "Pluto in a Minute" videos. NASA broke down interesting facts about Pluto and findings from the mission in one minute long videos. In each video, a NASA scientist talks about a specific topic, e.g. Pluto's moons. The findings are visualized using stills and animations. The "Pluto in a Minute" videos provide interesting bits of information about Pluto in a way that is understandable for an interested audience. A similar format is Minutephysics [19], which are done in the RSA Animate style.

Additionally, scientific data, reports, and scientific articles were published. Scientific data gathered during the mission that are publicly available can be used by researchers for further investigations.

Followed by social media, press, and TV, the New Horizons mission made international headlines, and it became the perfect media storm. The Pluto Fly-By story was on the cover of more than 450 newspapers in multiple languages.

Galaxy Zoo

Galaxy Zoo [11] is a well-known online citizen science project, where the general public is directly involved in research activities. It is available on the platform Zooniverse.org, which is the largest aggregator of crowd science projects in various disciplines. Galaxy Zoo is a project that invites people to assist in the morphological classification of large numbers of galaxies through a website. Citizens classifying galaxies help scientists to understand how galaxies evolved over time and to test theories about the nature of the Universe.

The purpose of dissemination is twofold: sharing research data in the format of galaxy images and involving citizen in the analysis of these scientific data. A highlight is the ZooTeach website [41], where teachers and educators can share high quality lesson plans and resources that complement all Zooniverse citizen science projects. Lessons can be retrieved by age groups and subject areas comprising of the topics related to Galaxy Zoo.

The Galaxy Zoo website is the primary place of dissemination of project activities. It includes a blog and a forum that supports the volunteers in discussing, analysing, and classifying galaxies. Other dissemination activities are videos available on You Tube, releases, and news articles in important journals and on TV (Times Online, USA today, Spiegel online, BBC news, etc). The main dissemination contents are images, video, text and data.

Galaxy Zoo involves a lot of professionals and uses high quality tools. The dissemination project outputs are both galaxy images associated with the Sloan Digital Sky Survey (SDSS) and the results presented in scientific articles and open-source sets of the analysed data. The Galaxy Zoo Blog and Talk are moderated by specialists.

Followed by news and social media as well as research institutions, Galaxy Zoo has reached a large audience. Concerning scientific impact, the project played an important role in discovering new knowledge and advancing science. The approach was so successful that the original Galaxy Zoo project, which ran from July 2007 until February 2009, was replaced by Galaxy Zoo 2, Galaxy Zoo: Hubble, and Galaxy Zoo: CANDELS.

Brain Project Thinks Big

Frontiers for Young Minds was launched in 2013 as a non-profit scientific journal written by scientists and reviewed by a board of young students. The journal provides a platform for young people to work with scientists, to ask informed, critical questions, and to give feedback. By working directly with scientists, Frontiers for Young Minds ensures that the published article contains relevant scientific research. By involving young students, Frontiers for Young Minds helps fostering curiosity in and out of the classroom, and engages the next generation of citizens and scientists.

Brain Project Thinks Big was the inaugural issue of the Frontiers for Young Minds in Neuroscience journal [30]. The journal *Understanding Neuroscience* wants to provide a chance for the next generation to think critically about the organ that makes it possible for them to think in the first place.

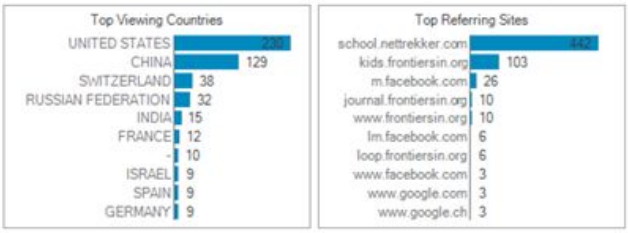

Figure 4. View count of *Brain Project Thinks Big* (as of March 2017)

The article *Brain Project Thinks Big* provided the younger audience with an understanding of the Human Brain Project. By publishing a child friendly version of the paper on the Frontiers for Young Minds platform, the team chose an innovative approach to reaching a different audience: children between the ages of 8 and 15.

The article was reviewed by a young student, mentored by a scientist with experience in peer review to guide the peer review process. The article is open access, distributed under the terms of the Creative Commons Attribution License (CC BY). A visualisation of the current count of abstract views (20), full text views (117), and PDF downloads (222) is available in Figure 4. The article has been accessed primarily in the United States and China.

The SOHA Project

The project "Open Science in Haiti and Francophone Africa (SOHA)" is part of the OCSD Network funded by the International Development Research Centre (IDRC) [35]. The project promoted open science as an essential tool for increasing the visibility of scientific work of Francophone Africa and Haiti researchers. The objective was twofold: to understand the obstacles to the emergence of an open science culture in Francophone Africa and Haiti, while creating a favourable environment to achieve the goal of an open science culture.

Dissemination consisted of several different activities ranging from releasing Youtube videos, newsletters, to organising scientific events, online training courses, interviews, and surveys. The produced dissemination materials are texts, data, and video. The outputs are a dedicated blog, scientific publications and datasets, as well as a network of emerging Science Shops (see below). The most important achievement is the consolidation of an international academic community of students as well as male and female researchers around the concept of cognitive justice.

A highlight of the dissemination strategy were the Science Shops. They are small entities which provide independent, participatory research support to civil society. Science Shops are often linked to universities where students, under the supervision of a professor, perform the research. Students usually get credit points counting towards their degrees for

their research. The criteria that most science shops apply are that clients must not exploit the research commercially, and the research results must become public.

All the outcomes of the project can be freely used by academics, students, and researchers generating new knowledge and turning them into new products. At the moment, the project is concluded, but to promote further tangible activities several members of Soha created an association called APSOHA that will take over the SOHA project.

CONCLUSIONS

Emerging Open Peer Review Landscape

The alternative review tools and services outlined above offer various methods for review, e.g. open review, pre-publication or post-publication review, collaborative or decoupled review, and different degrees of openness in identity, participation and interaction among stakeholders. They might differ in their solutions, but they all carry several common features:

1. they move away from the established publishing and review system by finding solutions to the problematic aspects of the traditional single/double blind review process (e.g. lack of transparency, potential bias, quality of review),
2. the review process becomes more transparent, either by opening up certain aspect of the process or by providing detailed review policies,
3. they urge a more conscious, collaborative participation from stakeholders, either through invitation and dialogue within small circles between authors, editors and reviewers or through crowdsourcing the process and allowing the public to add comments and reviews.

These tools and services identify the main issues where intervention is needed in the traditional review system. The solutions they offer invigorate conversation among researchers about the functionalities of the review, their role, and responsibilities in the process. Such dialogue, which is continuously reshaped by the exchange of ideas, promises a more scholar-centric approach through new perspectives (e.g. open science approach), tools (e.g. ORCID review tracking functionality), and emerging frameworks (e.g. pre-registration of research, uploading preprints for grant application) [32].

Altmetrics and Cultures of Appreciation

Even though we find an increased activity by researchers to study the underlying logics of Altmetrics data sources and to differentiate between different types of actions or reactions that are being counted, there still is a lack of understanding in which way acts of valuation and evaluation are connected. That is, how value generation and value appreciation are being matched in different dissemination channels. The new forms of referencing through social media are prone to new levels of manipulation reminiscent to the effects of link farms or search engine optimization and their impact on web page ranking. Manipulation no longer requires to modify the behaviour of others, and it can be achieved by specialized programs and fake user accounts.

With the rise of alternative metrics it is likely that new forms of classifications that are linked to the legitimacy of the different latent concepts captured in these indicators or in new forms of appreciation may arise. The relationship between these individual aspects, i.e. appreciation of certain actions and traits, their quantification and selection, and the acts of establishing and applying classifications is unclear, and will likely require dedicated research. Most likely such research will be on a disciplinary level at first. Understanding these interactions might allow for a clearer message what, why, and how certain alternative metrics capture new and relevant forms of regard, and how these feed back into cultures of selection and appreciation.

The increased attention towards Altmetrics could have a positive impact on data provider motives to increase or modify data coverage and quality as well as improved functionality for Altmetrics analyses. While such developments will require time, we can observe similar developments in the field of scientometrics and bibliographic data providers.

Innovative Dissemination Practices

The landscape scan of projects applying innovative dissemination methods revealed a number of interesting approaches going beyond traditional academic publishing, and gathered outstanding success stories from all over the world. In particular, the analysis demonstrated the potential of digital technologies to innovative dissemination practices and to reach out to target audiences beyond the usual academic peer groups.

The most striking lesson learned from the analysis is the fact that dissemination in an open science context becomes more interactive, and as a result it is often difficult to draw the line between the activities of dissemination and participation. There are various purposes of why dissemination is done, e.g. to reach out to a broader or different audience, or to actively involve peers or citizens that would otherwise be out of reach. Dissemination is increasingly done at earlier stages of the research lifecycle - sometimes as early as the research design phase - and is thus becoming an integral part of the whole research workflow.

In terms of novel dissemination practices and related standards, however, many questions remain unresolved. Tackling the additional effort and skills required to produce tailored dissemination material for various target audiences is not trivial. Future research in this area is needed to provide more qualitative and quantitative evidence of

innovative research dissemination projects and their impact, and on providing related guidelines.

Outlook

During the second project year of OpenUP it is foreseen to test and evaluate some of the methods, tools, and services related to innovative peer review, impact assessment, and dissemination presented above by applying them in seven pilot studies. The pilot studies will be implemented in specific settings and in close collaboration with various research communities from life sciences, social sciences, arts and humanities, and energy research. Our aspiration is not only to showcase new workflows and services in specific application contexts in the scholarly market, but also to identify working practices, developing standards, and remaining gaps.

The insights gained from the evaluation of the individual pilots are expected to deliver, on the one hand, further input on working practices, developing standards, and remaining gaps. On the other hand, we expect the pilot studies to provide useful lessons learned and good/best practices to be added to some of the policy recommendations that will be produced by OpenUP. In terms of awareness raising and community support, the pilot studies strive to document resulting success stories and working practices, which can become a useful resource for other communities who want to apply not yet well known open science methods. Finally, OpenUP hopes to inspire and equip the communities directly involved in the pilot studies with knowledge and methods to adopt the tested open science practices beyond the duration of the project.

The ultimate goal of OpenUP is to provide a cohesive framework that should support informing future policy for designing an open science system. The next phase of the project will focus not only on the challenges that rise from these open science practices, but also on providing possible solutions to the hurdles open science practices may experience in the form of policy recommendations. Since linkages between research and policy may well vary among the three key project pillars, disciplines, and research communities within the member states, it is therefore important to map and analyse the national contexts and existing policies in order to understand areas where our findings and recommendations could support evidence-based R&I policy. Data will be gathered and analysed through desk research of available literature and field research in the form of interviews with policymakers and survey of key stakeholders in selected countries. To achieve a clear and policy supportive identification of the major research issues, we will organise a validation focus group that will be open to active participants of the use cases policymakers, members of the research team, civil society organisations and other stakeholders (e.g. industry, media representatives).

We are also set out to explore further ties with ongoing projects in order to provide a well-rounded picture of the current EU and global open science landscape of scholarly communication. The OpenUP team has been affiliated to or is aware of a variety research projects and infrastructures that could be exploited throughout the course of the project (OpenAIRE, FOSTER, Research Data Alliance, LIBER, OASPA, etc.). The team will consistently evaluate and cross-validate the methodologies, tools, indicators and other outputs developed under OpenUP with relevant research activities funded elsewhere. This will not only help achieve synergies and complementarity of the activities in order to enhance OpenUP's impact, but will also help avoid overlaps and duplication of effort.

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