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'GREY LITERATURE SEEN IN TRANSITION'

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The Grey Journal

An International Journal on Grey Literature

COLOPHON

About TGJ

The Grey Journal is a flagship journal for the international grey literature community. It crosses continents, disciplines, and sectors both public and private.
The Grey Journal not only deals with the topic of grey literature but is itself a document type classified as grey literature. It is akin to other grey serial publications, such as conference proceedings, reports, working papers, etc.

The Grey Journal is geared to Colleges and Schools of Library and Information Studies, as well as, information professionals, who produce, publish, process, manage, disseminate, and use grey literature e.g. researchers, editors, librarians, documentalists, archivists, journalists, intermediaries, etc.

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About GreyNet

The Grey Literature Network Services was established in order to facilitate dialog, research, and communication between persons and organizations in the field of grey literature. GreyNet further seeks to identify and distribute information on and about grey literature in networked environments. Its main activities include the International Conference Series on Grey Literature, the creation and maintenance of web-based resources, a moderated Listserv, and The Grey Journal. GreyNet is also engaged in the development of distance learning courses for graduate and post-graduate students, as well as workshops and seminars for practitioners.

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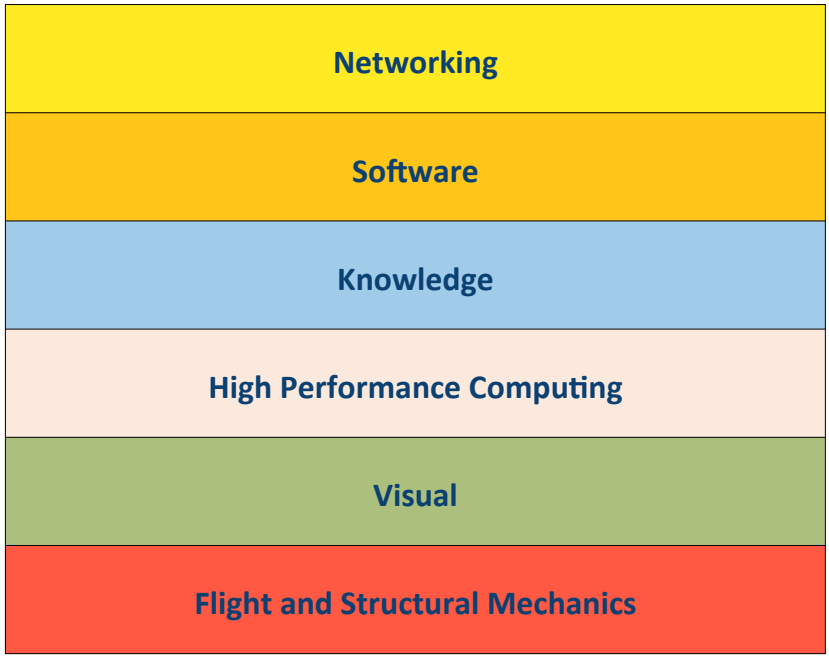

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EDITOR'S NOTE

In September 2019, the first seminar of its kind dealt with grey literature and the circular economy i.e. an economic system aimed at eliminating waste and the continual use of resources. The information compiled in advance of that seminar and the interest shown by the participants provides the lead-up to this research project in 2020.

Grey literature resources are a significant part of the information industry and like other industries in a circular economy such as textile, construction, transport, energy, and logistics, the role and value of these resources must be understood and demonstrated. This study looks at how grey literature resources are a vehicle for other industries in the circular economy, and at the same time how they themselves are part of an industry, which drives the circular economy.

This study first sets out to gain insight into the opinions of GreyNet's community of practice with regard to the circular economy and to determine if there is consensus. This will be carried out via an online community-based survey. The population of the survey will be drawn from GreyNet's Distribution List, GreyNet's Social Media, and the GreyGuide (GreyNet's Web Access Portal). As such, the responses will not be limited by geographical boundaries. The study will further look at the way in which grey literature resources can be seen as a vehicle for other industries in the circular economy. This part of the study will be carried out via a review of the literature based on a sample of a number of industries. Together, these results will allow us to explore good practices in generating societal awareness to the circular economy and in doing so, drive awareness to the value of grey literature resources.

Dominic Farace,
Journal Editor

Open Access – A Never-Ending Transition? *

Silvia Giannini and Anna Molino,
Institute of Information Science and Technologies, ISTI-CNR, Italy

1. Introduction

In recent years, Open Access (OA) has obtained growing attention from the public. From academics to active citizenship, having access to the results of science is a matter of great importance for many different reasons. For instance, research is, in the majority of the cases, publicly funded, and for this reason, its results should be in the public domain. The production of scientists would undoubtedly benefit from the broader view of the scientific landscape they would have. Funders may see either the profits or the impact of their expenditures and decide where to orientate future investments.

Moreover, the results of previous investigations show that OA publications receive more citations than those behind a paywall (cf. Gargouri *et al.*, 2010; Piwowar *et al.*, 2018), favoring academics in research assessment exercises based on such metrics as citation counts.

As we will see in the following paragraphs, much has been done and achieved. Over the years, technology has been fundamental for the creation of tools to support the widespread of OA (e.g., archives, repositories, databases, etc.). Different marketing strategies have been proposed, creating a new scenario in the publishing business, where native OA journals appeared and kept growing in numbers and size. The APCs system is now a consolidated reality; academic institutions and commercial publishers subscribed to a growing number of transformative agreements.

Likewise, an increasing number of academic and governmental institutions, as well as both public and private funders have issued policies, either mandatory or not, concerning the right of public dissemination, exploitation, and reproduction of scientific products and results.

In such a scenario, the marketing license regulating authorship and intellectual property rights becomes of fundamental importance. Thanks to the OA movement, nowadays, authors may safeguard their production via CC-BY licenses, which guarantee recognition to creators and favor reproducibility at the same time.

Nevertheless, OA is still struggling for its complete realization. Despite the mandates, much of the scientific production remains behind a paywall. Besides, major commercial publishers firmly maintain their oligopoly as well as the largest share of the licensing market, twisting the perspective on OA at their profit. Indeed, the emerging business models and even the most advanced technology solutions do not represent a threat to such *an in-elastic* market.

To favor the transition towards OA, trans-national initiatives as PlanS[1] and Amelica[2] were presented at the end of 2018. They share the common goal of turning OA into a concrete reality, starting, however, from different historical and cultural backgrounds.

In our work, we will go through the history of OA, from its first definition to the earliest initiatives until the current situation. We will trace a timeline that starts in the 1970s and highlights OA's most famous landmarks. Our focus will be on the evolution of scholarly communication. We will show how the editorial landscape and the publishing market has been changing over the years due to significant transformations in academia, economic conditions, and technology development. We will concentrate on the current scenario, in which even though a large number of solutions are available, it seems quite impossible to reach the complete transition to OA. Therefore, we will try to outline possible ways to accelerate the process. More than forty years after the first "open project" (Project Gutenberg 1971)[3] the time has now come to take a clear stand to obtain the complete realization of Open Access.

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* First published in the GL21 Conference Proceedings, February 2020.

[1] https://www.coalition-s.org

[2] http://www.amelica.org/en/

[3] https://www.britannica.com/topic/Project-Gutenberg

2. The origins of Open Access

2.1. Open Access: an ancient idea

The term *Open Access* as conceived nowadays dates back in 2002, when the Budapest Open Access Initiative (BOAI)[4] articulated its first public definition, extending the concept to all disciplines and all countries.

However, as we will show in the following sub-paragraph, several initiatives took their first steps years before, tracing back the first technological applications in favor of OA at the beginning of the 1970s.

Nevertheless, the idea of open access to knowledge goes far beyond that date. If we place the scholars at the center of our investigation, we can argue that it originates in the antiquity, when they gathered in - mostly oral - groups and communities to debate about different topics. It is the time when the first "research questions" were posed; the hypotheses expressed to answer them represent the essential function of research.

As far as the circulation of ideas is concerned, later individuals were able to connect across space with the establishment of various postal systems. The real revolution came after the invention of printing when group- and networked-dissemination of knowledge became much more accessible.

Indeed, if we consider scholarly communication as a mean offered to researchers to participate in a global, distributed system of knowledge, then we understand the metaphor of the "world brain" proposed by H.G. Wells in 1938. In his vision, the knowledge generated around the world should be accessible to any citizen without restrictions; in this sense, the connection between humans is "*as inevitable as anything can be in human affairs*" (Wells 1938). At the time when the speed of telecommunications was increasing very fast, Wells sketches the image of a world becoming a connected community. His "prophecy" has been maintained: we currently live in an incredibly connected world, thanks to the Internet and mobile technologies.

In our opinion, his idea fits entirely with the nature of scholarly communication, considered as any form of exchange that contributes to knowledge development through critical discussions. Wells' *world brain* represents a shared, open system that can be freely accessed by either scholars or citizens. In this perspective, it embodies the interconnected nature of scientific research and represents the multiple forms of creation and dissemination of knowledge, from informal exchanges to scientific publications.

Furthermore, when Wells sustains: *"the world has to pull its mind together, and this is the beginning of its effort"* (Wells 1938), he identifies in a single sentence the nature of "Open Knowledge," the intrinsic setbacks, and the significant efforts behind its complete realization.

2.2. A timeline for Open Access in the contemporary era

As said before, while the BOAI represents the first formalization of the concept of Open Access, different initiatives took place well before the year 2002. For instance, the first online digital library was launched in 1971, named "Project Gutenberg."[5] From the end of the 1980s, the resources available have been continuously increasing, as summarized in the timeline below.

[4] https://www.budapestopenaccessinitiative.org/read

[5] https://www.gutenberg.org/wiki/Gutenberg:The_History_and_Philosophy_of_Project_Gutenberg_by_Michael_Hart

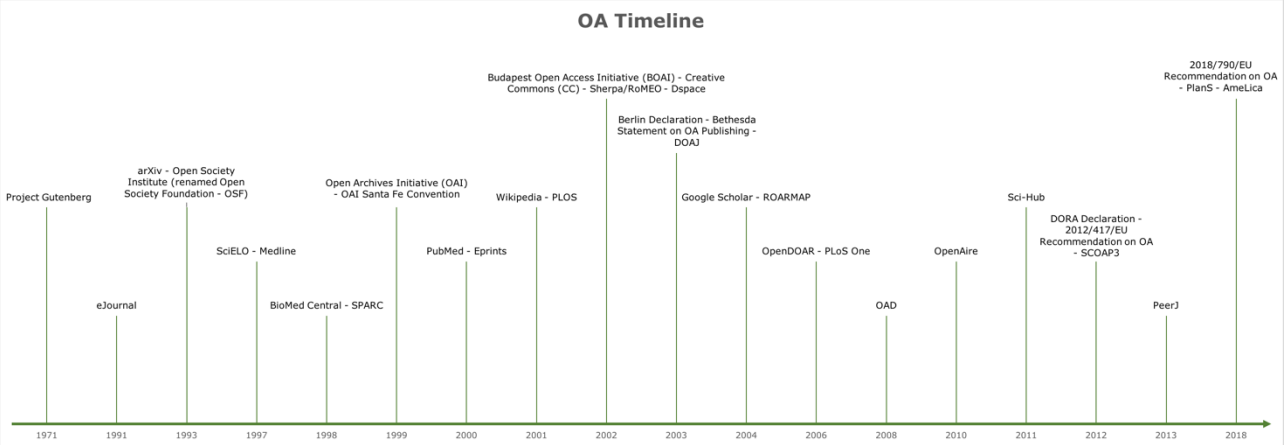

Figure 1: main initiatives in the OA landscape

In the diagram, we focused on the most common initiatives for the wider audience. It shows clearly that from the end of the 20th-century, technology advancements served as a primary mean for the widespread of OA. For instance, the first eJournal was created in 1991, opening the way to the first open, online commercial publisher, i.e., BioMed Central. The "opening act" of arXiv dates 1993, establishing the habit of using preprints among communities of scientists (especially physicists) as fully-fledged scientific material. Over the years, open tools have become of fundamental importance for everyday practice in research, both for granting wider dissemination and exploitation of results as for having resources always available, especially in contexts where funds have been constantly cut.

In this light, we decided to include in our representation the launch of SciHub (2011)[6], the website that provides free access to millions of research papers and books, without regard to copyright, by bypassing publishers' paywalls in various ways[7]. The widespread use of this tool represents the urgent need to institutionalize OA at the lowest costs for researchers and research institutions, to rationalize expenditures for the exploitation of research materials that have to be made available on a broader scale.

For the sake of brevity, we did not include the vast number of policies issued during the years. It is undoubtedly true that governments, funders, and academic institutions played a fundamental role in the advancement of OA in the last twenty years. They helped to institutionalize the concept, supporting strategies that offered not only to academics but also to the citizenship a view on the results of what has been paid mainly with public funds.

As we can understand from figure 1, the years 2002-2003 may be considered as a sort of turning point in the OA scenario. From BOAI to the Berlin Declaration[8] and the Bethesda Statement on OA Publishing[9], we pass through the releases of fundamental tools as CC licenses[10], Sherpa/RoMEO[11], DSpace[12], and DOAJ[13], until the San Francisco Declaration on Research Assessment (DORA)[14] and the first EU Recommendation on OA (2012/417/EU) ten years after.

The year 2018 also represents an essential step in this context, as for the publication of the second EU Recommendation on OA (2018/790/EU) and the launch of PlanS and Amelica. These two initiatives, although conceived in two completely different contexts, share the common goal of

[6] https://en.wikipedia.org/wiki/Sci-Hub
[7] https://en.wikipedia.org/wiki/Sci-Hub
[8] https://openaccess.mpg.de/Berlin-Declaration
[9] http://legacy.earlham.edu/~peters/fos/bethesda.htm
[10] https://creativecommons.org/
[11] http://www.sherpa.ac.uk/romeo/index.php
[12] https://duraspace.org/dspace/
[13] https://doaj.org/
[14] https://sfdora.org/read/

transforming Open Access into a concrete reality. We will describe them more in detail in a dedicated paragraph.

In the following sections, we will concentrate mainly on the development of scholarly publishing and the evolution of the editorial market. We will try to understand why, despite the significant accomplishments of the OA movement, its comprehensive realization has not been achieved yet.

3. Scholarly communication through time

The invention of printing (1454) represents the starting point of the modern dissemination of information. Between the end of the 16th and the beginning of the 17th century, scholars exploited this powerful tool to circulate the results and findings of experimental science. In this context, the first scientific journals, the *Journal des Sçavans*, and the *Philosophical Transactions* saw the light in the same year (1665) in France and UK, respectively (Santoro 2004). Especially in the Anglo-American framework, due to the establishment of learned societies, from the 1790s, an increasing number of periodicals were proposed to a growing reading public (Fyfe *et al.* 2017).

At the same time, the issue of intellectual property started to rise. However, it is during the 19th century that its importance grew significantly. Until that moment, the communities of scholars were mainly represented by independently wealthy, cultivated men, whose scholarly duties often ran parallel with their primary profession. In these years, major educational reforms led to the transformation of the "scholar" into an "academic," due mainly to the establishment of professional academic communities employed in universities. In such a way, doing research evolved into an actual job, which had to suit specific disciplinary standards. As a consequence, the list of publications became the method for demonstrating the knowledge of a particular field. For the administration of the universities, the number of published material became one of the fundamental tools to judge candidates for a potential academic position (Fyfe *et al.* 2017).

Publications counted not only in their number but also in their quality. In this changing landscape, the communication between peers shifted from direct- to mediated-communication. In the beginning, the outcomes of a scientific investigation were disseminated only after the revision of the journal's editor. Though, with the increase of the production and its more thorough specialization, only the articles that underwent the review of fellow experts would go to print (Greco 1999). It is the beginning of the peer-review mechanism as we know today.

There are no major changes since then. As in the 19th century, the review of the work of a peer is unprofitable for researchers, as it is part of their academic routine. Conversely, the evolution of the market is quite significant. Even though it is not before the 1940s that publishers start to make real profits with scientific publications, the transformations in academia and the professionalization of the scholars undoubtedly affect the mechanism of supply and demand.

Another significant variation regards the "key functions of scholarly communication" as described by Henry Oldenburg and Robert Boyle in the *Philosophical Transactions* (1665). They had identified four primary purposes of scholarly publishing: registration (attribution), certification (peer review), dissemination (distribution, access), preservation (scholarly memory and permanent archiving). The process itself has remained remarkably stable. However, a few decades later, an additional function emerged, i.e., evaluation (Guédon 2019). The significance of this factor has been growing exponentially over the years until reaching the importance that today affects not only scientific publishing but research in general.

During the 20th century, and mostly from the 1940s, research institutions have undergone substantial changes. Many universities have been turning more into large enterprises whose administrations adopt managing techniques similar to different areas of business (Fyfe *et al.* 2017). In such a competitive environment, "excellence" rises as a crucial parameter not only for scientists, but also for research institutions, funders, and in national and trans-national research strategies.

In this landscape, the business of scientific publishing has undergone considerable transformations. As we will see more in detail in the following paragraph, after the end of World War II, the revenues in this industry have increased exponentially, transforming it into a very profitable market.

4. The business of academic publishing

As mentioned before, from the end of the 17th century until 1945, academic publishing could not be considered as an actual profitable business: the publication of scientific journals was primarily part of the core activities of learned societies. The topics covered were quite broad, mainly coinciding with the societies' areas of interest. Individual subscriptions to receive copies of the paper journal were not very expensive and mostly included in the societies' membership fee (Björk, 2017).

It is after the second post-war era that the profit margins of commercial publishers exponentially grow. From the 1940s to the 1980s, state funding to R&D increased. The number of academic and research institutions multiplied, together with the number of people employed in this area. Research became an international business, owing to the increasing interconnection of the scientific communities at a trans-national level. Therefore, scientists received their academic credit among significantly larger groups of peers, reinforcing the trend of considering "excellence" as one of the principal parameters to obtain career's recognition. This criterion is firstly measured counting publications' number.

Researchers represent the suppliers and the primary recipients of scientific publishers at the same time, leading to an escalation in demand for publishing outlets. Journals became more and more discipline-oriented, and their number inflated (Fyfe *et al.* 2017; Björk 2017).

In such a context, commercial, scientific publishers increased their market share. The two basic strategies were: waive authors publication costs per page, as charged by society journals; regularly launch periodicals that cover niche areas of research, responding to the market demand (Björk, 2017). Hence, it is not difficult to imagine why between 1950 and 1980 the number of journals published worldwide went from 10,000 to 62,000 (Meadows 2000), while in 2002 53% of the trebled number of the monographs published in the UK since 1950 covered academic or professional topics (Thompson 2005; Fyfe *et al.* 2017).

As far as academic libraries concern, the investments in research coincided with substantial funding for their core functions, such as acquisitions and subscriptions. The expenditures dedicated to published material considerably increased, giving leeway to librarians as to the purchasing of titles and the types of contracts to subscribe with publishers.

In this booming market, the number of scientific papers circulating grew steadily. Therefore, it became necessary to elaborate on different standards for the evaluation of the "excellence" in research. As a consequence, in the 1970s, databases (e.g., the Science Citation Index) converted into a fundamental tool to count not only the number of articles circulating but also the number of citations they received.

However, at the beginning of the 1980s, the situation dramatically changed, leading to what is known as "serials crisis". Due to severe contractions in government funding to research, libraries were not able to feed the business of academic publishing as in the past decades. Maintaining high numbers as well as high quality in acquisitions became a challenge, forcing librarians to "go for convenience" (Chan 2018).

On the other side, researchers started to look for grants in more and more competing contexts. The "impact" of research grew in importance, and adopting strategies for its evaluation turned out to be of considerable importance. Indeed, despite the cuts in funding, scientific production kept rising. As a result, quantitative measurements of scientific excellence like journals' Impact Factor, H-index, citation counts appeared. They are currently considered as universal standards for research assessment, profoundly affecting the nature of research itself (Neylon 2019). By the end of the 1960s, publishers represented a "necessary partner in the advancement of science" (Buranyi 2017).

This situation left room to major commercial publishers for establishing what is now commonly considered as their oligopoly. Their revenues have incremented continuously since then, due mainly to the commercial system they actively contributed to establishing. In such a structure, scientists create their work, supported mainly by public funds, and hand it to publishers for free. Publishing houses pay editors to evaluate if the work is ready to be disseminated and to check its grammar and spelling. It is quite evident that the editorial burden (i.e., the peer-review) is carried primarily by scientists voluntarily, respecting a long-term tradition (see §3). At this point, publishers

are ready to sell back the outcome to the same institutions that contributed to its production and exploited by the same audience involved in its preparation.

In 1990, while libraries and consortia were struggling to renew increasingly expensive subscriptions, Ann Okerson[15] launched an appeal to the scientific community to subvert the system. She invited authors and institutions to claim intellectual property rights on their products and advertised the introduction of modern technologies for dissemination. In particular, she referred to the emerging Internet technology and the expansion of digital archives: the combination of the two would represent a significant step towards the evolution from the publishers' dominant position. In the same year, Stevan Harnad launched *Psycoloquy*, one of the first online, peer-reviewed journal (Santoro 2004).

As illustrated in figure 1, from that moment onwards, a growing number of initiatives were set mainly in universities and research centers. This situation highlights the profound need of the scientific community to find alternative solutions for scholarly dissemination.

However, publishers did not remain silent. From the mid-1990s, the affirmation of the World Wide Web revolutionized many industries, including scientific publishing. Due to the revenues obtained with the business of subscriptions, commercial publishers were able to set up the first commercial online solutions. Companies such as Elsevier proposed services to both libraries and researchers that could not be offered by public-funded laboratories.

First, they developed web-based platforms to publish electronic versions of the work and manage the peer-review process at the same time. Second, taking vantage of the transition to the online versions of paper journals, they were able to implement different business strategies and solutions for customers. These circumstances led to the affirmation of the "Big deals" between publishers and individual universities or consortia (Björk 2017). These contracts aimed at helping libraries' savings, allowing the cancellation of subscriptions to paper journals in favor of the acquisition of packages of digital resources.

Frazier (2001) explains that a "Big deal" is: "*an online aggregation of journals that publishers offer as a one-price, one size fits all package. In the Big Deal, libraries agree to buy electronic access to all of a commercial publisher's journals for a price based on current payments to that publisher, plus some increment. Under the terms of the contract, annual price increases are capped for a number of years*."

Initially, this appeared to be a win-win situation for both publishers and libraries, who were able to offer to their researchers and students a vast number of titles. However, Frazier again highlights that: "the content is […] "bundled" so that individual journal subscriptions can no longer be canceled in their electronic format." Hence, he invites research institutions not to sign any contract of this kind, as well as any comprehensive licensing agreement (Frazier 2001).

Technically speaking, due to the lack of statistics to rely upon pricing, publishing houses usually offered a deal covering several times more titles than before, for a slight mark-up compared to what they had paid earlier (Edlin, Rubinfeld 2004). After signing the first of such contracts, universities established a compelling lock-in situation: publishers were given leeway to keep rising prices every year, not only exceeding inflation but also the growth in library budgets. Furthermore, they implemented the strategy of unbundling articles for pay-per-view. It has not become prevalent, though: instead of looking for funds to pay for reading electronic resources, scientists preferred to rely on those already included in the contract subscribed by their central libraries.

Quoting Stephen Buranyi's article for *The Guardian* (2017): "*What other industry receives its raw materials from its customers, gets those same customers to carry out the quality control of those materials, and then sells the same materials back to the customers at a vastly inflated price*?"

[15] https://en.wikipedia.org/wiki/Ann_Shumelda_Okerson

5. Open Access in practice

5.1. Support strategies and tools

As is well known, OA represents a sub-sector of the broader concept of Open Science (OS), a paradigm encompassing numerous aspects and implying a profound cultural change. The European Commission has made a precise choice to sustain Open Science, realizing the European Open Science Cloud[16], a shared infrastructure to support various innovative services for the scientific community and citizenship. The theoretical principles are stated in the EOSC Declaration[17], while the EOSC Roadmap[18] offers operational indications.

The project *Accelerate Open Science*[19] has recently given the following definition of OS:

> *'Open Science' stands for the transition to a new, more open, and participatory way of conducting, publishing, and evaluating scholarly research. Central to this concept is the goal of increasing cooperation and transparency in all research stages. This is achieved, among other ways, by sharing research data, publications, tools, and results as early and open as possible.*
> *Open Science leads to more robust scientific results, to more efficient research and (faster) access to scientific results for everyone. This results in turn in greater societal and economic impact.*

In the framework of OS, together with Open Data (OD), OA firmly supports the view of research as a public good. The actions taken by the European Commission in recent years have much sustained the spread and affirmation of such concept among the different actors of scholarly communication. The EC Communication 2012/401 officially structured the prominence of OA for faster scientific progress in fostering the profits of public investments. The EC Recommendation 2012/417 clearly states: "[…] there should be open access to publications resulting from publicly-funded research as soon as possible, preferably immediately and in any case no later than 6 months after the date of publication, and 12 months for social sciences and humanities". FP7 first and Horizon2020 later granted financial support by the EC to achieve the goals of OA.

The European regulatory framework, as well as the long list of documents and recommendations concerning best practices in OA, are very well detailed.

Here below, we report a list of the essential documents[20]:

- **2018** C/2018/2375 Raccomandazione (UE) 2018/790.
- **2017** Guidelines to the rules on Open Access to scientific publications and Open Access to research data in Horizon 2020.
- **2015** Towards a modern, more European copyright framework. Communication from the Commission to the European Parliament etc. (COM 2015/626).
- **2013** Launch of Horizon 2020 and related Open Access policies (followed by an upgrade in 2017).
- **2012** FAQs on Open Access to publications and data in Horizon 2020.
- **2011** Main references to open Access in the European Commission's proposals for Horizon 2020; report entitled National open access and preservation policies in Europe.
- **2010** Europe 2020 Flagship Initiative and EU publication Policy proposals for developing world-class research and innovation space in Europe 2030: second report of the European Research Area Board, 2010
- **2008** European Commission and Unesco - Open Access handbook. Opportunities and challenges.
- **2007** Communication from the Commission to the European Parliament etc. on scientific information in the digital age: access, dissemination, and preservation.

[16] https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-cloud.
[17] https://ec.europa.eu/research/openscience/pdf/eosc_declaration.pdf.
[18] https://ec.europa.eu/research/openscience/pdf/eosc_strategic_implementation_roadmap_short.pdf.
[19] Cf. https://www.acceleratеopenscience.nl/what-is-open-science/.
[20] Cf. http://cde-genova.unige.it/openaccess

For further information, we suggest consulting the web of the European Commission at the section dedicated to Open Access[21].

On the side of OA everyday practice universities, research institutions, projects, libraries, associations, and foundations have operated for the establishment of suitable environments and to provide necessary information for the dissemination of the OA best practices. In this light, a vast number of tools and guidelines have been developed to support authors in open access publishing.
For instance, with the purpose of providing them with an instrument for rapid consultation of OA policies applied by publishers and journals, the Sherpa-Romeo service was implemented. Sherpa is supported and maintained by a British research consortium and currently represents a fundamental instrument that synthesizes publishers' policies for self-archiving.
The fact that publishers often impose an embargo for the deposit of the OA version of a publication, may lead to significant delays with funders' mandates. For this reason, addenda to publishing contracts and specific licenses as Creative Commons are now available.
A practical example of authors' addenda is the models supplied by SPARC - Scholarly Publishing and Academic Resources Coalition[22] or the H2020 model of publishing agreement for the authors participating in actions financed by EU publishing in non-OA journals.
With the application of a CC license, the author grants to the publishers and the readers some rights for the re-use of the scientific and educational material, e.g., public reproduction of the document or creation of derivative works.
Other fundamental instruments are Sherpa/Juliet[23] and Sherpa/Fact[24]: they guide authors about the compliance of publishers' policies to funders' mandates. Depending on these search results, authors may choose to follow the Green or the Gold Road.
Examples of directories to obtain information about OA monographs, journals, and archives are: DOAJ, DOAB[25], OpenDOAR[26], ROARMAP, CORE[27], Base Bielefeld[28], Open Access Button[29], OAD[30], ROAD[31].
Furthermore, infrastructures like OpenAIRE, projects like Foster, or institutions as TU Delft promotes webinars, tutorials, and (open) courses to examine OA issues more in-depth.
Finally, an exhaustive overview of the tools available to practice Open Science is given by the famous Rainbow of OpenScience Practices by Bianca Kramer and Jeroen Bosman[32].
To sum up, after almost twenty years from the Budapest Open Access Initiative (BOAI), OA today is a global issue involving at the same time and in the same way the protagonists of academic dissemination, who developed essential tools to make Open Access in practice.
In the following paragraph we report some data, which show how much OA spread in the scientific community.

5.2. A bit of data

According to a recent study (Piwowar 2019) at the present we have:

- 31% of all journal articles are available as OA
- 52% of article views are to OA articles

They can be considered as the results of the actions taken after the BOAI, and as a consequence of the formal definition of OA. In 2002, authors had only two strategies available to contribute to OA,

[21] https://ec.europa.eu/research/openscience/index.cfm?pg=openaccess
[22] https://sparcopen.org/
[23] https://v2.sherpa.ac.uk/juliet/
[24] https://sherpa.ac.uk/fact/
[25] https://www.doabooks.org/
[26] http://www.opendoar.org/
[27] https://core.ac.uk/
[28] https://www.base-search.net/
[29] https://openaccessbutton.org/
[30] http://oad.simmons.edu/oadwiki/Main_Page
[31] http://road.issn.org/
[32] https://zenodo.org/record/1147025#.XfSibdZKjR0

i.e., the Green and Gold Roads. However, the so-called Red or Hybrid Road appeared in the market immediately afterward.

The Green Road concerns the self-archiving of the pre-print or the post-print in an institutional or disciplinary repository, or on the author's website. Indeed, publishers impose an embargo period to the public access of the deposited documents in the majority of the cases.

Following the Gold or the Red Road, authors retain the copyright of their work, as specific licenses (e.g., Creative Commons Licenses) regulate the use and the re-use of the scientific production. Moreover, they publish their articles in peer-reviewed journals upon payment of an Article Processing Charge (APC). The difference between Gold and Red is that the so-called Red journals, or hybrid journals, are already covered by a subscription paid by the authors' institutions.

The offer has expanded to this day with the addition of the following models:

- **Bronze Open Access**: the article is published and available free of charge on the publisher's website, but no license for re-use is specified. Examples of this type are articles published for promotional purposes or under a Delayed Open Access regime, or Gold Open Access articles where the publisher does not make explicit reference to re-use licenses.
- **Diamond Open Access**: seen as a form of Gold Open Access, they share high-quality peer review and editing processes, but the Diamond model requires no article processing fees. Diamond OA is mainly supported in the academic environment and seeks to make the production, dissemination, and consumption of knowledge as free as possible.
- **Black Open Access**: this is the definition given by Björk (2017b) to the methods of publication of the so-called "academic social media" such as ResearchGate and Academia.edu as well as the pirate website Sci-Hub. These are channels that illegally offer copies of published articles without subscriptions, payments, and bureaucracy.

We can say that the Bronze category shares both Gold and Hybrid attributes. On the one hand, OA Bronze is available on publishers' websites. On the other, Bronze articles do not appear in OA journals and, unlike Hybrid, do not contain license information. For this reason, no use is allowed for them other than reading. Likewise, the publisher retains the right to give free access to the content permanently or only temporarily.

Another study shows that Green OA represents a relatively small percentage of the samples used. The most prevalent subtype in all samples is OA Bronze, although many Bronze articles are not recent, thus being classifiable as Delayed OA from toll-access publishers (Piwowar 2018).

The same study examines the citation impact of OA publications and concludes that open articles receive 18% more citations than closed articles.

John Tennant and other authors provide a very detailed bibliography on the scientific literature dealing with the relationship between the number of citations and open access. It argues that OA is related to the increase in the number of citations, as shown in the next graph. However, the results are still quite variable depending on the disciplinary field (Tennant 2016).

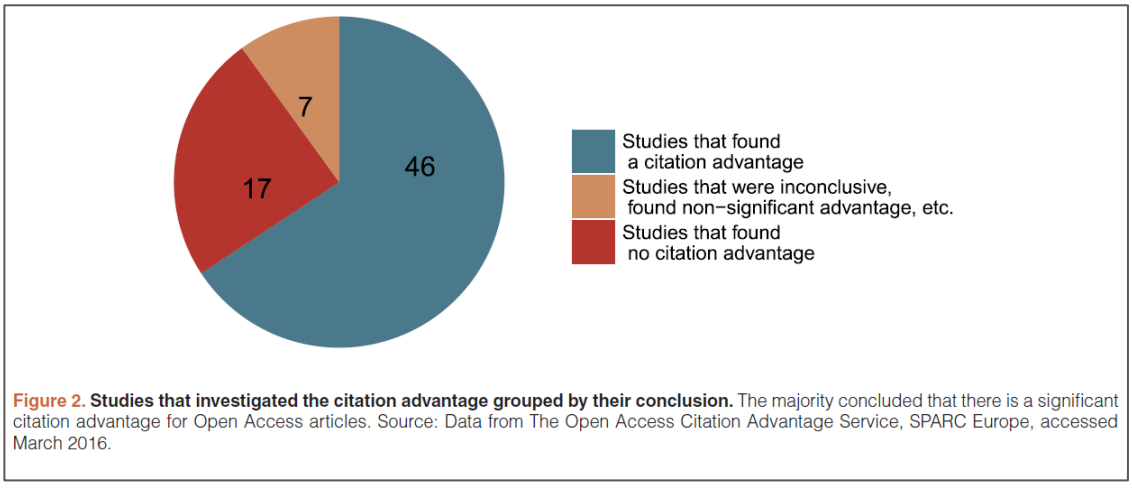

Figure 2. Studies that investigated the citation advantage grouped by their conclusion. The majority concluded that there is a significant citation advantage for Open Access articles. Source: Data from The Open Access Citation Advantage Service, SPARC Europe, accessed March 2016.

Figure 2: The academic, economic and societal impacts of Open Access: an evidence-based review (John Tennant et al. 2016)

In their work, Tennant and his co-authors analyze the impact of OA from different perspectives: academic, economic, and social. As far as the first is concerned, in their opinion, the most significant impact of OA is about:

- the increased documented impact of scientific articles as a result of availability and re-use;
- the possibility for researchers to have access to a large amount of scientific literature and to use automated tools to extract it, legally and without restrictions.

From an economic point of view, the authors argue that access to more research results certainly benefits private industrial sectors, with effects that go beyond financing. Indeed, adequate licensing and accessibility can give great benefits in terms of financial results. With access to scientific articles, entrepreneurs and small businesses can accelerate innovation and discovery by stimulating regional activities and global economies in the public interest.

From a social point of view, it is undoubtedly irrefutable that open access to scientific literature benefits not only academics but also other sectors of society. Access to knowledge has been defined as a human rights issue, making specific reference to Article 27 of the United Nations Declaration of Human Rights[33].

As we all know, one of the most innovative aspects of Open Science is the dimension of citizen science. Projects such as Galaxy Zoo, Zooniverse, Old Weather, Fold It, Whale FM, Bat Detective, and Project Discovery are all initiatives in which citizens engage publicly and openly in active research.

The benefits of implementing OA models seem to have been taken up by many organizations if we consider the increase in the number of OA policies and repositories on a global basis. As of October 15, 2019, OpenDOAR reports the existence of 4,367 repositories with the distribution shown in the charts.

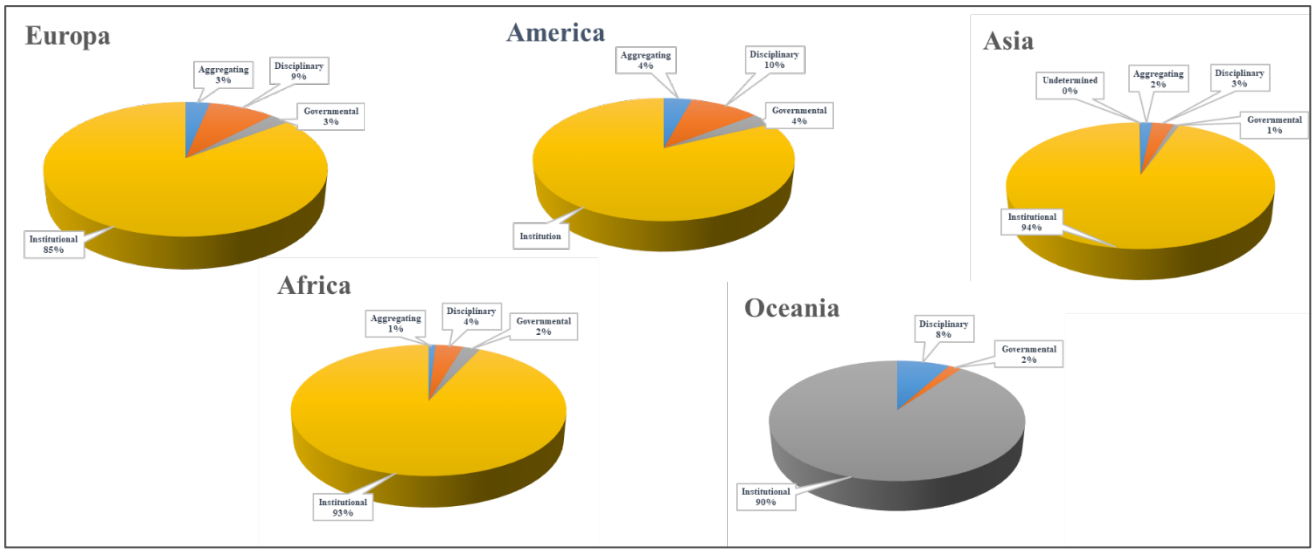

Figure 3: Distribution of repositories worldwide

The distribution of repositories in the different regions of the world varies significantly. Their majority locates in Europe and the US.

In almost every country analyzed, the most significant number of repositories is institutional, with percentages that slightly vary between 82% and 94%. The others are aggregative, disciplinary, and governmental repositories. The exception is Oceania, with no aggregative repository.

An in-depth analysis of the contents of OpenDOAR is outside of this study. However, it is quite evident the growth in the number of repositories over the years, as graphically explained below: from 2005 to 2019, we estimated annual growth of 32.38%.

[33] https://www.un.org/en/universal-declaration-human-rights/

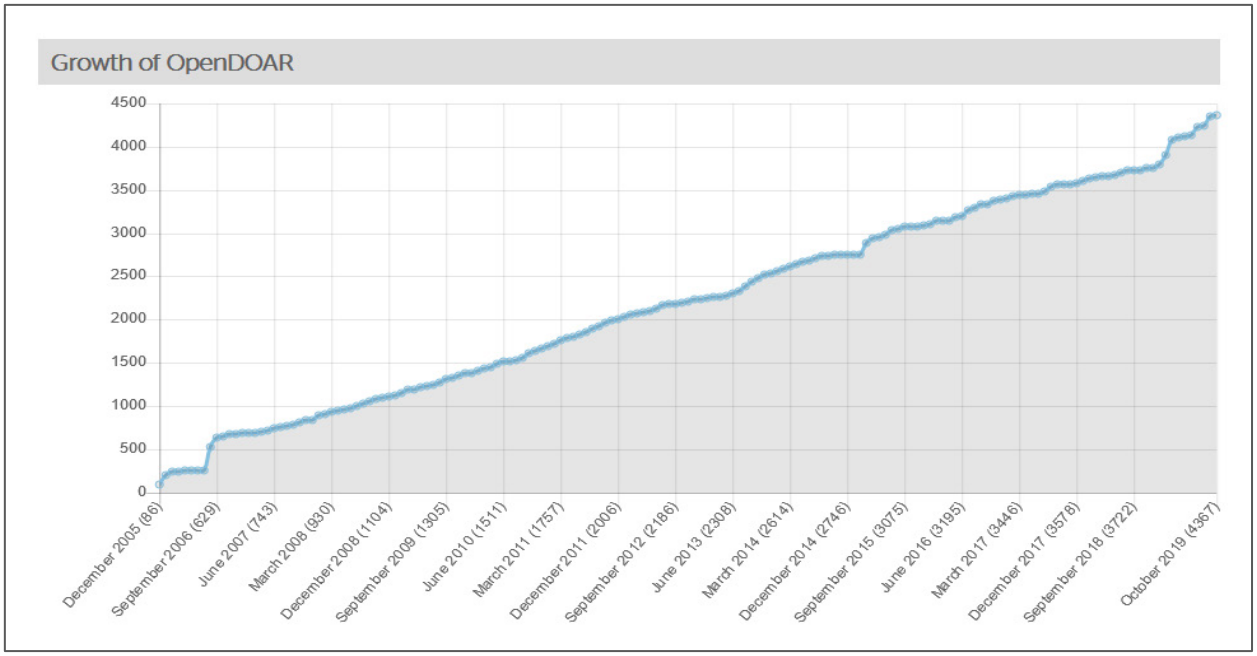

Figure 4: Growth of repositories in OpenDOAR (2005-2019)

The following graph shows the presence of more than 750 OA policies and mandates, registered in ROARMAP by a series of research institutions and subdivisions around the world, the majority of them being geographically distributed as highlighted above, i.e., in Europe and USA.

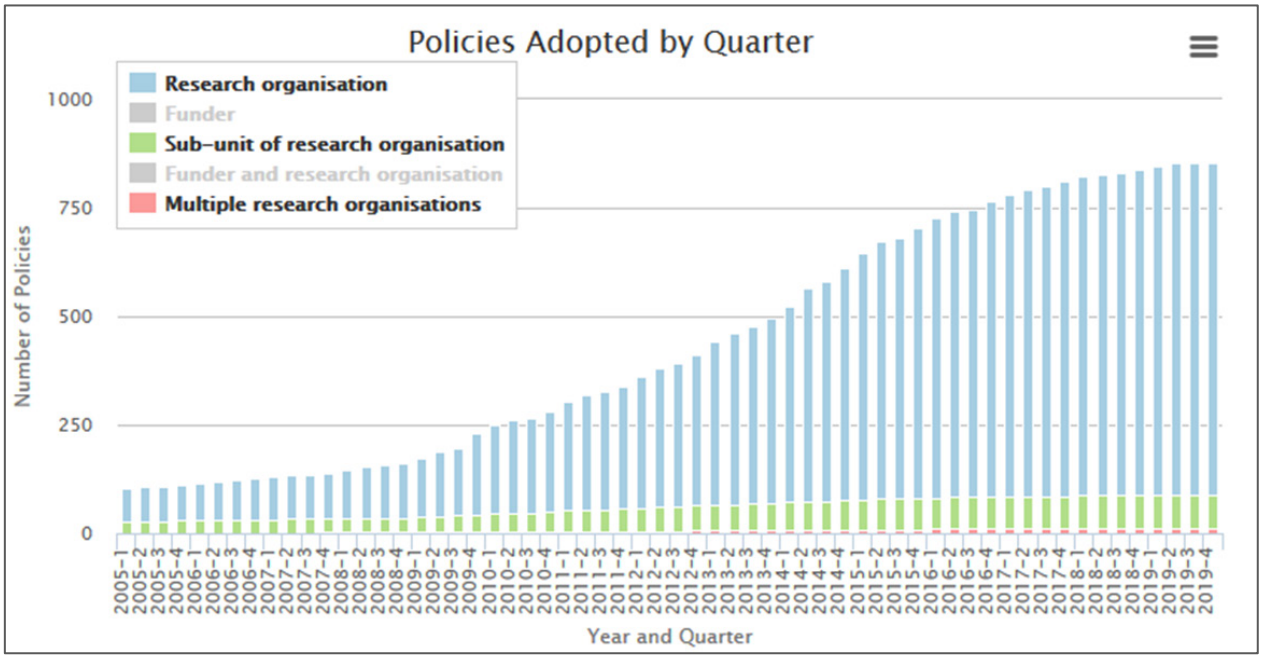

Figure 5: Number of policies in OpenDOAR 2005-2019

We estimated annual growth in the number of policies recorded by ROARMAP between 2005 and 2019 at around 15.62%.

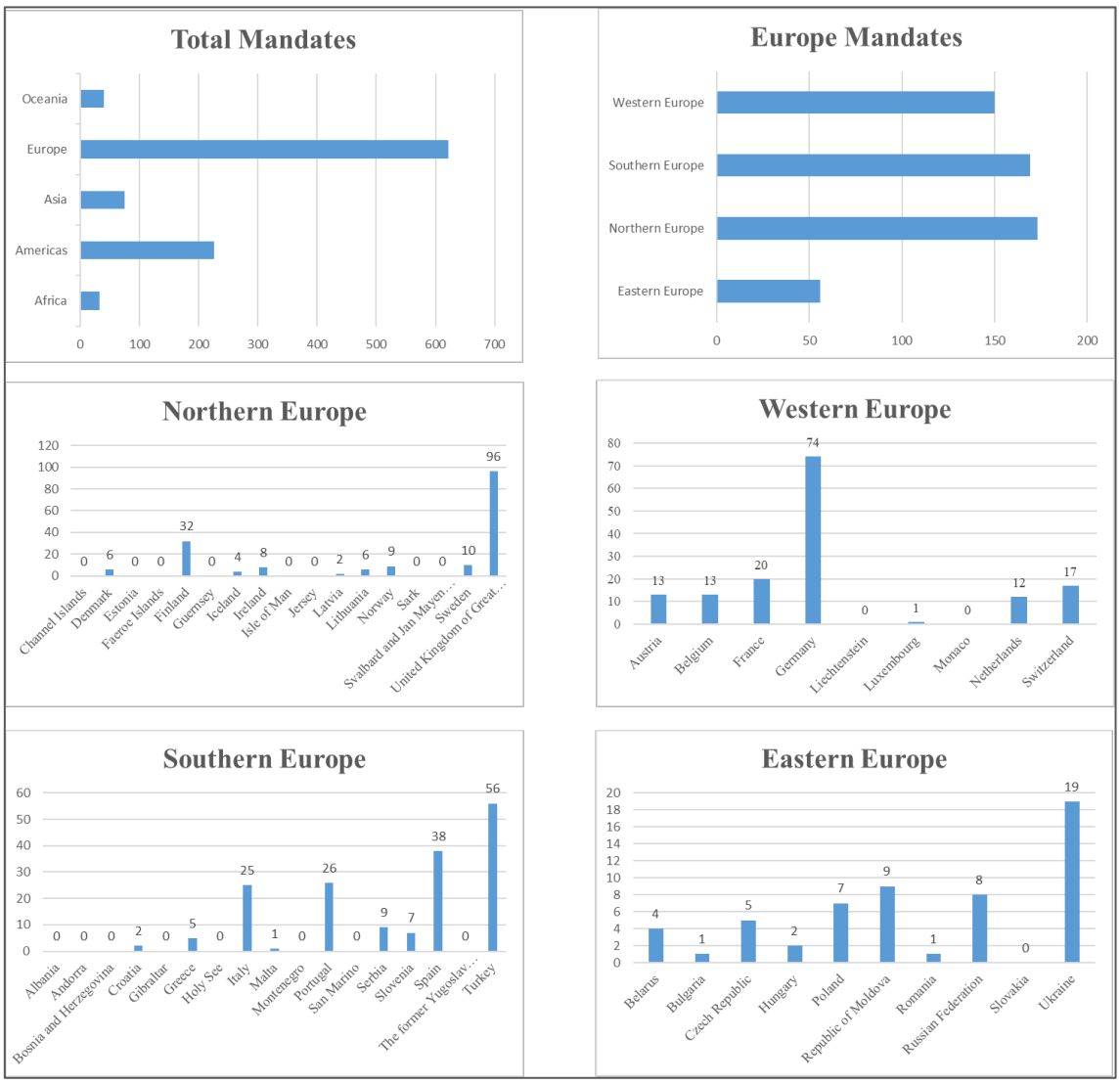

Figure 6: Distribution of policies in Europe

As far as the distribution of OA policies in Europe is concerned, the graphs above report quite noticeable results. While northern and southern Europe present the highest total number, they concentrate on fewer countries. A similar situation is also registered in western Europe, while in the East, the situation appears to be more consistent, except for Ukraine.

These figures provide consistent background for major transformations in the contemporary editorial scenery, as we will describe in the following paragraph.

6. The changes in editorial landscape

As we saw before, after more than three hundred years from the publication of the first scientific journal, the editorial system has not changed, its core still relying on the work done voluntarily by fellow scientists. The outcomes appear on journals whose subscriptions are paid by research institutions. It raised two fundamental issues:

- publications are behind paywalls: only those who can afford to pay the reading fee may access the contents;
- institutions pay the same work three times: researchers' salaries, research funding, and journals' subscriptions.

A situation like this causes great harm not only to scientists but also to citizenship. A widespread opinion sustains that public access to research results is not necessary as they are not understandable by non-specialists. We firmly believe, on the contrary, that everybody should have the possibility to freely access scientific contents, especially those of significant concern for the population worldwide (e.g., healthcare and climate change) (Tennant 2019).

In the contemporary world, the majority of scholarly communication goes online; therefore, costs like printing, shipping should not be charged as before. However, prices imposed by publishers have not dropped down (Borrelli 2019). In order to better afford the costs of Big Deals, academic and research institutions have gathered in consortia. However, this strategy has not turned out to be a win-win situation for institutions as well as for publishers.

As mentioned previously, a provocative, illegal reaction was the foundation of Sci-Hub in 2011 by Alexandra Elbakyan. She has been recently sentenced by an American court of Justice after suited by major editorial brands like Elsevier. Even though we cannot defend Elbakyan's misconduct, such a condition brings to some observations. On the one hand, a scientist whose aim was making science accessible by everyone, especially in economically disadvantaged countries, was condemned. On the other, academic and research institutions pay millions every year to keep science behind a paywall (Tavecchio 2017).

The results of a survey conducted by the European University Association (EUA) over 31 consortia in 30 European countries show that every year, institutions spend at least 1,025 billion euros for electronic resources (e.g., journals, databases, e-books...). Between 2017 and 2018, consortia spent 726 billion for Big Deals, 475 of them paid to the five major publishers (Elsevier, Springer Nature, Taylor & Francis, Wiley, and the American Chemical Society) (EUA 2019).

The study took into account the annual price increase and the resulting negative effect of the rising costs on the institutions, which try to guarantee access to scientific content when funding to research is steadily reducing.

The advent of Open Access brought to light a different business model based on Article Processing Charges (APC), i.e., the costs to support the dissemination of an article in Open Access.

There are three models of APC, with three different financial impacts[34]:

- APC for native Open Access publishers (e.g., PLoS, BioMedCentral...) that have no other source of income.
- APC for traditional publishers that offer optional Open Access to publications. In this case, the journal remains upon subscription, but the individual article becomes Open Access by the payment of a fee.
- APC for fully Open Access journals from traditional publishers.

The second model brings editorial brands profits from both subscriptions and APCs, leading to the so-called *double-dipping*, another *bizarre* mechanism that once again increases the costs of the institutions for the work of their researchers.

On the other side, APCs for Gold OA may be quite expensive, especially if authors choose to publish in journals with high Impact Factors, as necessary to succeed in research assessment exercises.

Increasing spending induced the arrangement of different deals, the so-called "transformative agreements." A transformative agreement is a contract negotiated between institutions and publishers whose purpose is to move from the current business model based on subscriptions to one that bears the costs of OA. The assumption is based on the evidence that the amount currently paid for journals' subscriptions is mostly sufficient to sustain OA publishing. Besides, copyright remains to the authors; transparency of costs and contractual terms are essential.

The most common models of transformative contracts include *formulas* such as:

- *Read & Publish*: in the same contract, institutions pay for both reading and publishing.
- *Publish & Read*: institutions pay only to publish; reading costs are already covered.
- Inclusion of the entire (or part of) publisher's OA and non-OA portfolio.
- Inclusion of all (or part of) the OA publications of an institution[35].

A practical example is the agreement reached in 2018 between Wiley and Projekt Deal[36], a consortium of 700 German research institutions. Other instances may be the "Springer Compact"

[34] cf. Elena Giglia, https://www.oa.unito.it/new/article-processing-charges/

[35] Silvana Mangiaracina. *Dai Big Deals ai contratti trasformativi*, https://www.slideshare.net/BiblioBoCNR/dai-big-deal-ai-trasformative-agreements-unanalisi-del-cnr

[36] https://www.projekt-deal.de/wiley-contract/

models (Read & Publish), subscribed with the publisher by countries such as Austria, Germany, Sweden, Hungary, Poland, The Netherlands, and United Kingdom.

Approximately 50% of all articles published in peer-reviewed OA journals are published upon APC payment. This mechanism of "pay-to-publish" has raised several "moral" reactions as it can only generate a conflict of interest. This can be resolved if editorial decisions on the quality of the publication remain separate from the commercial aspects (Tennant 2016).

Numerous initiatives nowadays promote sustainable OA and facilitate informed negotiations with publishers. Among them, OpenAPC[37] aggregates data from various research entities, creating datasets that facilitate an overview of the fees paid for OA. All data collected are provided voluntarily by the participants; data transfer may vary among countries, but each data provider agrees on the principles of Open Knowledge.

The following table shows data from OpenAPC listed by the publisher as of November 2019.

Publishers (489 entries)	Sum	Number of Articles	Mean Value	Standard Deviation	Percentage
Elsevier BV	€34.572.109	12579	€2.748	€1.094	20.12%
Springer Nature	€28.220.357	14475	€1.950	€924	16.42%
Wiley-Blackwell	€16.676.961	7159	€2.330	€767	9.71%
Public Library of Science (PLoS)	€12.633.071	8765	€1.441	€411	7.35%
Frontiers Media SA	€9.931.876	6083	€1.633	€557	5.78%
Oxford University Press (OUP)	€7.389.019	3075	€2.403	€760	4.30%
Springer Science + Business Media	€5.588.097	3733	€1.497	€505	3.25%
American Chemical Society (ACS)	€5.575.937	2133	€2.614	€1.057	3.25%
MDPI AG	€4.118.463	3612	€1.140	€439	2.40%
BMJ	€3.871.729	1801	€2.150	€704	2.25%
Copernicus GmbH	€3.382.865	2426	€1.394	€606	1.97%
Informa UK Limited	€3.232.511	2388	€1.354	€828	1.88%
IOP Publishing	€3.196.756	2054	€1.556	€675	1.86%
Ovid Technologies (Wolters Kluwer Health)	€2.360.543	777	€3.038	€1.327	1.37%
		view small values			
Total	**€171.828.193**	**87916**	**€1.954**	**€984**	**100%**

Table 1: articles' number and amount paid by publisher for APCs
(data from OpenAPC – November 2019)

OpenAPC does not substitute national or international reports and collected data only from countries with significant financial resources. However, with its complete transparency, it has gradually become a fundamental source of information to obtain a more profound knowledge of transformative mechanisms.

7. A slow and difficult transition

7.1. International initiatives

Unless the favorable results, we are still talking about a *transition towards OA*. At the end of 2018, cOAlition S[38] launched Plan S to accelerate the complete and immediate open access to research publications.

In the first version of the project, the results of publicly funded scientific publications should be published in OA journals or platforms by 2020, without any additional financial burden on the authors.

The guidelines on the actuation of Plan S were published on November 27, 2018, and were left open to the general audience until February 8, 2019.

The publication of Plan S raised a debate with contrastive opinions, opening an extensive international consultation on OA policies. Thanks to the contributions received and the debate between the participating institutions, at the end of May 2019, cOAlition S published updated principles and guidelines for the program's implementation.

[37] https://www.intact-project.org/openapc/
[38] https://www.coalition-s.org/about/

The revised Plan-S maintains its fundamental principles:

- scientific communication must be accessible;
- Open Access should be immediate;
- Creative Commons Attribution CC BY is the tool to implement full Open Access;
- funders undertake to support Open Access fees at a reasonable level;
- funders will not support publication in hybrid journals unless they are part of a Transformative agreement with a clearly defined endpoint;

with some significant modifications:

- the outcomes of publicly funded scientific projects should be available OA by 2021;
- it will support transformative agreements until 2024;
- it will promote multiple transition models;
- it will provide greater clarity on the various routes to comply with Plan-S;
- it will place greater emphasis on changing the system of evaluation and rewarding academic production;
- the importance of transparency in OA publication fees (APCs) is stressed;
- the technical requirements for the OA repositories have been revised and simplified.

At the same time, in Latin America, another project called AmeliCA started. These are the ten principles as appear on its official website:

- Scientific knowledge generated with public funds is a common good, and access to it is a universal right.
- The open academy-owned non-profit non-subordinate sustainable and with responsible metrics publishing model ought to be strengthened.
- Open Access has neither future nor meaning unless research assessment systems evolve.
- Open Access consolidation demands the transition to digital scientific communication.
- Financial investment in Open Access ought to be in line with its benefit for society.
- Open Access sustainability using cooperative work schemes and a horizontal distribution to cover costs.
- The diversity of scientific journals is necessary; hence the pressure to homogenize them ought to be stopped.
- Journals ought to allow authors to retain their copyright and remove their embargo policies.
- Science's social impact is the foundation of the existence of OA.
- The various dynamics to generate and circulate knowledge per field ought to be respected, especially as regards Social Sciences and Humanities.

Both the initiatives, together with others as the ***African Open Science Platform***, ***OA2020***, **and** ***SciELO***, have the same global aspiration and stem from the need to accelerate an excessively slow and ineffective transition to Open Access.

As reported by cOAlition S, their common objectives are:

- scientific knowledge is a global public good. When generated by public funds, free access to it is a universal right;
- providing universal, unrestricted, and immediate Open Access to scholarly information, including use and re-use by humans and machines, is the ultimate objective;
- this common goal can be achieved through a variety of approaches, looking for alignment within their approaches and ways to co-operate;
- they both promote an active dialogue with all stakeholders (e.g., researchers, funders, universities, libraries, publishers, learned societies, governments, and citizens), referring to the diversity of the global scholarly community.

By coincidence, Plan S and AmeliCA have a similar structure and are both based on ten principles, so they are often associated and compared. However, their different historical and cultural backgrounds led them to distinct, often opposed, strategies.

Plan S generates in a context where the use of scientific contents is entrusted to commercial systems, based on the relationship between publishers and institutions.

Because of its history and culture, AmeliCA "*leads its efforts towards a non-profit publishing model to preserve the scientific and open nature of scientific communication (also known as "diamond open access").*" Indeed, scholarly communication in Latin America refers to a non-commercial structure in which scientific publications belong to the academic institutions and not to major publishers.

As a result, on the one side, Plan S appears to be strongly oriented to regulate agreements and to establish a limit to the costs that institutions have to pay. On the other, AmeliCA aims to build multi-institutional platforms led by the same scientific community to consolidate a collaborative, sustainable, and non-commercial Open Access.

Accordingly, we are facing two profoundly different understandings of Open Access. In the Global South, the access to the scientific production has been historically more challenging, due to the high costs either for reading or for publishing in high impact journals (Chan, Kirsop, Arunachalam, 2011). In Latin America, earlier than BOAI, state budgets have always been a primary element in the dissemination of scientific knowledge, as institutional funds usually cover OA without any fee for authors and readers.

On the other hand, the current version of Plan S appears to be closed tight to the publishing market and, therefore, to the same structure that OA principles firmly disapprove. For this reason, the supporters of AmeliCA sustains that this model would not be exportable outside Europe.

Moreover, while the nature of Plan is indicative/normative, AmeliCA proposes concrete actions and projects to solve the problems related to the diffusion of science.

Both initiatives criticize current research evaluation systems, almost exclusively based on indicators such as the impact factor and express their commitment to the application of the principles promoted by the DORA Declaration. Nevertheless, AmeliCA has also set up a multidisciplinary working group of experts from various countries to generate more relevant and equitable metrics for researchers, science and Open Access.

Regarding institutional repositories and OA platforms, although Plan S recognizes their role in long-term archiving and their potential for the promotion of new editorial systems, it does not acknowledge their practical value for global access to scientific production.

However, COAR[39] and cOAlition S in their joint statement argue that: "*repositories offer a low-cost, high-value option for providing Open Access and are also a mechanism for introducing innovation in scholarly communication, acting as vehicles for developing new dissemination models and providing access to a wide range of scholarly content.*"

On June 2019, at the end of the XI Joint Steering Committee Meeting of the Bilateral Agreement on Science and Technology between the European Union and Argentina, a joint declaration reported about Argentina's accession to Plan S, and, at the same time, the intention to bring the issue to the discussion of the whole of Latin America and the Caribbean countries.

Finally, we can reasonably argue that the debate is still very open as the guidelines of Plan S do not address essential issues for Latin Americans. In addition, Plan S "*…will influence the publishing ecosystem worldwide, [but] its design has ignored more than 20 years of agenda on Open Access from the Global South and the paradigm of a contrasting scholarly publishing landscape in Latin America*." (Debat, Babini 2019).

7.2. What went wrong?

Since we are still talking about a *transition towards full OA*, we must argue that something went wrong during these years, and identify some possible reasons.

One is the lack of researchers' awareness. Many of them still think of Open Access as something that is not of their concern. Researchers are almost wholly unaware of the costs sustained by the institutions for subscriptions, even though we are talking about public money that ends up in the pockets of the publishers. Besides, a large number of them are unaware of neither the principles

[39] COAR – Confederation of Open Access Repositories, https://www.coalition-s.org/coar-supporting-repositories/

nor the practices of OA. Furthermore, it favors the persistence of some mistaken beliefs. The famous *Six false myths* by Peter Suber (Suber, 2013) are still in force in some scientific communities.

Between these false myths, we find the widespread belief that it is necessary to publish in OA journals to make Open Access. As we have seen in the previous sections, BOAI immediately provided the strategies to practice OA, and, since the beginning, there are two complementary models to achieve the goal: the Green and the Gold road. Almost every OA policy in the universities or the funding agency requires storage in OA archives and repositories, and repositories for self-archiving are a concrete reality that researchers can exploit.

Many researchers believe that it is necessary to pay APCs to publish in peer-reviewed OA journals. However, the majority of them do not require any publishing fee, as demonstrated by data in DOAJ (December 2019): OA journals utterly free of charge are over 10,000 against about 3,000 that require payment.

Similarly, several authors are not aware that most of the publishers allow the green road. Authors then are free to publish in the best journal of their field and deposit the allowed version in an institutional or disciplinary repository. Furthermore, as we have already pointed out, there are various tools for knowing publishers' policies and others that allow the authors to request amendments to the publication contracts.

Another misbelief is that open access journals are low in quality. Scientists should always remember that the quality of a scientific journal is in its contents, authors, and reviewers, and not by its publisher's business model or access policy. However, the so-called predatory publishers have contributed a lot to the persistence of this false principle.

As a matter of fact, in the OA panorama, there have been less severe publishers who are riding the OA phenomenon to take advantage of the *pay-to-publish* system and cash the APCs in exchange for publication in low-quality journals without peer-review. They are very often publishers who falsely state that their journals are indexed in databases such as WoS or Scopus with high Impact factors or other indicators of prestige used in research evaluation systems. Unfortunately, the problem of predatory publishers has had a very negative impact on the OA movement, and many authors, especially the youngest and most inexperienced ones, have fallen in the network of predators. However, now several methods can help authors to avoid predatory publishers: from the Beall's List to modern tools such as *Think, Check, Submit,* which provides checklists to help researchers in identifying reliable journals and "real" OA publishers.

Finally, some scientific communities argue that the obligation to publish in Open Access may violate academic freedom. This conviction partly leads to the issue of the distinction between Green and Gold road. On the one side, Gold OA indeed implies publication in specific journals. Nevertheless, on the other, Green OA in no way limits the freedom of researchers to publish in the journals of their choice. Probably this is the main reason why almost all OA policies issued by universities and research institutions support the Green road.

Furthermore, are researchers currently free to publish not only **what** they want but also **where** they want? In our opinion, the answer is no, because they have to publish in high Impact Factors journals for a positive evaluation.

The importance of the Impact Factor in research evaluation systems is still very dominant, despite the success of initiatives such as the DORA declaration or the Leiden Manifesto and the criticisms expressed by numerous authors (Wouters 2019). Some argue that the IF provides a poor representation of real trends, while others explicitly talk about manipulation by unscrupulous publishers and even fraud, referring to the emergence of a craft industry of questionable journals that make use of falsified impact factors (Pudovkin 2018).

The selection of journals based on bibliometric indicators has become a driving force behind the research activities themselves. It discourages publication in journals that are not included in the citation indices and reflects research planning, performance, and communication. As long as the assessment is based on the number of citations received and the prestige of the journals, it will be difficult to change the model of scientific communication.

The publication of Plan S has raised an open debate, which in many cases highlights a lack of knowledge of the same principles of Open Access, confirming the persistence of the false myths as well as a general low degree of awareness about the topic.

For instance, the fear that OA is opposed to peer-review emerged in some criticisms addressed to Plan S. Nonetheless, the importance of peer-review is also reaffirmed by Plan S itself. Open access, or rather Open Science, does not discredit peer-review but supports the need to expand the means of evaluation. We speak in this sense of *Open peer-review* as the opening of a process traditionally closed would make the practice completely transparent.

Other misinterpretations would expect a total ban of hybrid journals from the editorial panorama after the entry into force of Plan S. Alternatively, the initiative would divide somehow the scientific community, causing damage to the circulation of knowledge. Last but not least, it would lead to an exorbitant increase in publications costs, so that scientists would be forced to publish their work exclusively in Open Access.

Another obstacle concerns the practice of Green Open Access. Although the growth in the number of OA repositories and policies, the publication in institutional or disciplinary repositories is still lacking. In 2016, John Tennant said that this situation might have three potential explanations:

- *authors are unsure whether they have the legal right to practice self-archiving;*
- *authors are concerned that the request for self-archiving may jeopardize the acceptance of their article for publication;*
- *authors believe that self-archiving could involve much work.*

The first point highlights the issue of the embargo imposed by the publishers on the unrestricted access to post-print. As is well known, the EU regulation establishes that research products published with the support of EU financing should follow the indications provided in the Commission Recommendation (EU) 2018/790 (April 25, 2018), which substitutes those published on July 12, 2012. It confirms that the research products should be deposited in an online repository granting open and free access as soon as possible or within six months (STM) or 12 months (SSH) from the publication date at the latest. Research products whose purposes are bound to copyright, economic exploitation, and marketing are not involved (e.g., patents).

Very often, the embargo period established by the commercial publishers does not coincide with the European rules. In these cases, the only choice available to an author is to opt for Gold OA directly.

A possible solution may be the acknowledge of different status to the preprint, as demonstrated by a recent analysis that focuses on its potentially transformative role in the academic communication landscape (Chiarelli 2019). The community of Physicists has been sharing preprints for over 60 years. In the beginning, paper copies circulated via postal service. Even though the emergence of arXiv and the Web after 1991 redesigned the distribution system, and a wide range of platforms are now available for archiving preprints, the dissemination of preprints is not the same within all communities. The reluctance to the use of preprints is mainly due to the absence of peer review and the fear that a deposited preprint may not be accepted and published.

At the same time, preprints do not entirely integrate into the publication workflow. Although technology is perfectly capable of supporting versioning systems, the deposit of a preprint is disconnected from the subsequent processing of the work, resulting in overlapping information and identification problems.

Therefore, we can argue that today the different scientific communities would not consider enhancement in the status of preprints as a priority. However, *a growing number of research funders are starting to acknowledge and accept preprints as suitable for inclusion in grant applications*, and we recognize the role that preprints can play in the evaluation of researchers (Chiarelli 2019b).

Soon, the possible role of preprints may bring very significant changes in the publishing landscape, shifting the focus from the publisher to the author and, most of all, towards the scientific outcomes.

8. Conclusions

It seems to have everything we need. We have the support of the European Commission, models, tools, laws, policies, recommendations, and repositories. However, universal or partial access to about 70% of articles is not yet directly possible unless the author's institution pays a subscription, or has enough money to pay per article.

The aforementioned Piwowar's study estimates that in 2025 (given existing trends):

- 44% of all journal articles will be available as OA
- 70% of article views will be to OA articles

The results achieved by the movement in almost 20 years are significant, even though there are still obstacles to overcome. The most significant limit probably is that Open Access requires a significant cultural change, especially on the researchers' side. At the moment, there is a general lack of knowledge, and it will be necessary to make them aware of the benefits offered by OA. The institutions should identify the best practices to involve all researchers in all phases of the transition, for example providing institutional incentives and awards if they publish in Open Access journals or repositories. At the same time, institutions should provide researchers and all support staff adequate training. Moreover, the institutions should promote the development of open e-publishing systems and repositories and also plan the building of new skills in copyright and data protection, platform management, research data management.

Another critical barrier is the current system for research evaluation and career advancement, which gives more importance to *where to publish* instead of *what to publish*. In research evaluation, quantitative metrics (e.g., number of publications, the impact of journals) should not replace a meaningful and qualitative assessment of an individual's work. With the move towards an open editorial system, research evaluation processes could, for example, include incentives for open access publication as well as rewarding the quality of the article itself, regardless of the impact factor of the journal chosen. Besides, activities such as review, evaluation, care, and management of research data, as well as data sharing and the development of open resources, should be explicitly recognized in the framework of researcher evaluation.

The editorial landscape has changed a lot in recent years. The increase of OA has required careful negotiations between several stakeholders (e.g., librarians, financiers, academics). Many countries have already adopted strategies to transform the economic model of scientific publications. The Netherlands, Germany, Sweden, and Norway defined transformative agreements whose rates are based on the number of OA articles published. The University of California and the Max Planck Society canceled its contracts with Elsevier.

However, at the moment, the APC market and the transformative agreements do not seem to produce the expected results, from a strictly economic point of view. On the contrary, with the growth of OA, the most prominent publishers have seen the phenomenon as a further business opportunity. They are generating additional profits through the APC mechanism, while institutions are incurring additional expenses in addition to the Big Deals.

So, while OA has the great merit to have defined the concept of scientific research as **a public good** and to have introduced the idea of change, it has not been able, until now, to significantly contrast the great publishing oligopolies.

In order to contrast the great publishing oligopolies, institutions should:

- follow the "gold" and the "green" roads as both of them present considerable advantages;
- avoid hybrid models and any other model that charges additional costs;
- ensure that publishers respect the embargo periods established at national and EU level;
- ensure greater transparency on contracts and costs in the scientific publishing market by acquiring the necessary knowledge on the costs incurred for APCs and subscriptions at regional, national and European level;
- seek more cost-effective solutions by taking control of the total cost of publication;
- acquire a higher bargaining power in negotiations with publishers;
- secure the support of governments and funders.

Plan S has undoubtedly triggered a kind of revolution in the circuit of scientific communication. Nevertheless, we still need to understand if Plan S represents a turning point. Does it work at trans-national level? Will transformative agreements save the libraries' finances, or they will be the "New Big Deals"? According to some authors, *every time we sign one of these so-called transformative contracts, which often contain multi-year lock-ins, we lose the opportunity to create something more just, sustainable, efficient, and effective* (Tennant, 2019).

On the other hand, the primary duties of institutions like the European Commission will be to give concrete indications to remove the obstacles currently posed to Open Access. With the new framework project, Horizon Europe, the EU will have the opportunity to determine different conditions for the practice of OA. We hope that the experience of FP7 and Horizon2020 has helped to understand how to overcome obstacles as the embargo periods by re-evaluating, for example, the role of preprint in the dissemination of research results.

In the course of this study, we had the opportunity to understand that OA increases the knowledge and contributes to its transfer, creates positive spin-offs in the economy, and allows interdisciplinary approaches on issues of great importance for society. Only with the collaboration of all actors and a significant change in mentality, we would obtain an effective revolution in the scholarly communication.

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From Digitization and Digitalization to Digital Transformation: A Case for Grey Literature Management*

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Abstract
Following digitization and digitalization, digital transformation is the next step in the automation of grey literature management. A brief historical overview and analysis of current trends will shed some light on terminological differences in these three terms, but also on more important conceptual differences. At one time, these terms were used almost interchangeably, especially the first two. Although the term 'digital transformation' is newer and currently more frequently used, it still causes semantic confusion. Digital transformation — including the management of grey literature — attempts to rise above this terminological ambiguity by assuming an umbrella role, encompassing digitization and digitalization as its constituting components and regarding them as small, but necessary, steps in the big picture of an organization's digital transformation. Digital transformation has a major impact on all activities carried out by those organizations that adopt it. Because it offers valuable opportunities for the growth of commercial, government, and public organizations, it requires the full attention of business and information managers. It also provides the opportunity to enhance the management of grey literature, increase its value and importance, and improve its usability and accessibility.
Keywords: digital transformation; digitization, digitalization, grey literature

Introduction

The terms digitization, digitalization, and digital transformation often cause confusion and are sometimes used interchangeably, especially the first two terms (Brennen, 2014). Digital transformation is a newer and, currently, a more frequently used term, while still causing semantic confusion. Digital transformation — including information and grey literature management — attempts to rise above this terminological ambiguity by assuming an umbrella role, encompassing digitization and digitalization as its constituting components and regarding them as small, but necessary, steps in the big picture of an organization's digital transformation.

Because digital transformation offers valuable opportunities for commercial, government, and public organizations, it deserves clarity and the full attention of business and information managers. It also offers a chance to enhance the management of grey literature, increase its value and importance, and improve usability and accessibility.

This paper begins by exploring the basic facets of the concept of digital transformation and offering some reasons about why it matters for businesses today. It will then give an overview of terminological, conceptual, and historical differences between digitization, digitalization and digital transformation. Special emphasis will be given to the impact of digital transformation on grey literature management, specifically on its work, workplace, and workforce.

Digital Transformation Concept

The term digital transformation is often used in business presentations, discussions, and numerous papers. However, there is not a single, widely accepted, definition. Researchers and businesses have differing definitions, depending on their area of expertise and interest. Most agree, however, that digital transformation, using modern information technology (IT), represents large-scale change in fundamental business processes and components. These changes generally target business models, products, productivity, employee roles, production, marketing, financial management, and other processes. They also include cultural changes that challenge the status quo, and the way information is managed, structured, and positioned within an organization. All parts of an enterprise can undergo, or feel the impact of, transformation — from infrastructure,

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supply chain, sales, marketing, purchasing, finance, and human resource management, to customer relations.

Some writers regard standard business process re-engineering as digital transformation. Although some elements are the same, business process re-engineering is mainly algorithmic, or rule-based processes, where automation is done simply by deploying newer technologies. Digital transformation has a different goal in mind. It concentrates less on the technology, although highly dependent on it, and more on the starting and end points as business related goals. Information technology is only an enabler in the process of digital transformation for more efficient and, often, different ways of doing business.

Having said that, it does not mean that the type and sophistication of information technology does not play an important role. It does and will continue to do so. Some of the new technologies are of paramount importance in implementing parts of digital transformation. These include artificial intelligence, machine learning, robotics, the Internet of things, big data, cloud and mobile computing, powerful analytics, social networks, 5G networks, 3D printing, augmented and virtual reality. However, it is the business rationale that determines its use, not the other way around.

Digital transformation did not happen suddenly — it is only the last part in a chain of various processes and developments related to automation. Historically speaking, the business world initially went through the process of digitization, followed by digitalization, and finally arriving at the current stage — digital transformation. All three phases are covered in this paper.

The importance of digital transformation

Many trends have been regarded as 'important', 'major', 'game changing', etc. They have come and gone. With that in mind, it is fair to ask if digital transformation really matters — and why it matters. In other words, what is the importance of digital transformation? What makes this latest trend different and special? And will it really have a lasting impact?

Even a brief look at current relevant literature and business reports shows some very important, large-scale predictions for the near and not-so-distant future. The OECD Employment Outlook (OECD, 2019) predicts that 14% of jobs are at high risk of automation, while another 32% of jobs could be radically transformed in the next 15-20 years. This makes 46% of all jobs undergoing some radical change in a relatively short period of time.

According to a report published by Dell Technologies and authored by the Institute for The Future (IFTF) and a panel of 20 tech, business and academic experts from around the world, 85%of jobs that will exist in 2030 haven't even been invented yet (DELL Technologies, 2019).

Worldwide spending on the technologies and services that enable the digital transformation (DX) of business practices, products, and organizations is forecast to reach $2.3 trillion in 2023, according to a new update to the International Data Corporation (IDC, 2019).

The climate change ("green") movement, also sees an opportunity for improvements and benefits arising from digital transformation. For example, due to intensive automation and digital transformation, Telstra Corporation Australia (2019), predicts a 20% reduction in global carbon emissions by 2030.

From a personal aspect, digital transformation might have some negative impacts. Gartner (2016) predicts that by 2020, the average person will have more conversations with bots than with their spouse. With the rise of Artificial Intelligence (AI) and conversational user interfaces, we are increasingly more likely to interact, unknowingly, with a bot in the future than ever before.

Digitization

According to the Oxford English Dictionary (OED) (2019), the terms 'digitization' and 'digitalization' in conjunction with computers were first used in the mid-1950s. OED defines digitization as, "the action or process of digitizing; the conversion of analogue data (esp. in later use images, video, and

text) into digital form." Digitalization, by contrast, is defined as, "the adoption or increase in use of digital or computer technology by an organization, industry, country, etc."

The easiest way to understand digitization is to regard it as a phase of intensive conversion of various content from analogue to digital format. It includes the conversion of paper, audio, and visual recordings to electronic formats. The rise of commercially available hi-resolution document scanners (e.g. 600 DPI or more) triggered a mass conversion of analogue data — for example paper archives to digital, computer-based formats.

In addition to the introduction of scanners, the invention of the first compact disk (CD-ROM) in 1982 offered a cheap storage and distribution medium, used not only for storing paper documents but also for the conversion of audio and video analogue formats, such as LPs, cassettes, film reels, and VHS tapes. During the digitization phase, several new digital formats were invented to accommodate different requirements. TIFF (1986), PDF (1993), and DjVu (1996) formats were introduced to help convert microfilms and microfiches to electronic media, while MPEG-1 and MPEG-2 file formats were developed in 1991 and 1994 respectively for audio-visual recordings. It should be noted that there were two previous audio-visual formats, H.120 in 1984 and H.261 in 1988, but their resolution was too low to be useful for digitization purposes.

The benefits of this massive conversion of analogue media to digital formats were overwhelming. They included increased usability, speed of access, transferability, and the very important possibility for further processing, which opened the gate for many other applications.

Digitalization

The first use of the term 'digitalization' was in a 1971 essay by Robert Wachal (1971) where he discussed the social implications of digitalization, "as a humane man he naturally fears the digitalization of society". It is worth mentioning that the fear of technology and the fear of automation is an interesting phenomenon, that is still present today in many discussions about digital transformation (e.g. loss of jobs), and especially those on the potential dangers of artificial intelligence.

Still, technological progress is hard to stop, which leads us to the next phase, digitalization, characterized by the automation of business processes. Digitalization most often refers to enabling, improving and/or transforming business operations, functions, and/or models/processes and activities, by leveraging digital technologies and the broader use of digitized data, turned into actionable knowledge, with a specific benefit in mind (i-SCOOP, 2019).

This automation of various business processes and operations, also known as infrastructure convergence (van Dijk, 2006), was based on the development and wide use of powerful IT hardware and software. Enthusiasm for this newly discovered technology was overwhelming. Huge investments were made in purchasing, developing, deploying, and maintaining different applications. Many business processes were reviewed and digitized. However, it was still in its infancy — dealing with single tasks and using unrelated technologies that hardly communicated with each other. Stand-alone applications were mushrooming within the organizations, solving some, while creating other, problems including standardization, networking and communication, and interoperability.

Digitalization went through several phases, which can be categorized as follows:

- **The initial phase,** where single operations or processes were automated.
- **The mid-phase,** where related processes were automated and joined together.
- **The third**, most complex phase, where multiple systems that supported business processes and information flows were partially integrated.

Although information was still, for the most part, kept in silos and applications were distinct, different, and sometimes redundant, digitalization helped lower production costs, optimized business results, and created new revenue options and customer experiences.

Digital transformation

The current phase of overall reorganization and automation is digital transformation. Creating a digital company, for the great majority, means doing things very differently. Starting with the creation of a new business model, it uses modern IT, leverages existing knowledge, and profoundly changes the essence of the organization — its culture, management strategy, technological mix, and operational setup. It also pursues new revenue streams, products and services.

The pivotal point of these newly organized businesses is a customer-centric approach — placing the customer in the center of all decisions and actions.

As with the previous phases, new technologies play a crucial role. They include the use of mobile applications, artificial intelligence, machine learning, augmented and virtual reality, cloud computing, analytics, and chatbots. Still, the goal is not to use technology for technology's sake, but rather to use it in a process of business transformation. In other words, changed business strategies and goals benefiting from technology to bring about and implement foreseen scenarios.

The benefits of digital transformation are numerous, visible and usually very lucrative. They include customer satisfaction, profitability, process streamlining, new business opportunities, and increased revenues.

Impact of automation on grey literature management

There are different ways of looking at the impact of automation on grey literature management. Based on the previously elaborated historical phases, a parallel can be drawn by looking at the specific impacts on grey literature management made throughout the different historical periods. Therefore, the following three historical phases will be reviewed:

- Digitization — Scanning
- Digitalization — Automation
- Digital transformation — Business change

The impact on grey literature work, its workforce, and the workplace will also be examined.

Digitization and grey literature

The digitization of grey literature, just as digitization in general, appeared in the late 1990's and was prompted by the appearance of commercially available scanners, CD-ROMs, and new formats. This created increased interest, funding, and research into the area of grey literature management. From what was once regarded as 'ephemeral documentation' — in other words, routine, trivial, duplicated (also available somewhere else), and of little administrative, financial, legal, cultural, or historical value — grey literature became important, valuable, worth collecting, processing and sharing. From physical preservation and storage — always regarded as labour-intensive and expensive — came easy scanning and cheap storage, and grey literature became interesting, affordable, and easily available. Organizations began not only to scan and store this type of literature for their own use, but also started massively distributing to their customers annual reports, promotional materials, manuals, product catalogues, and other forms of grey documents. As this took place before the introduction and popularity of the Internet, much of the information was exchanged through regular mail, making CD-ROMs a big financial saver.

However, several major issues surfaced. They included the quality of scanning, long-term preservation challenges, appropriate management standards, lack of qualified professionals, and the need for proper training opportunities. Moving from paper and microfiche/microfilm to more sustainable formats, the short life-span of CD-ROMs (5-10 years), and unreliable content quality, were huge obstacles standing in the way of wider acceptance, and especially for archiving. Criticism of this new e-format rapidly grew and soon became a detrimental factor, contributing to its demise.

Digitalization and grey literature

Despite considerable success implementing digitization in the area of grey literature, the digitalization phase that followed was less successful. Procuring powerful IT hardware and software became the main emphasis of organizations and huge investments were made in IT. Investing in stand-alone systems and applications, such as those used in information and grey literature management was not a high priority for organizations.

Grey literature professionals did not help much to alleviate this organizational level focus and consequent priorities. Grey literature managers, in a way, lost their focus and insisted on their omnipresence in all processes, operations and activities. They came up with over 150 types of GL (Farace, 2010). Everything was put in the same basket, from government reports, to business emails, and academic theses. IT became another stumbling block. There were no specific applications developed for grey literature, since it was widely regarded as a larger part of libraries, document management systems, or archives.

A serious issue that became obvious during this phase and still remains unresolved, was the lack of standards and best practices, proper professional training opportunities, and weak professional associations.

Digital transformation and grey literature

Two very strong arguments favouring the increasing importance and impact of grey literature during the digital transformation of today's organizations are a customer-centric approach and organizational culture change. Grey literature has always been connected to and had a special affiliation with non-commercial approaches to dealing with information, such as the open access movement and a culture of sharing and cooperation. These characteristics can improve the status of grey literature within any organization willing to take the path of digital transformation.

It Digital transformation represents a huge opportunity to reposition grey literature within commercial organizations, governments, and academia. Still, grey literature management needs to become part of overall business and information strategies. It needs to establish itself as a key component of Enterprise Content Management (ECM). According to the Gartner Magic Quadrant for Content Services Platforms report (2019), information and documentation management, including grey literature management, should:

- Connect content to digital businesses for efficiency and productivity gains;
- Accelerate performance by integrating with key business applications;
- Improve information governance and minimize non-compliance risk;
- Drive digital transformation to help businesses disrupt their industries.

A strong link with IT departments should also be established by working on various joint projects, including intelligent search and long-term preservation. Within its own ranks, GL management needs to adopt and promote new modern approaches, including agile management, team organization and cooperation, and open access.

Grey literature work

It is predicted that the impact of digital transformation will bring about drastic changes in grey literature work, encompassing its very essence and nature. It will also impact the actual actors, those who are doing the work — the workforce — and how grey literature is managed in the workplace.

What the essence of the grey literature work will be depends on: 1) the variety of existing formats and how they increase; 2) the exorbitant amount of volume; 3) its truthfulness or veracity (a huge current and future issue); 4) the velocity of its creation, already regarded as very high; 5) and the actual value, where the tendency is to regard any information as an asset.

Why something is performed within the organization and the role of leadership should always be considered. Digital transformation requires forward thinking, a visionary approach, high-tech awareness, sharp customer focus, and consideration for the usefulness of grey literature.

Who is managing grey literature. The profile of the grey literature professional workforce will undergo serious changes and modifications. Newly required characteristics will include life-long learning, active engagement, mobility, dealing with the generation gap at work, and importantly, digital ethics.

How the work is organized is undergoing dramatic change in the workplace. This includes the introduction of completely new and different tools; the introduction of digital culture; digital dexterity requirements; agile teams; remote work, and the removal of info silos.

Conclusions

Although historically and conceptually different, digitization, digitalization, and digital transformation are often used interchangeably. Digital transformation assumes an umbrella role, encompassing both digitization and digitalization and regarding them as initial steps in an organization's digital transformation and the reorganization of its information and grey literature management.

Digital transformation has a major impact on all activities carried by organizations that adopt it, and as such it requires the full attention of business and information managers. It offers valuable opportunities for commercial, government, and public organizations to grow. It also offers a chance to enhance the management of grey literature, increase its value and importance, and improve its usability, usefulness, and accessibility.

Grey literature work has already been impacted and undergone changes due to digital transformation. These include the nature of grey literature work and the reasons for managing it. Both the workforce and the workplace have been impacted by digital transformation. To cope with these changes, the workforce needs to adopt new working and learning behaviours, and counter the speed of change by quickly acquiring new grey literature management skills. Constantly improving and obtaining new knowledge is essential for grey literature professionals. Finally, we should consider that the major factor for successful change is not technology itself, but rather the people working with that technology.

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How Open Science Influences Next Developments in Grey Literature*

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Abstract

The practice of open science reinforces the intersections of open access, open data, open educational resources (textbooks), open methods, open standards, open transcription, open peer review, to promote how science is based on replication of experimental process and outcomes. Traditional publishing streams of books and journals capture just a fraction of the content now contextualized in open science. Our definition of open science blends the Foster Open Science Taxonomy with contextualizing science as Abraham Flexner summarized in The Great Paradox of Scientific Research. We suggest how scholarly communication today is inclusive of the range of grey literature that supports the sciences. Applying the Foster paradigm of understanding open science to the grey literature rubric allows us to explain how scientific publishing has expanded to include new forms of scholarship including theses, patents, standards, models, preprints, systematic reviews, formulas, specimens, instrumentation, spatial information, data sets, lab manuals, interviews, visual miscellany, networks, genomics, proteomics, computational analysis, and other emerging fields. Multimedia encompasses some of these examples and new media releases promote changes in product development, thus creating a new sense of authors and communities of users. Weaving the taxonomy into the new web of scientific grey literature where there is a greater demand for understanding impact and competitive intelligence by assessing scientific outcomes per scientist, institution, and national scope. We will demonstrate how the process of grant seeking, writing, funding and expectations that are such a large component of scientific research contribute to outputs, innovation and new forms of grey literature. The compliance and regulatory demands at every government level demonstrate how shifts in scholarly communication attempt to create an open and transparent environment where each stage of research is documented and to which all parties are held accountable. Open science will continue to generate new knowledge, promote multiple forms of collaboration and release new products in this ecosystem of open science. Our findings conclude that innovation to achieve and meet open science goals assume that the scientific record will be open, secure and reflective of how grey literature continues to evolve.

What is Open Science and where is it headed?

With the increasing competition for recognition and credits and a far greater emphasis on innovation and finding solutions to the world's serious problems by looking to science as evidence for both what has led to the current state of affairs as well as probable ways to remedy that situation, there is a reckoning of how to respond. The academic community and the public at-large have embraced the "open movements" by first exploring how published information can be better and more systematically shared, and thus the open source and open access elements were born. Open Science like many of its sibling "open" relationships is perceived as both a disrupter and a mediator in bridging access and practices to be available to all communities across the globe regardless of different socioeconomic strata and conditions. Many scientists, technologists and scholars have introduced open science as a new paradigm that "front-ends" the innovation process and also challenges industry to participate and redefine the legal parameters that have so carefully protected intellectual property, not to be dismissed in this discussion. We, as librarians are committed to fostering the sense of knowledge creation. Curiously, this conference coincides with the international celebration of Open Access Week. Those of us who work in the science (and other) disciplines are reminded of our history of publishing and acknowledge how far global commerce has come to share its pathways forcing us to view international patents as necessary protections for ideas and products. In addition to the prevailing business view of open science articulately chronicled by Friesike and colleagues who share a significant table of initiatives that

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became products that have informed and led the open science culture in creative ways that they characterize as philanthropic, reflationary, constructivistic or exploitative. (Friesike, 2015: 585-6)

More simply, open science is the movement to make scientific research, data and dissemination accessible to all levels of an inquiring society, amateur or professional. Described by many as an "umbrella" paradigm subject to liberal interpretations and inclusions. It encompasses practices such as publishing open research, campaigning for open access, encouraging scientists to practice open notebook science and generally making it easier to publish and communicate scientific knowledge. (Wikipedia, 2017)

Friesike, et al identifies many products that are relevant to our examination of how open science lends to operations and ways to make information available to anyone at point of need by being free and shareable. Selected examples of products and creators that support information generation and dissemination and inform the work of libraries and librarians include:

- Altmetrics (impact of usage)
- arXiv (preprints)
- CERN (open sharing of lab results)
- Creative Commons (copyright)
- DOAJ (OA platform or collection of OA journals)
- LIBRE (open peer review)
- OpenScience Project (software)
- Open Science Framework (discussion platform sharing)
- SHERPA/RoMEO (publishers' policies on self-archiving in repositories)
- Zotero (bibliographic management software) (Friesike, 2015)

Within the spirit of launching new information products that can share and promote new methods, we have seen how not one tool is now sufficient to use and apply towards any research finding but instead requires several products, tools or methods when demonstrating a new idea or outcome. Many of these products, platforms and methods subsequently have been absorbed by commercial publishing enterprises and only a minimal version remains open or free as subscription costs are now required to get all the bells and whistles or full capacity as development costs were too expensive without that investment. Being associated with a commercial venture has had its advantages and disadvantages but the open movement remains strong with new products launched all the time. This creates an obvious barrier in establishing true openness.

Building on Flexner's work

Abraham Flexner, best known for his work as an educator and specifically as a medical education reformer and the founding director of the Institute for Advanced Study at Princeton issued a book, *Usefulness of Useless Knowledge* in 1939. This provocative work, not as well known nor as cited as other works attributed to him, is about why "useless" science often leads to humanity's greatest technological breakthroughs. It suggests to us that he would be very proud how open science has taken shape over the last 80 years by the promotional sentiments to this volume, "The search for answers to deep questions, motivated solely by curiosity and without concern for applications often leads not only to the greatest scientific discoveries but also the most revolutionary technological breakthroughs." (Princeton University Press jacket cover to Flexner, 2017 edition)

Projecting forward, out a decade

Our future is defined as the next five-ten year window. During this period, federal governments around the globe are regionally self-defining and have already launched new requirements and established mandates around open science. This includes trying to reduce funding the same research protocols multiple times and now requiring researchers to file data management plans, post grant submissions, and share data that can be repurposed and tested for reproducible results.

The bigger picture for which we are most optimistic is that open access publishing is growing and is strong. The dilemma is how to pay for it without eliminating scholarly publishing, as we know it. The commercial players are distraught as the model of author pays is broken and unsustainable. Preprints are not new and are usually "classified as grey literature and green open access." (Langham-Putrow (2019: 506) but preprint repositories are multiplying and are often hosted on the Open Science Framework (OSF) preprint platform. The preprint or Xiv movement has expanded into many new subject fields including Biology (https://www.biorxiv.org/) & most recently Engineering (https://engrxiv.org/) with great traction thanks to the applied physics community who paved the way in 1991 for preprints and a new publishing lifecycle. Related to this, we think that the major trend is that scholarly publishing is being fixed by libraries and authors who attempt to influence the commercial publishing behemoths' by challenging their subscription models, authors' rights licensing agreements, assuming the role of content provider/publisher and choosing to publish and direct readers to other options, that promote more openness.

Another trend in open science is that not all science is being performed in large research enterprises. The entrepreneurial spirit is widespread among faculty, researchers and students who are actively participating in start-ups with roots in universities worldwide. The new entrepreneurial ecosystem of academic-born companies, the significant new labs and think tanks that started thanks to the generosity of prominent philanthropists such as:

- Chan Zuckerberg Initiative in San Francisco (https://chanzuckerberg.com/) that has calls out for open source developments to cure diseases
- Allen Institute in Seattle that has just launched its second round of its Open Scope competition in neurosciences (https://alleninstitute.org/what-we-do/brain-science/news-press/articles/three-collaborative-studies-launch-openscope-shared-observatory-neuroscience);
- Bill & Melinda Gates Foundation in Seattle that has been adamant about open publishing (https://gatesopenresearch.org/about),
- How Stewart and Lynda Resnick recently gave the California Institute of Technology its largest gift to address climate change. (Stoller, 2019)

These examples and many more around the world demonstrate how the public will not wait for governments, traditional academic practices and industry to respond to the dire needs that science can address in advancing practices in healthcare, environmental crises, and social wellbeing. Everything takes time but it is clear that new players now constitute some significant initiatives that are practicing and developing open science every day. The legal changes related to intellectual property are equally profound as industry is practicing a trend from stockpiling to patent donation at an accelerated pace with patent pledges very much on the horizon (Ehrnsperger & Tietze). The taxonomies that they have developed illustrate the revised patent licensing strategies that many patent holders now consider in a more fluid open science environment where accessibility, compensation and conditions are noted. Concepts like a restricted patent pledge describes how more lenient licenses are becoming for smaller companies because no first use of software patents against companies with less than 25 people will be required (http://www.thepatentpledge.org/) and as more companies subscribe to this notion, faster developments will be made in science with new products or solutions to age long problems. Although not as widespread as one would expect, we hope to see this continue.

Impacts on Grey Literature

In terms of grey literature, we see open science influencing it in the following ways:

1. Less will be grey, as more science is released and disseminated in open formats. This includes the obvious, that OA is here to expand. Working out the nuances and kinks indicate that at the time of publication, more content will be available in OA. Methods of publication will continue to evolve as the review process for both submissions and academic review will undergo change. Indicators such as impact factors and other descriptors are already showing how open access content is cited sooner after publication and the reward systems will adapt accordingly going forward.

2. Scope of grey literature will continue to expand but may not always be so grey. The cloudiness or haziness of the grey will depend upon functionality, timeliness and sourcing. Grey will be characterized as less organization-centric and more outcome or product defined. This may reduce the challenges in identifying and accessing grey literature. Already this is evident with theses and dissertations, preprints, technical reports, data sets and other once well-defined grey literature that now is eligible for DOIs and other defining metadata elements and is crawled by big search engines, exposing its findability due to the Internet and the cloud, grey literature has changed its hue.
3. Interdisciplinarity will continue to blend – the grey will become greyer and the rest will become easier to identify and access. Functional areas will have computational elements as a foundation, data and its metadata will be common, and applications, new findings will be shared across different disciplines. New ideas will form emerging fields as openness invites more participants to collaborate and challenge the status quo. Examples of this are how Systems Biology defined throughout the twentieth century and entered the academy in 1966 with its first international symposium at Case Institute of Technology (today Case Western Reserve University) and by 2003, many academic departments were formed with that name. Today Systems Biology is central to the study of the intersections of many subjects where computational work addresses the massive amounts of data generated by the explosion of all the "omics" such as genomics, epigenomics, phenomics, proteomics, economics. We see established centers for Cancer Systems Biology dedicated to studying the complex molecular systems of cancers such as leukemia, melanoma and others. Clearly this is the catalyst for change and is transformational in how open science approaches new applications and makes scientific breakthroughs.
4. Transparency will be a central issue in conducting science as well as publishing science. This may translate into more quality control measures that allow for greater participation in Citizen Science activities that encourage establishing greater collaboration, community and credibility and other means of participation in research. (https://www.citizenscience.org/) Crowdsourcing requires a greater openness and funding will be critical for open success.
5. IoT: Insertions of Alexa everywhere. The Internet of Things is not just in kitchens and living room parlors but now Amazon has announced that the voice assistant will be a companion nearly everywhere by connections to smart devices that will allow one to communicate about nearly everything. Whether considered internal or external, Alexa will have a role in how we find out about all things we need or want. "Every person" will determine their needs for Alexa and her voice may change per the function performed, and we may become more dependent on her to translate our expectations and demands. She can perform an array of duties including confirm the day's news and reflect the latest developments in artificial intelligence and machine learning. Consumer electronics and daily living appears to merge with this utility in every appliance and device that is developed. It will become the new normal (Weise, 2019)

In addition to Alexa who comes bundled in our communications devices, another of the most visible examples that we use in daily life is the handheld, smartphone Global Positioning System (GPS) that aids navigation and provides directions and context. The US Government opened Geographic Information System (GIS) data that allowed companies such as ESRI to create products through crowd-based technology. Many examples illustrate how NGOs, local governments and others partner to achieve spatial relationships between multiple destinations.

The Polymath Project was created by a group of mathematicians who collaborate online to solve open mathematical problems (https://polymathprojects.org). The forum is a blog that has recently celebrated its 10-year anniversary and is currently in use today. This open, crowd-based approach allows problems to be solved more quickly through the communal effort of the mathematics community. Proper attribution is credited to the individual scholars who contributed to the problem-solving approaches. (Marchetti, 2018)

The drug Praziquantel (PZQ) was launched as an open-source approach that treats a parasitic infection called schistosomiasis that started in 2006 on a The Synaptic Leap forum. Two years later

the World Health Organization and the Australian Government funded the PZQ project through a partnership. In 2010, the initial problem was posted on LinkedIn to a closed, 2,500-member chemistry networking forum and progress was made towards solving problems by contributors who had not worked on the project previously. Eventually the number of contributors expanded to develop a cost-effective, off-patent drug that drove "down the price of the active pharmaceutical ingredient to approximately 10 US cents per gram and that of a 600 mg tablet to 8–14 US cents." The main takeaway is that the research process accelerated by using open technologies. Since everything is web-based, the process is transparent viewable by scientists and consumers worldwide. (Woelfle, 2011)

Implementing taxonomies in the learning space and becoming relevant elsewhere

With online practices increasingly robust, eLearning more mature and global in its reach, and new information technologies adopted universally, the European Commission funded a large initiative to determine how to achieve some scalability in rolling out Open Science. In 2014, FOSTER was launched (Facilitate Open Science Training for European Research) with an initial 28 training activities in Open Science translating into 110 events and the following year there were 24 events in 18 countries and in 2017 there were 39 events. Today, Foster's influence is clear in many research, publishing, and learning applications.

The publishing and research lifecycle demonstrates how FOSTER delivers a product and addresses the responsibilities of openness reflecting best practices for:

- Scholarly communication
- Repurposing content
- Data management
- Affirming rights management
- Quality & process of peer review
- Conservation & stewardship
- Honoring government & funding mandates
- Contributing to future social good
- Creating publishing paradigms that result in a new ecosystem

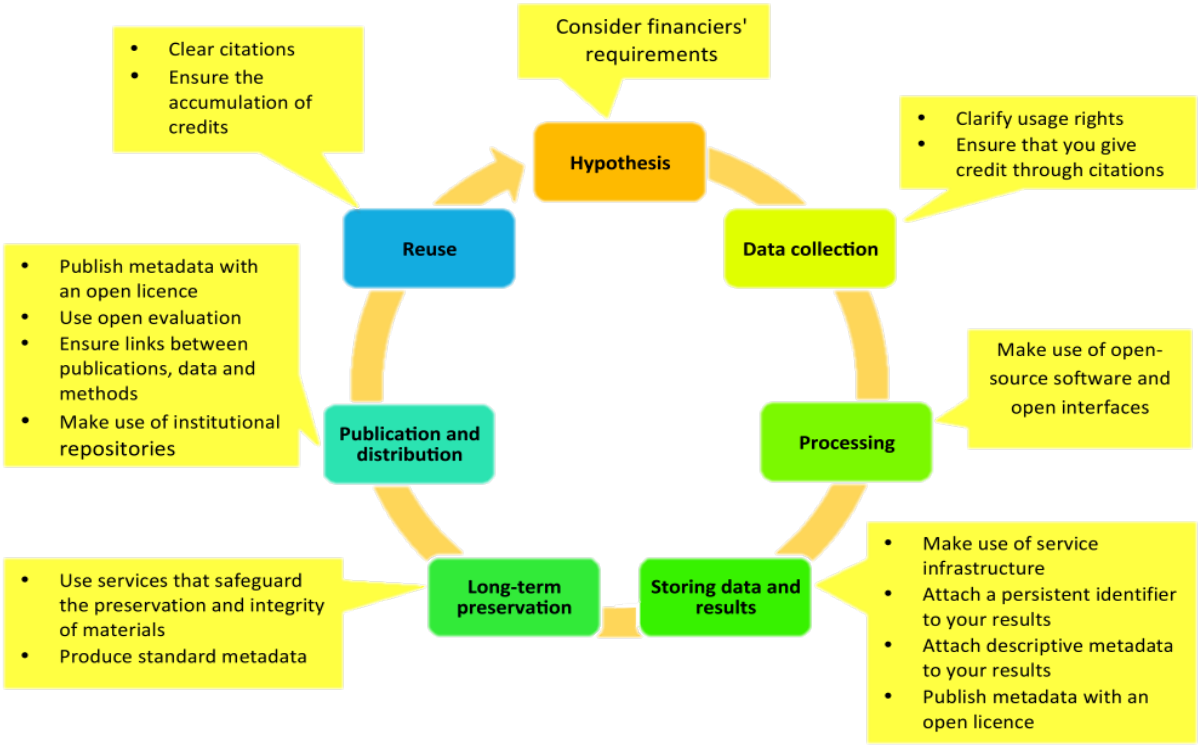

Figure 1. Promoting openness at different stages of the research process
https://www.fosteropenscience.eu/content/what-open-science-introduction

The taxonomy of open sciences processes and workflow covers open access, open data, open reproducible research, open science definition, open science evaluation, open science guidelines, open science policies, open science projects and open science tools as shown below.

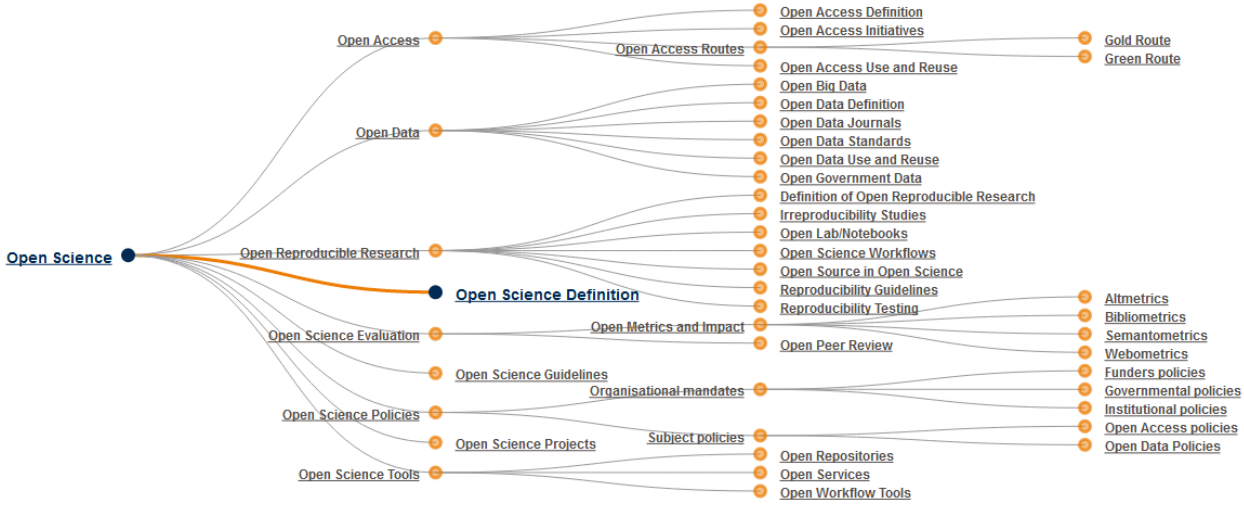

Figure 2. FOSTER Open Science Taxonomy
https://www.fosteropenscience.eu/content/what-open-science-introduction

Each thematic line is developed with curriculum so that specific initiatives can be clearly articulated and followed for different taxonomies in the thematic pillars noted above. Five years into development still suggests that there is a learning curve with this process. However, new case studies and research examples show that specific goals are being reached and delivered with new open communication channels building on the nine taxonomic terms of the first instance. A 200 page FOSTER Open Science Training Handbook (2018) was developed to guide training and build capacity and was created by contributions from 14 authors in a 5-day writing sprint here at TIB in Hannover last year for which a call was issued across the European continent for volunteers (https://book.fosteropenscience.eu/en/). The scaling of any of these initiatives takes patience and consistent dedication. FOSTER's two-year project definitely exceeded just testing the waters, and is a model that can be replicated around the world with lessons to teach and lessons learned. "The aim of the FOSTER project is to advance the stakeholder's knowledge on the usefulness of Open Science and explain the technicalities, strategies and best practices using which Open Science can be applied." (Pontika, 7) Besides the portal and handbook, the international community will continue to expand with diverse stakeholders committed to developing open science within the legal framework and the infrastructure noted below.

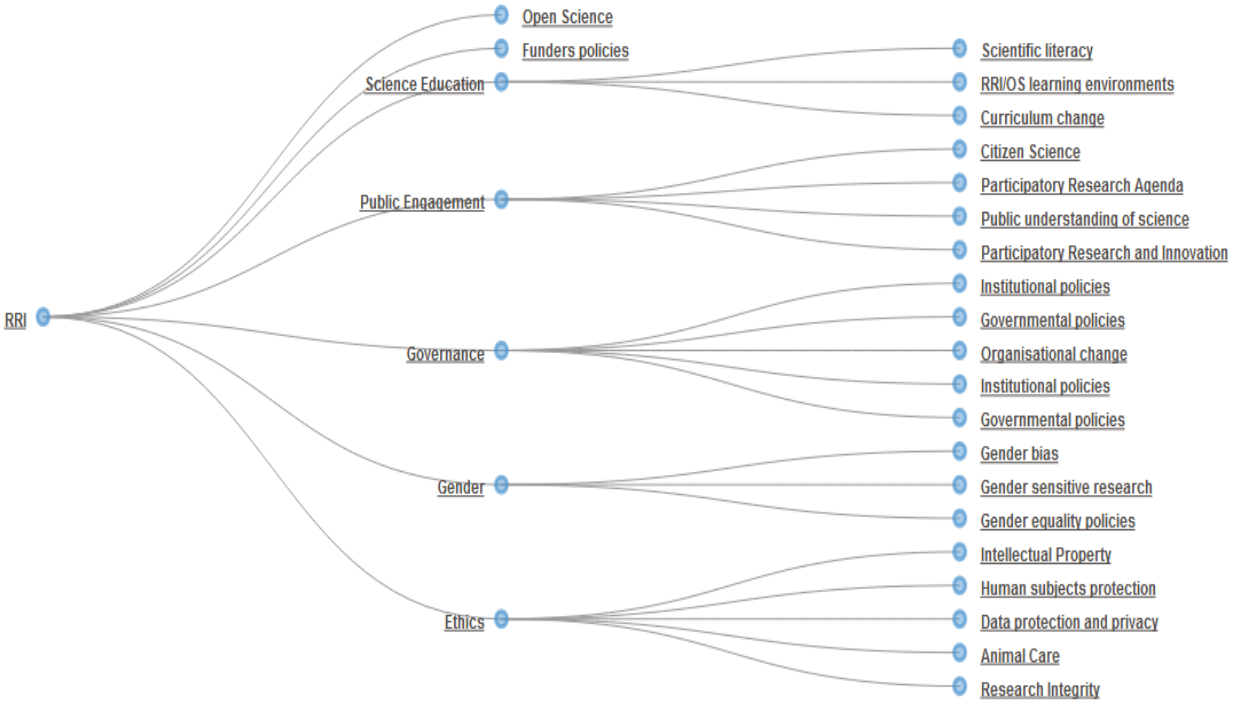

Figure 3. Responsible Research and Innovation
https://www.fosteropenscience.eu/taxonomy/term/7

Across International Borders

Open Science has advanced in Europe due to more initiatives spearheaded by individual and collective government entities such as the European Communities, as is clear with FOSTER. This image from the European Commission (2015) of relationships suggests how the puzzle of open science is building out.

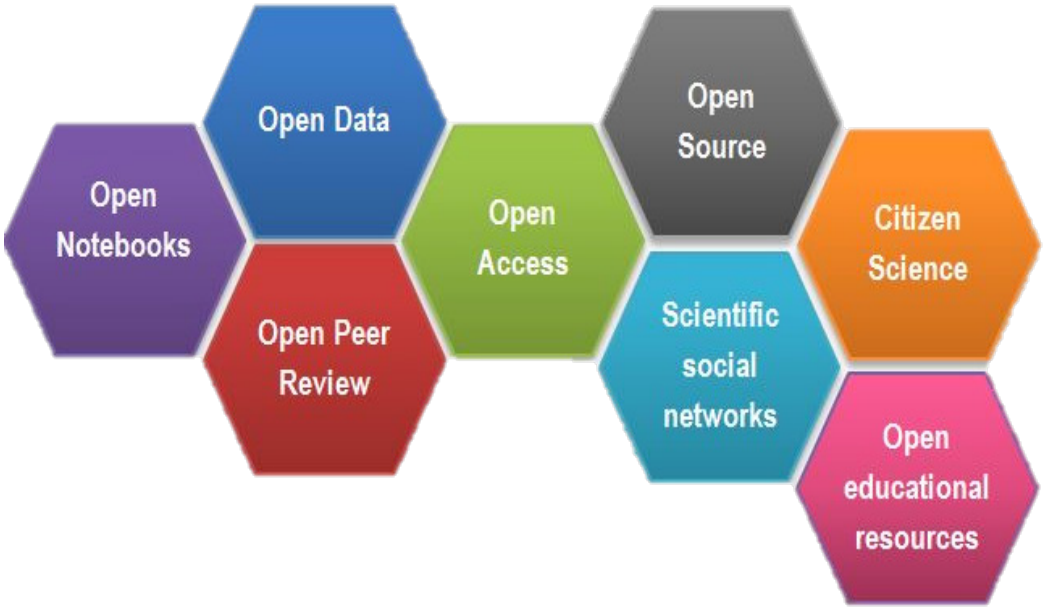

Figure 4. Open Science facets as a beehive
https://www.fosteropenscience.eu/content/what-open-science-introduction

These successes have cemented how collaboration across borders is possible in a multilingual setting and among diverse cultures. Nevertheless, English, the lingua franca of science has assumed the major role in communicating and disseminating scientific information, however the international partnerships and collaborations are essential for sharing responsibilities for big

science. Topics such as global warming, big data and other areas in which citizen science now finds itself immersed dictate current programs.

The recent United Nations Youth Summit on the Environment held in New York highlighted another open movement by the world's youth, who called out for a global response and unified work plan to address solutions to the enormous environmental impacts they fear for their generation and future. This demonstration illustrates that not only international, geographic borders but generational ones are heavily invested in these efforts to apply open science to create change, share ideas, mobilize activities, and anticipate a new strategy for greater global collaboration and participation.

Some of the greatest interest in open science originates in developing countries; however, that is where some of the greatest challenges exist. The rationale is obvious due to that geography having more restricted resources, interruptions in connectivity and being disadvantaged politically. Open Science promotes neutrality and agnostic sourcing. As populations in those developing regions depend on the latest research to educate themselves locally and build micro-economies, an increase on illegal access to information through hacked content has forced one to consider the roles of these filesharing sites such as Sci-Hub that threaten and compromise network security over copyright infringement. Even though there is no universal consensus that this is illegal it is an act of desperation that certain citizens in many parts of the world feel is their only hope to stay informed of the latest science. Open Access is a solution to this serious problem breaking down firewalls and excessive subscription costs that will allow improved sharing on an international scale.

Access to commercially published content however challenging was improved when initiatives such as AGORA (www.fao.org/agora/), Hinari (www.who.int/hinari/en/, and OARE (www.oaresciences.org/) were launched over a decade ago to provide low and middle-income countries access to biomedical and scientific journals through these programs sponsored by the World Health Organization and Research4Life. Open Access would allow immediate access to the literature without requiring this support and intermediation.

Europe's ongoing focus on Open Science

The US system of "have's and have not's" combined with a "sink or swim" approach to open science and little support from the federal government create a difficult environment to further the aims of open science in the US. Though the US has great potential to collaborate with the EU to create global standards in Open Science, at this moment, the EU has the clear advantage to make strides in the advancement of making global open science more sustainable.

EOSC and OpenAIRE

The European Open Science Cloud (EOSC) is an overarching framework that encompasses several components to support and promote open science in the EU at national, regional, and institutional levels. Scholarship in both open science and grey literature have shown the contributions of EOSC and OpenAire. The major elements of the EOSC model form the National Grid infrastructure across the EU. (European Commission, 2018)

EOSC-hub operates alongside OpenAIRE, an Open Access scientific repository that links peer-reviewed literature to associated data. (OpenAIRE, 2018) This collaborative space hosted by CERN (Conseil Européen pour la Recherche Nucléaire) was created in 2008 as part of the ERC Scientific Council Guidelines for Open Access, with much written about it. Since then it has expanded to all European member states with a presence of 34 National Open Access Liaison Offices to aid researchers who wish to deposit their work in an Open Access environment. OpenAIRE' objectives are the following:

1. Build support structures
2. Establish and operate an electronic infrastructure
3. Work with subject communities to further enhance OpenAIRE

Figure 5. EOSC Model action lines
http://ec.europa.eu/research/openscience/pdf/swd_2018_83_f1_staff_working_paper_en.pdf

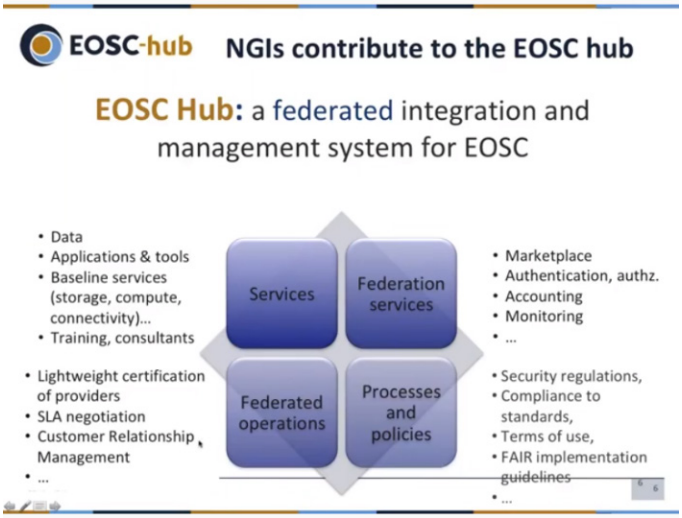

Figure 6. EOSC Hub
https://www.slideshare.net/OpenAIRE_eu/eoschub-and-the-ngis

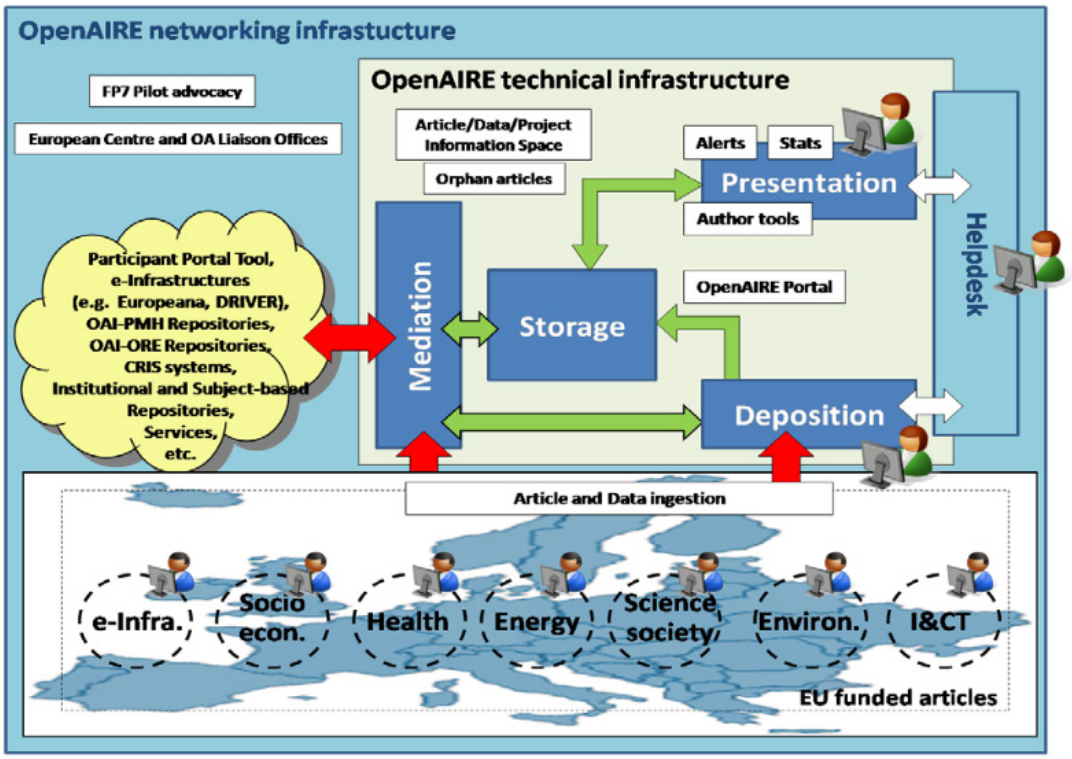

Figure 7. OpenAIRE networking infrastructure diagram
https://ercim-news.ercim.eu/en80/es/openaire

The OpenAIRE European Helpdesk acts as an intermediary between OpenAIRE and the researcher to determine the appropriate repository for the data, best practices for structuring the data to meet OpenAIRE requirements, instruct researchers on the Open Access environment, and assist with data uploading as needed. (European Commission, 2009) By providing the framework, structure, and facilitation for researchers to store their information, OpenAIRE paves the way to create a collaborative space where researchers from various countries can collaborate on the same platform to spark innovation new developments.

In April 2018, OpenAIRE-Advance and the European Open Science Cloud Hub (EOSC-hub) signed an agreement to collaborate and form an "open virtual environment for research data" from the start to finish of the data lifecycle process. Both are built around three major pillars of activities: (European Commission, 2018a)

- Service integration
- Communication, engagement, support, and training
- Governance and strategy

The distinction between the two entities is that OpenAIRE will take place towards the beginning and end of the research lifecycle, while EOSC-hub will constitute the intermediary stages. In other words, Open AIRE will guide researchers at the beginning of the research lifecycle in part by its pan-European, National Open Access Help Desk (NOAD) network by interacting with researchers to create a research data plan. Once this plan has been fully implemented, the curation, workflows, processing, and results will be turned over and handled by EOSC-hub. Once the analysis is complete and the research objects have been created, the baton will be handed back to OpenAIRE to publish and share the information.

The EOSC and OpenAIRE contribute to Open Science by offering a distributed, federated, interoperable, scalable, and common data approach to research data management in the research lifecycle. The EOSC pilot offers a glimpse of the potential of EOSC through its science demonstrators. (EOSCpilot, 2018) Early adopters of EOSC participated in the science demonstrators and used the services provided to test the services, workflows, and implementation of the EOSC. The end of the pilot project highlighted the strengths, challenges, and recommendations needed to further refine and develop the EOSC. A big challenge lies in the common policies in data management, service delivery, and open science. (EOSCpilot, n.d.) The results of the EOSC pilot that ended in May 2019 prove promising for a fully functional working EOSC that will integrate the best principles of open science by allowing researchers to focus on the science and innovation and leave the burden of data management to the EOSC.

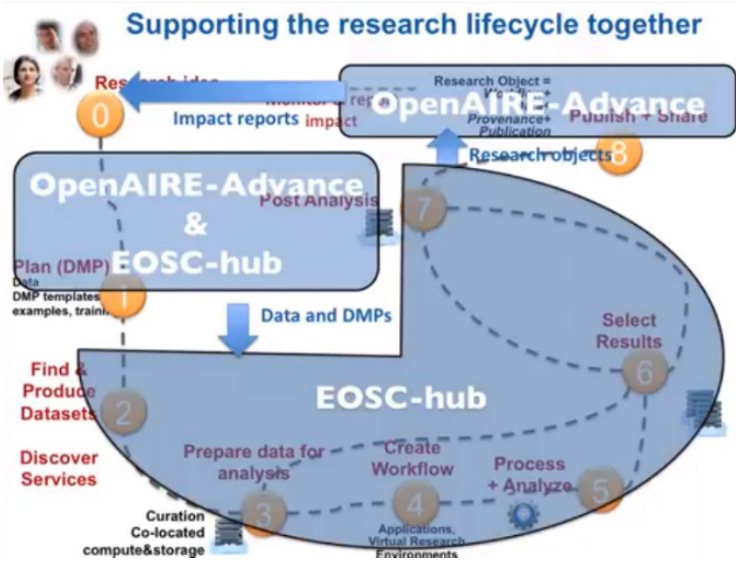

Figure 8. EOSC-hub and OpenAIRE diagram
https://youtu.be/wNXBew5OYWw

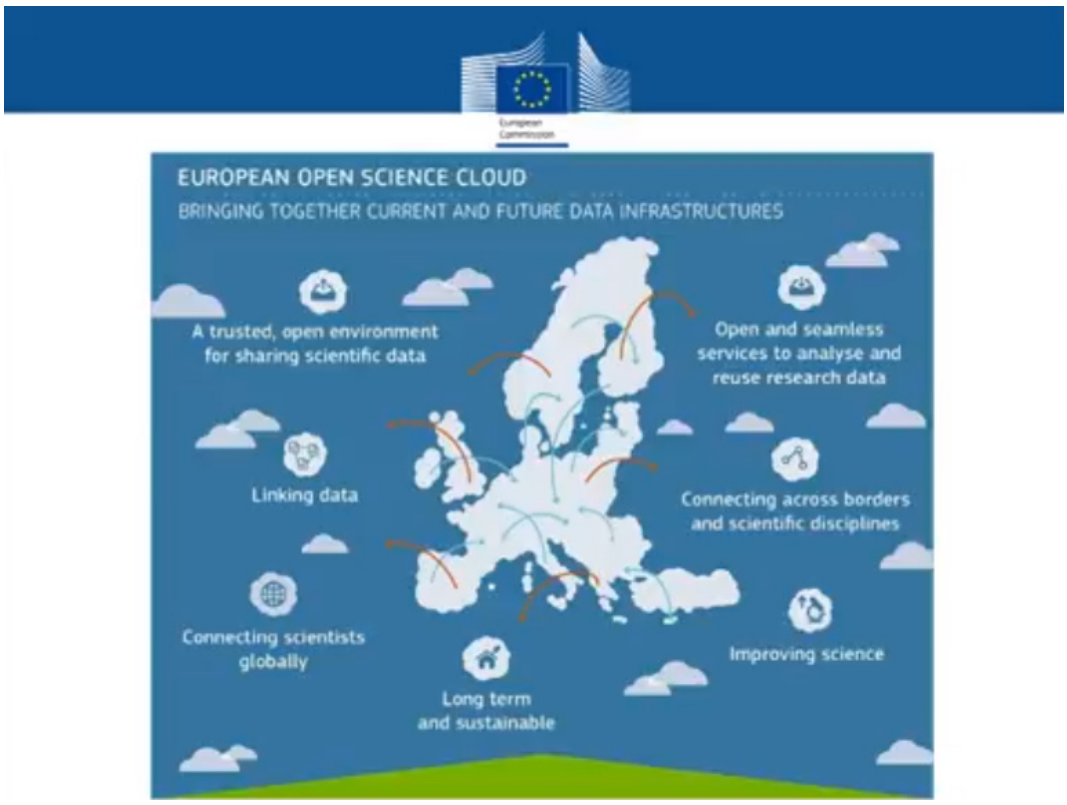

Figure 9. European Open Science Cloud
https://youtu.be/wNXBew5OYWw

Although the EOSC (Wilson Center, 2018) is still in the early stages of development, the convergence of the EOSC centralized space, the interoperability of Findable, Accessible, Interoperable & Reusable (FAIR, 2016) data principles, and the direction of the European Commission (EC) Open science policy platform (OSPP) will blend disparate elements into synergistic data powerhouse that will positively impact European altmetrics. (European Commission, 2018c) The best analogy for the EOSC is Airbus, a company created by collaborative efforts from different countries, different cultures, different languages, and different levels of expertise. The individual pieces of the puzzle seem minor by comparison, however when merged together into a collaborative whole, the final product is innovative, competitive, and world class. (Gordon, 2014) We can draw parallels to the anticipated strength of the EOSC to a European idea, the Pareto Principle (aka the 80/20 rule). In other words, 80 percent of the consequences come from 20 percent of the causes. (Chappelow, 2019)

Pontika and others attribute open science to resulting from sharing based on open access, open data, using open source software to distill data with a free source code license and the result is hopefully open reproducible research. The foundation is the principles that support transparency, universal accessibility and reusability of the scientific information disseminated via selected tools. (Gezelter, 2009)

This is demonstrated by tracking how federal support, new institutional and government mandates and regulatory practices are defining research agendas and calling for them to be followed if public resources are to be used in conducting this research. We are seeing evidence of this not only in science but also in nearly all fields of open scholarship, including the digital humanities where compliance is the scientist or scholar's responsibility. It is often trickier when the data includes human subjects that are challenging to anonymize but new practices and tools allow researchers to more easily comply.

Creating a data repository that is interoperable with other systems is no easy feat. Manghi et al. noted that OpenAIRE via the OpenAIRE-Connect project as an integral part of the EOSC, introduces the concept of Open Science as a Service (OSaaS) where the researcher interacts with the OpenAIRE through a thin client interface such as a web browser. This approach allows the

researcher to focus on the research rather than the IT infrastructure, policies, or other elements that may stifle the innovation process. (Manghi et al., 2018) The EOSC acts as the 20 percent that can be delegated so that the individual scientist can dedicate more effort to focusing on the work at hand, rather than the infrastructure that will eventually curate and process her work. This may yield the remaining 80 percent that may spark innovation and creativity. If we scale this on a larger level to hundreds of scientists and researchers in the EU, the effect will be massive, much like Airbus, but with enormous benefits to be openly shared by all.

Open Science in the US

The Open Science landscape in the United States is a patchwork of diverse players from government, non-profits, research universities, corporations, and partnerships. There is a dizzying array of options for services, platforms, storage options, and data management. Although it is possible for a researcher to bootstrap an open data system based on the current infrastructure, the time investment to find the appropriate elements to coordinate into a cohesive system does not come easily. Even if the elements have been identified, the onus is on the researcher to spend time to figure out the actual technology itself. This takes time away from task. Many US researchers resort to the path of least resistance by designing Application Programming Interfaces (APIs) to work with the resources that are available. An example of this is an open source platform, AGAVE, a partnership between the University of Texas at Austin, Louisiana State University, and the University of Hawaii at Manoa. It provides a solution for science-as-a-service that supports the Open Science community. (Wilson Center, 2018)

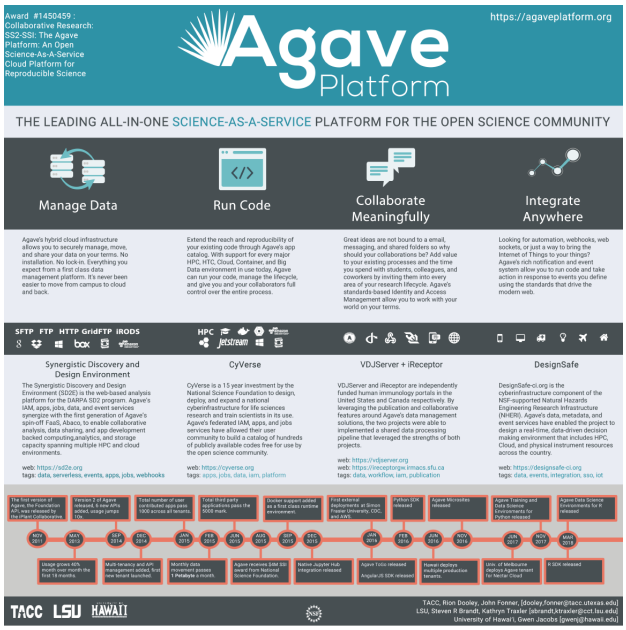

Figure 10. Agave Platform
https://figshare.com/articles/The_Agave_Platform_An_Open_Science-As-A-Service_Cloud_Platform_for_Reproducible_Science/4675765

Based on what we have learned from the Open Science Framework and engagement from the scholarly and scientific communities we can attest that Europeans have advanced the agenda for Open Science far faster than elsewhere. This is due to the European Community response to urgency on many related matters and individual strong government influences and support. Not perceived as a competition but more of a call to action open science has become a global focus and way to share and contribute to the needs of nature and humanity.

Compared to Europe, the United States government takes a scaled back approach by setting policy and provides financial support to key players. For example, the US "National Science Foundation (NSF) funds open science that is based at universities, museums, and other research organizations." (National Science Foundation, 2017)

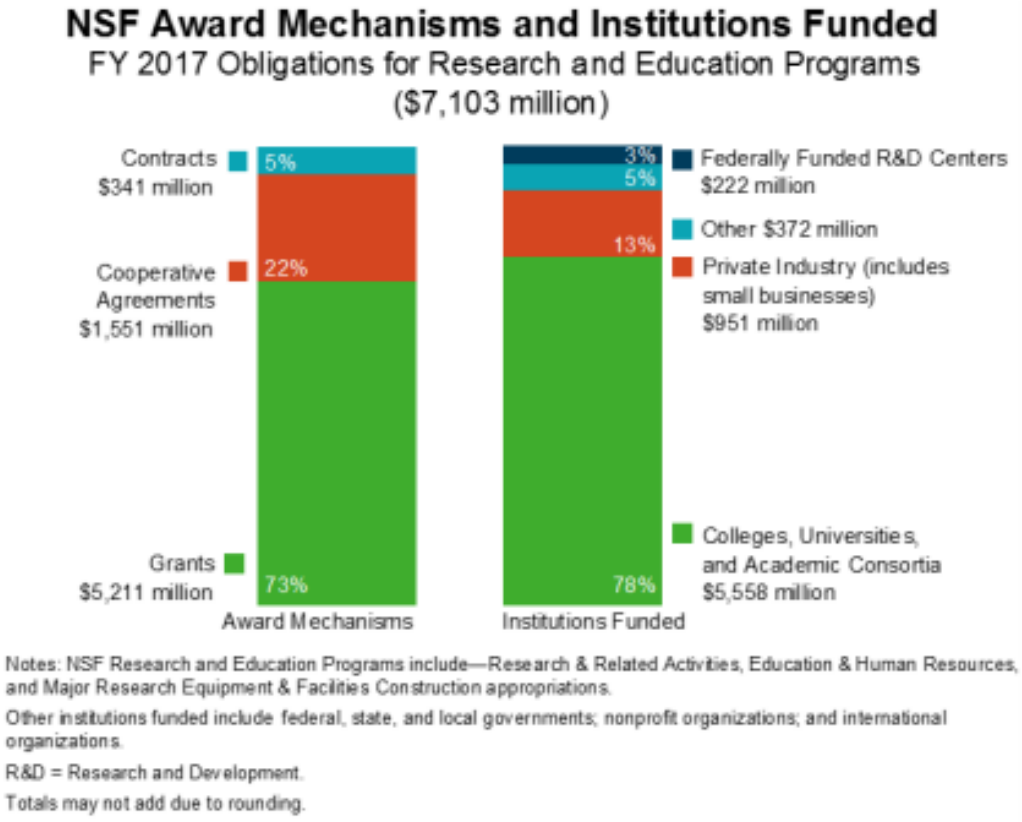

Figure 11. NSF Award Breakdown
https://www.nsf.gov/pubs/2018/nsf18020/pdf/nsf18020.pdf

These grants are offered for a limited period. Once the funding period has passed, it is assumed that the project will sustain itself past the seed money invested in the project. The data may be stored in a repository with a questionable funding future or the resources and costs to properly curate the data may vanish. University budgets often ebb and flow with funding sources leading to a change in service for their repositories. Unlike the European model of EU backed resources that provide greater assurance for long term sustainability of data management through the EOSC, the US counterparts are subject to economic cycles that leave long term sustainability in a constant state of insecurity. Thus libraries are resources for this long-term stewardship in repositories or in the cloud.

Big Science where great impact and discovery is likely appears to be better supported by government largesse and generosity. But the small scale, US citizen scientist who wants to curate their data following the principles of Open Science has to work independently. The US government through the Government Services Agency, an agency that specializes in procurement of assets, created the Citizenscience.gov toolkit is responsible for its maintenance. It outlines very basic steps on data management but does not provide specific resources for the scientist on where to store the data. (U.S. General Services Administration, 2017) The open science environment in the US awards those who already have the means to create the staging for proper interoperable practices for data curation. It completely ignores the "long tail" researchers who may have the expertise to create their own discoveries but may lack the knowledge to properly curate their data. After all, Apple Computer was started by two men who built their prototype computer in a garage which was funded by selling a VW microbus and HP calculator. (Rawlinson, 2017) Seemingly ordinary people have made extraordinary advances by changing the world.

Conclusion: Impact of Open Science on Publishing and New Products

In conclusion, the power of Open Science lies in the web-based, networked approach allowing data to become shareable and more accessible to members of the worldwide community. This crowd-

based approach provides strength in numbers and taps into the specializations of members in the field who can draw upon each other's assets. The result is a collaborative effort that cuts costs, speeds production, and facilitates the increase in productivity of research. (Marchetti et al., 2018)

The vision of open science continues to evolve. The foundations "in which useful knowledge is widely available and actively applied to improve human conditions" (Mokyr, 2002) builds on the work and thinking of Flexner, Vannevar Bush and many others who have called for an egalitarian, agnostic and non-elitist approach to science. Observing how grey literature both shrinks and expands with more collaboration and better tools to create new knowledge demonstrates the contributions of open science.

Publishers are releasing new content that is increasingly open and products such as Knowable Magazine is such an example. Annual Reviews, a nonprofit and highly respected publisher leveraged its output from 1932 to launch a digital open access non-academic publication, *Knowable Magazine* "dedicated to synthesizing and integrating knowledge for the progress of science and the benefit of society" and "to explore the real world significance of scholarly work through a journalistic lens." Together as collaborators and readers they share and contribute to open science in many ways.

The "Open Science band" was used as an analogy for the strength of collaboration earlier this year on a Copyright Clearance Center Podcast that explored STM Tech Trends over the next five years. Suggesting how many band members are needed to represent all stakeholders to "tone down some of the competition and raise the volume on the concern for the customer experience" (Kenneally, 2019) is probably how we can best call out how open science principles fuel a host of new products, applications and methods of dissemination by promoting more openness. The television shows, "The Voice" and "American Idol" are about the performers and "Songland" is about the songwriters, composers and lyricists. Regardless of the imagery of reality shows, we need more evidence that reinforces the collaboration that goes into making music or anything creative and transformational. It's all about collaboration in order to make something happen. Let's keep singing….

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From "Grey Literature" to "Specialized Resources": Rethinking Terminology to Enhance Grey Literature Access and Use*

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Abstract

Gambling Research Exchange (GREO) is an independent Knowledge Translation and Exchange (KTE) organization that aims to reduce harm from gambling. GREO curates and maintains a digital library of credible gambling information, most of which is grey literature. Several stakeholder groups use this library, including policy makers, researchers, treatment providers, regulators, and gambling operators. In order to meet knowledge needs, GREO both manages and produces grey literature, and maintains a research data repository for use by the gambling studies community. In keeping with the Open Science movement, the goal of the library is to provide timely and relevant evidence in formats accessible to diverse audiences, which can be used to inform decision-making, research, treatment, and policy direction.

This paper documents how GREO's digital library reorganized its search interface and document types and adopted accessible terminology so that complex research findings could extend beyond the academic community to broader audiences. Beginning in 2017, we assessed the existing library's terminology and document types for accessibility and credibility. The first step was to rename the library from "Knowledge Repository" to "Evidence Centre", a term that resonated more with non-academic audiences. Similarly, in 2018, we renamed the "Grey Literature" collection to "Specialized Resources" so that it is readily understood. Since the collection had grown considerably, we divided the single "Grey Literature" resource type into ten searchable categories to help direct users to the most appropriate resource formats. Examples include white papers, reports, visual tools, and instructional resources. A recent change in our funding model necessitated a further transition from a focus on Ontario, Canada to international audiences. Using examples drawn from a recent focus on gambling in Great Britain, this paper demonstrates how the GREO Evidence Centre has become increasingly accessible to wider audiences since 2017 to more effectively address their information needs.

Keywords: *digital libraries, search interfaces, document types, stakeholders, public policy, health libraries, special collections*

Introduction

Special health libraries often serve multiple, diverse audiences. In addition to researchers and treatment providers who seek the most recent information to support their needs, such libraries attract other knowledge users like policy makers, treatment providers, educators, and people with lived experience. Further, in recognition of the influence of the social determinants of health[1] on various health issues, interdisciplinary approaches may be undertaken to better understand complex health problems. This presents challenges to information professionals since a variety of evidence types, formats, and terminology may be required to address needs from both disciplinary and occupational vantage points. Decisions need to be made about terminology used to present the collection, as well as the most useful and logical way to share information so that resources are used.

Although high-quality grey literature is abundant in health, there is sometimes a lack of understanding of what constitutes "grey literature". The term can be confusing to some or misunderstood with regard to quality standards. The goal of this project was to examine the terminology and structure of the Gambling Research Exchange (GREO) digital library, the "Evidence Centre" from a knowledge user perspective. By applying knowledge translation principles, we hoped to enhance understanding, awareness, and, ultimately, uptake of grey literature among diverse audiences.

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GREO is an independent knowledge translation and exchange (KTE) organization that aims to reduce harm from gambling. Knowledge translation (KT) is the process of customizing credible research so that it is accessible to audiences who will use it for evidence-based decision making. Knowledge Exchange (KE) occurs when researchers and other knowledge users collaborate to use the translated research to effect change.[2] As summarized by Rock, the goal is ultimately to "get the right information to the right people at the right time in the right format so as to influence decision making".[3, para 3]

The GREO Evidence Centre plays a central role in KTE. It is a freely accessible digital collection of research evidence on gambling and its related harms that provides timely and relevant information to diverse audiences in a format most useful to them. The collection, which consists primarily of grey literature, is used to inform decision-making, research, treatment, and policy direction. Grey literature is particularly useful in health research where systematic reviews are often undertaken to determine best practices. The reviews regularly include grey literature for a more comprehensive information picture.[4] In addition to managing and developing the grey literature collection, GREO regularly produces grey literature in forms such as research summaries, white papers, evidence syntheses, infographics, and webinars. All these grey literature types move beyond an academic article to make research accessible to wider audiences.

Although there are different definitions and multiple components of Open Science, we propose that knowledge translation and exchange is an essential element of research projects, and that accessibility is vital in making research truly available to the wider community. Part of the democratization of scientific knowledge is acknowledged to be "making science better understandable for a wider population",[5, p.466] which is what KTE seeks to accomplish. Many granting and government agencies now require a KTE component and Open Access publications resulting from their financial support[6] so that findings can be shared with audiences beyond the research community. According to the Canadian Institutes for Health Research (CIHR), it is "increasingly important to demonstrate the benefits of the investment of taxpayer dollars in health research by moving research into policy, programs and practice".[7, p.1]

There is support for the hypothesis that Open Access helps "to advance knowledge translation to more readers and beyond academia to health practitioners".[8, p.3] Yet, is important to note that Open Access applies to academic articles only, which often pose challenges to readers unfamiliar with complex statistics and scientific language. Although Open Access publication is still seen by much of the academic community as the main form of KTE, funders like CIHR are increasingly requiring that the needs of non-academic knowledge users be considered alongside academic publishing. A further step in summarizing the research is usually needed to improve knowledge democratization, such as designing new tools or exploring different dissemination channels.[5] As O'Neill observes, information needs to accessible, assessible, intelligible and usable to meet decision maker needs.[9] In this way, the transparency of open science moves beyond *scientific* relevance only to also being *socially* relevant.[10]

Background to the project

Prior to 2014, GREO was known as the Ontario Problem Gambling Research Centre (OPGRC). From 2000 to 2013, it was the world's largest single funder of gambling research, investing close to $40 million in research grants, capacity development, knowledge translation, and student awards. When the OPGRC organizational mandate changed in 2013 from funding gambling research to supporting KTE, it was renamed Gambling Research Exchange Ontario. During this time, it continued to support researchers' information needs and developed new audiences for its digital library. In 2019, the funding structure, which had relied upon support from the Ontario Ministry of Health and Long-Term Care changed, and GREO became an independent, not-for-profit organization. It continues to provide research evidence to the gambling studies community, but KTE services are expanding beyond the Province of Ontario to serve national and international clients. The Evidence Centre, however, remains focused on gambling and related harms.

When the GREO mandate shifted to KTE in 2013, a library was created to share research findings with a wide audience of stakeholders. Originally named the "Knowledge Repository", It contained: (1) plain-language summaries of published research articles, (2) summary reports of research funded by GREO and its predecessor OPGRC, and, (3) research datasets. Beginning in 2017, a more directed and broader focus was applied to collection development, with the result that GREO now has an extensive catalogue of gambling grey literature that is published throughout the world. Sensitive to the GREO KTE mandate, the library needed a new name that held deeper meaning to broader audiences than, "Knowledge Repository". Consequently, GREO embarked on a public naming contest where people who used the digital collection were encouraged to submit suggestions for renaming, with a prize incentive offered to encourage participation. Names ranging from "The information Centre" to "The Sphere of Infinite Knowledge" were submitted and the new name, "Evidence Centre", was selected as being both meaningful and accessible to multiple user groups. Further, the new name better represents the range of materials included and reflects the lively and dynamic nature of the collection. The library is available online at http://www.greo.ca/EC.Having acquired a new name, the next step was to assess the terminology used to organize the collection for accessibility to diverse audiences.

Goal: Enhance Grey Literature Use

There is a wealth of high-quality gambling research published only as grey literature, such as government-commissioned reports, working papers, or policy documents. Despite the depth and breadth of useful information, knowledge users may face obstacles that interfere with its uptake. The first challenge is finding reliable information sources. Searching for public health grey literature can be a daunting task, even when undertaken by experienced librarians (e.g., see Adams et al.[11]). Another constraint is that many of GREO's stakeholders are confused about the concept of grey literature. Some believe grey literature is never peer-reviewed, or that it consists only of a limited selection of popular media. Other scholars are narrowly focused on a specific type and do not understand the breadth of grey literature resources.[12] Critically, they may think that literature published outside an academic journal is of inferior quality, as noted by Cooper et al.[13] in their investigation of grey literature citing practices of tenured and tenure-track faculty at an R1 university in the US. On the other hand, researchers who publish grey literature have indicated a desire to GREO staff for greater uptake of their materials.

Until 2017, the GREO grey literature collection was organized as a monolithic block, with no descriptors or subcategories to help or guide users to the information best suited to their needs. Furthermore, the Evidence Centre graphics used a grey book icon for grey literature items, which did not generate interest. The unstructured approach was relatively useless to the reader and, just as importantly, represented a missed opportunity to educate about the wide array of credible resources available in the grey literature. To remedy this situation, GREO's approach was to apply KTE principles to the EC so that people would more easily understand the vast range of high-quality resources and select formats to best meet their information needs.

From "Grey Literature" to "Specialized Resources"

An important principle for KTE is plain language.[14] In plain language writing goal is for the intended audience to be able to easily understand and use the information[15], whereas scholarly writing prioritizes precision and accuracy and uses jargon to do so. Since our primary goal is to enhance use of our grey literature collection, we decided it was not necessary to use the precise jargon "grey literature" in our user interface. Another principle of KTE is to know your audience. By considering and catering to the characteristics of your intended audiences, you will increase the likelihood of uptake.[16] We decided to rename the collection "Specialized Resources". The word "resources" is broad enough to encompass the manifold document types of grey literature, whereas the word "specialized" reflects our intended audiences: our main audiences include researchers, policy makers, gambling operators and treatment providers: all specialized professionals whose work concerns gambling harm. Thus, we expect our intended users would not be intimidated by the word "specialized", but rather encouraged that they would find resources to match their specialty.

At the time of review, the grey literature collection contained over 1,600 items. The database contained a "grey literature type" field, which was a free-text field with over 70 unique values. This field was displayed for each item but not searchable. Our first goal was to make this field more useful. To achieve this, we used GreyNet's "Document Types in Grey Literature"[17] as a guide to clean and revise the data, resulting in 41 document types in our collection. We created some document types not on the GreyNet list that serve our audiences' specific needs. For example, there is high demand among gambling policy makers for information about gambling policies in other jurisdictions, so we created the document type "jurisdictional review".

Second, we arranged the 41 document types into 10 document type categories to be used for the search interface. We also created a colourful icon for each of the 10 categories, replacing the single grey book icon. The full category system is presented in Table 1.

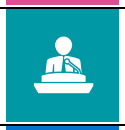
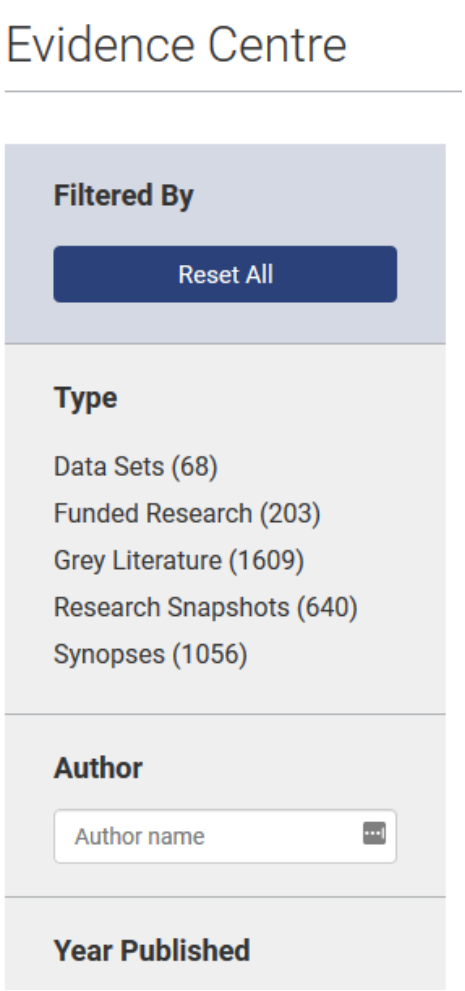
Category	Icon	Document types
White Papers		White Paper
Summaries		Research summary, Brochure, Brief
Reports		Jurisdictional review, Technical report, OPGRC-funded research report, Policy document, Summary report, Government report, eBook, Policy review, Preprint, Research report, Conference paper, Background paper, Legislation, Annual report, Forum report, Literature review, Assessment report, Methodology, Program report
Visual Tools		Research poster, Factsheet, Infographic
Multimedia		Podcast, Video, Webinar, Interview
Instructional Resources		Workshop, Guidebook, Booklet
Commentaries		Position paper, News release, Consultation
Conferences and Presentations		Conference presentation, Conference proceedings
Bulletins		Digest, Bulletin
Bibliographies		Bibliography

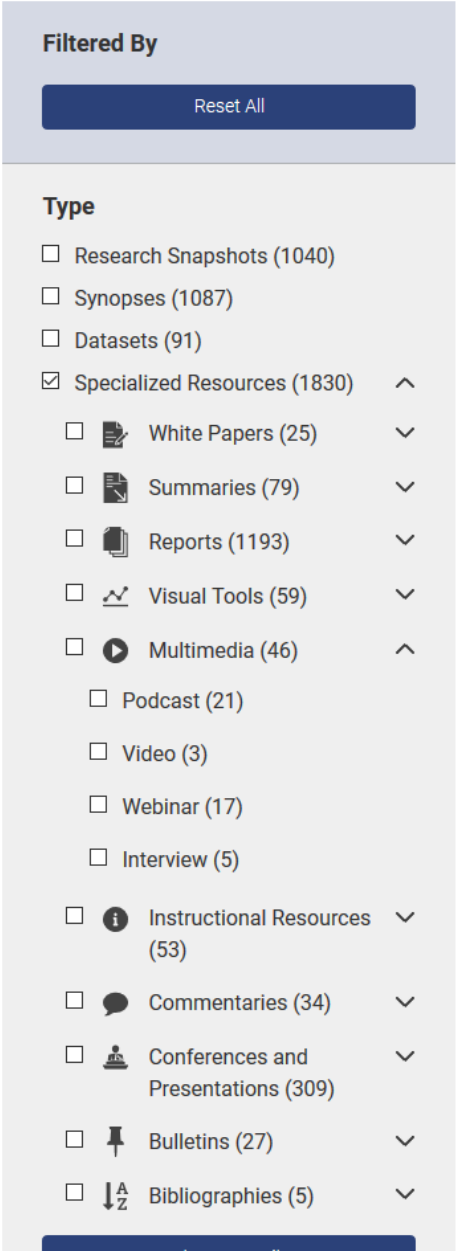
Table 1: The category system of grey literature document types in the Evidence Centre "Specialized Resources" collection. The categories are ordered as they appear in the Evidence Centre. Icons are presented in greyscale in this document but are each a different colour in the Evidence Centre.

The category system was developed heuristically based on anticipated use cases. For example, users may require a different level of detail, so "Reports", "Research summaries", and "Visual tools" (i.e., Factsheets) are separate categories that may all have information about the same topic. When a publisher produces a full research report, a research summary and/or a factsheet for a single project, we add documents to the Evidence Centre so that users will find that information regardless of the document type they search for.

Regarding specific audiences, the category "Instructional Resources" is a good example of where the essence of the category is the intended audience rather than the document types. In this case, the category contains various resources that would be useful for people working directly with gambling harm, including front-line clinicians and people experiencing gambling harm.

The ordering of the resources is intentional and was guided by Adams et al.'s[18] credibility tiers of grey literature, while also considering the accessibility of the document. In short, resources that represent empirical evidence from expert sources and outlet control are at the top–e.g., White papers, Research summaries, and Reports–with White papers and Research summaries listed first because they are more accessible formats. Types that have less editorial control (i.e., Conference presentations), or may represent more opinions than empirical evidence (i.e., commentaries), are lower on the list.





• Figure 1 The Evidence Centre's original grey literature search filters.
• Figure 2 (Right): The Evidence Centre's revised grey literature filters, relabeled as "Specialized Resources".
• The category "Multimedia" is expanded to show an example of document types therein.

We implemented the new category scheme in the Evidence Centre search interface under the new label "Specialized Resources", as shown in Figure 2. The collection can be expanded to show the 10 categories, each of which can be further expanded to show the individual document types. Importantly, we employed checkboxes at all levels so users have the option to specify certain document types or quickly search the whole collection. All categories have four or fewer document types except for "Reports", which has 19. Although this is a difficult number of types to choose from There are many report types; the expected use case is that users will select all report types instead of individual ones, but the specific information is useful when reviewing individual items.

To summarize, all aspects of the library's information architecture and terminology were revised with consideration for the users' frames of references, from how the grey literature document types are categorized and the name and order of those categories, up to the names of the grey literature collection and the entire library itself.

Strategic collection development

Another way we anticipate and respond to our users' needs is through our collection development policies. A newsletter listing all new items added to the Evidence Centre is sent to subscribers each month. By directing collection development strategically, we can raise the profile of grey literature as a valuable and legitimate form of evidence. Two straightforward ways of doing this include 1) cataloguing major works in the same month they are published, and 2) cataloguing related documents together so they are always part of the same newsletter. Some gambling research programs will publish a full research report, an executive summary report, and factsheets all pertaining to the same study. An important example of this is the 2016 study on gambling-related harm in Victoria. This was the first large-scale study to include population-level public health methodologies as one of the research approaches used to assess gambling harm, and the findings were published in a full 188-page research report as well as in four two-page factsheets.[19-23] Select findings were also published in academic articles, that GREO translated into two-page research summaries for wider accessibility. These documents all present the same findings in different ways that are most useful to different knowledge users. With cases like this, by ensuring that all documents are disseminated in the same announcement, we demonstrate the potential of grey literature as a flexible yet still credible avenue for evidence.

A third strategic goal of collection development is to respond to current issues and events. For example, at the time of writing the Gambling Commission (Great Britain) is conducting a consultation on the topic of gambling with credit cards, in advance of a decision to either ban or otherwise restrict the use of credit cards for online gambling. During this period, we sought evidence on this topic published in grey literature documents and added them to the Evidence Centre.[24] When British gambling stakeholders visit the Evidence Centre or receive the monthly content alerts, they will see grey literature directly related to a current issue in the policy landscape. This achieves the immediate goal of providers knowledge users with information relevant to their needs, while also demonstrating to these audiences that grey literature is a unique and valuable source of evidence for policy decisions. Thus, we are building a comprehensive topical grey literature collection in a way that optimally raises the profile of grey literature by addressing current user needs.

Discussion

Why Terminology Matters

Grey literature is a complex source of information that appears in multiple traditional and nontraditional types that can fluctuate over time.[4] Relabelling headings in our digital library with the user experience in mind and explicitly naming all document types achieves dual goals of educating knowledge users about the breadth and complexity of grey literature while also helping them locate materials best suited to their needs. This aligns with the Open Science principle of supporting the democratization of scientific information.[5]

We believe that changing the title of the collection from "Grey Literature" to "Specialized Resources" holds greater meaning for our knowledge users and generates more interest. Grey literature content becomes more understandable and useful when subdivided into smaller, recognizable categories. This helps to reduce the complexity of a manifold, fluctuating information source. As Sulouff et al. have noted, even among faculty members, the term "grey literature" is not used by many and of those who do use it, the range of resource types is highly circumscribed.[12] Plain language headings help to address the confusion of discipline-specific language and create meaning for knowledge users who have not been taught or do not understand the accurate meaning of disciplinary terminology. In this way, the dissemination path is changed in order to make research evidence more accessible.

These changes in terminology extend beyond the information design of the digital library and into our active dissemination efforts. Replacing the term "grey literature" with more descriptive document types in our monthly content alerts increases interests and helps users determine whether the information is in a format that is readily usable by them. In addition to presenting useful metadata about the documents, we strategically catalogue grey literature on topics of current interest in gambling policy to ensure the grey literature that we deliver is immediately usable, and create future demand for the grey literature on gambling.

Future directions

A challenge faced by our Knowledge Management team is measuring current and long-term impacts in grey literature use in the gambling studies community. Although we have not yet undertaken a formal evaluation to determine the extent to which knowledge users may have increased their knowledge and use of grey literature types, we do see steadily increasing numbers for access and use of the Evidence Centre. We anticipate implementing a user experience survey to assess multiple factors. Beyond learning more about our diverse knowledge user groups, we would like to increase our understanding of the extent to which the relabeling has been helpful in increasing understanding and use of grey literature, whether the categories (with icons) are meeting user needs, and how to continue to improve access to research evidence.

Conclusion

By applying KTE principles to our digital collection, more people from diverse occupational and disciplinary backgrounds can access grey literature in formats most useful to them. This facilitates greater uptake of evidence by the people who can benefit from it most, thereby fulfilling funder mandates, such as those outlined by CIHR,[7] designed to advance health practices and policies. Further, KTE supports the Open Science movement by ensuring that research evidence is presented in accessible formats so that it reaches wider audiences. This is one of the most important contributions of the Evidence Centre to the gambling community.

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Research Data and Open Science in the Russian University Environment*

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Abstract

The leading Russian universities, such as Saint Petersburg State University (SPbSU), pursue a policy of openness. The number of different digital collections, thematic portals and subject indexes are increased. Also the internal databases of all the faculty members' publications are created. In parallel, centralized resources of online courses appeared. However, these positive changes mainly relate to the initiatives of the high university management. In the conditions of a certain disintegration of the different areas of Russian science, there is a search for new ways for cooperation, initiated by scientific community itself.

Keywords: open science, open education, science communication.

Relevance

Modernity is marked by a variety of the grey literature forms, which nevertheless have a national specificity. This specificity is also manifested in such an international and in many ways transparent field as science communication. In Russia, the state plays a key role in SciCom formation. The Russian scientific community has been tasked with making Russia one of the five leading scientific powers in the world (while the USSR was a real leader). The essence of the Russian science policy at the present stage is to actively enter the global scientific space. In this sense, the vector of science policy contradicts the political orientation towards isolationism. However, this process is accompanied by significant difficulties, since Western ranking systems that evaluate the effectiveness of both individual scientists and science corporations are focused on the Western realities, which are positioned as a priori more effective.

The global world is undergoing a gradual transition to the open science and education. Open science as an essential part of the modern science communication includes:

1) Open access papers and research data;
2) Open repositories;
3) Open universities (including online education);
4) Digital popular science and educational resources.

Discussion

Open science involves general communication channels and the databases free exchange possibility.

The main resources of global research data are the following:

1) *Directory of Open Access Journals* (DOAJ) is the largest international aggregator of the open access scientific journals. DOAJ was launched in 2003 by Lund University (Sweden). The base includes more than 11,000 magazines from around the globe.
2) *Open Journal Systems* (OJS) is a journal management and publishing open software system that has been developed by the *Public Knowledge Project* to expand and improve access to research.
3) *Sci-Hub* is pirated service that allows free access to the subscription articles. In the USA, as in Russia, it is illegal. It develops under the slogan, *Down with copyright in science*.

The single Russian scientists in their real research practice more often use the following resources:

1) *Google Scholar* is a free search system for the full scientific publications texts of all disciplines. It includes data from most peer-reviewed online journals of the major scientific publishers. Articles are also available here indexed in the international scientometric databases Web of Science (plus Russian Science Citation Index) and Scopus, in its turn, providing full-text access based on a paid subscription. The important part of Google Scholar is *Google Academia*.
2) Russian scientific articles aggregators: *eLibrary* (elibrary.ru) and *CyberLeninka* (cyberleninka.ru), although the proportion of open access articles there is still quite small.

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3) Full-text dissertations abstracts are available at the *Electronic National Library* platform (rusneb.ru).

The following resource is available for scientific organizations on the basis of an agreement, *National aggregator of the open repositories of Russian universities*, supported by the Presidential Foundation of the Russian Federation. The project assumes the creation of a unified platform of open access repositories (green open access), accumulating Russian scientists' works.

Within the framework of the project, including *Open Russian Science,* it is planned to modernize Russian repositories and integrate them into the world open systems, develop new technical support services, as well as popularize open science crucial ideas. The project is developing a national network of the Russian repositories based on a central hub, the *openrepository.ru* platform.

Modern processes of the press monopolization led to the fact that almost the half of the scientific journals market is under the control of the several major international publishing houses, among which *Elsevier* is the leader. In the segment of social and human sciences journals, the expansion of large publishing houses was carried out especially intensively, although open access was less developed in these areas of knowledge than in the natural sciences. The key role in this process was played the world's largest research foundations policy, which funded research and made the open access publication a mandatory requirement for its grantees. The *European Union Open Access 2020* project supported this trend.

Despite the efforts made, there were still many problems, *The open-access movement has been around for 25 years, and still just 15 percent of articles are fully open at the time of publication* [4].

In Russia, open access is developing less intensively than in the West. It mainly implemented in the non-profit university research journals. Currently, the transition programs to open access in Europe and the United States are more focused on the repositories development. In this regard, the Western university journals do not occupy a leading position, although they could potentially become an alternative to the commercial area [about open access see: 5]. Moreover, universities are forced to subscribe to products of the same Elsevier company.

Russian libraries approach open access selectively, since the open access requires a library system significant transformation. The informational and technological conservatism of the many Russian scientific and educational institutions is explained not only by the lack of mobility, or inability to reform, but by the desire to maintain the purity of elite knowledge, a high scientific level. However, recently the federal project, *National Electronic Library* (NEL), was launched (http://government.ru/docs/37756/). It aims to create a single information library space in the country. The objects of the NEL are electronic copies of the printed and electronic publications, unpublished documents, including dissertations, and books heritage.

Russian universities are more actively implementing an open science policy than research institutes. The mission of the universities open science is to increase the transparency and prestige of the Russian education.

The main Russian federal electronic educational resource is named *National Open Education Platform. Open Education* is an educational platform that offers mass online courses of leading Russian universities that have joined forces to provide everyone with the opportunity to receive a quality higher education. Any user can take courses from leading universities in Russia for free at any time, and students of Russian universities will be able to count the results of training at their university. The project focuses on broad collaboration between universities. The platform currently has over a million listeners. All courses posted on the platform are available free of charge and without formal requirements for a basic level of education. The platform also provides an opportunity to receive university certificates, which means obtaining credits in the discipline. Courses are focused on different areas of training. For example, the social and humanitarian block is represented by such courses as *Digital History*, *Media History and Theory*, *Social Media*, *The USA Public Diplomacy*, etc. [2].

St. Petersburg State University is one of the leaders in the open science in Russia. SPbSU created a repository of the students' graduate works; all teachers' scientific data is placed in the *Pure* online system. The policy of maximum openness of all spheres of university life is proclaimed [3]. Along with the Higher School of Economics, SPbSU is also a leader in online education. Online courses are prepared on a competitive basis. Online courses have to solve the following tasks:

1) They must respond the demands of the education and labor market;
2) SPbSU open online courses should be hosted on online platforms, including *National Open Education Platform*, *Platform Coursera*, *XuetangX* and *Stepik*;
3) Improving the competitiveness of SPbSU open online courses in the global competition with the leading world universities;
4) Increasing the number of students studying open online courses at SPbSU;
5) Inclusion online courses in the major educational programs at SPbSU.

In priority, online courses are being developed in priority educational areas in Russia:

1) Digital economy;
2) Personalized medicine;
3) Microbiome technology;
4) Investment potential of the Russian Federation Arctic zone;
5) Russian as a state language;
6) Information security;
7) MegaScience;
8) Modern anthropology in the system of natural and social sciences;
9) Environmental security and urban issues [1].

Pros and cons of online learning

Pro: online courses provide modular training opportunities (different target groups), as well as the educational competencies formation (they are exactly measured in the credit units). In the US, online courses are being actively introduced even into high school education. However, in Russia e-learning access is becoming more open than even in the West.

Contra: there is no process of the real communication; if professors can be replaced by a computer, then the entire education system is collapsing. In addition, copyright issues are problematic. In Russia, students also are not satisfied with e-learning, preferring the real, and the university academic environment rejects the universities transformation into the commercial enterprises, which contradicts their mission. This transformation is also actively criticized by the greatest scientist and intellectual figure of modern times Noam Chomsky.

Conclusion

In Russia, online courses are really effective when they are mostly enlightenment (cultural), to a lesser extent, educational academic project. That's also meaning some kind of protest against educational officialdom. Therefore, in the urban environment more and more art clusters (like *New Holland* in St. Petersburg) are created.

The specialty of the open science marketing in Russia is the certain platforms promotion, to a lesser extent – single scientists.

In the last ten years in Russia, the steady growth of the various popular science and educational resources (network portals, video films, cultural and educational sites) has increased. Growth is also observed in the natural science blogs and web sites. Humanitarian knowledge representatives are also seeking to unite both institutional and non-institutional groups. The new media combining journalistic, enlightening, and educational functions and even the function of storing information (depository) are formed. These hybrid media represent research data, and at the same time open the science for the different target groups. Multiple media platforms focused on scientific and educational content bring the audience out of an information passive consumption to an active user's environment.

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Data from "Policy Development for Grey Literature Resources: An Assessment of the Pisa Declaration"

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Abstract
The data collected is based on the answers of 60 respondents to an online questionnaire. The respondents were among a controlled population of signatories, who endorsed the Pisa Declaration on Policy Development for Grey Literature Resources published in English on May 16, 2014[1]. Translations in 22 other languages have since appeared published[2] and the Declaration remains online, open for endorsement[3]. The dataset consists of responses to ten questions of which one allowed a single response, six allowed for multiple responses, and three were open-ended. All 10 questions invited additional comments. After two years from its initial publication, the survey sought to understand how important the organizational, educational, legal, financial, and technical points in the Pisa Declaration are to the respondent's organization, what additions and/or revisions deserve consideration, and did the respondent have an opportunity to promote public awareness to the Pisa Declaration. The data was collected over a 12-week period in 2016 via SurveyMonkey[4], where it remains stored along with a copy housed in the DANS Easy Archive[5]. It's potential for reuse resides in its full open access compliance and lends itself to comparison with other Declarations published in the field of information. The reuse of the data may also be considered of value in leveraging information resources.

Keywords: Data Paper; Policy Development; Data Resources; Assessment

Subject Area: Information Science; Grey Literature; Policy Studies

Methods Applied

● Steps
In formulating the questions that comprise the instrument used in this study, the five sections of the Pisa Declaration dealing with the organizational, educational, legal, financial, and technical aspects of policy development for grey literature resources were revisited. The fifteen points related to these sections provided the wording used in drafting the questionnaire. The final edited version of the online questionnaire was then entered in SurveyMonkey and the link generated was emailed to the defined population.

● Sampling strategy

The population of the survey was drawn from the signatories, who endorsed the Pisa Declaration as of the date on which the SurveyMonkey link became operational. The names of those who endorsed the Pisa Declaration and their email addresses are contained in an online directory housed on the GreyGuide Portal[6]. The strategy behind this controlled population allowed that the survey recipients would be familiar with the original contents of the Pisa Declaration. The survey was online accessible for a period of 12-weeks.

Survey Population	Survey Respondents	Survey Results %
133	**60**	**45,1%**

● Quality Control

There was no specific control carried out on the data acquired from the survey. None of the categories of responses were grouped or otherwise normalized. Based on the survey questions directly related to the five sections of the Pisa Declaration, little variation appeared among those who answered the questions – on average 46 and those who skipped questions – on average 14. Also marked is that 46 (76,6%) of the respondents provided their contact details solicited in the final question of the survey. This of itself allows one to assume that there is no cause to question the validity of the responses.

Dataset Description

File name:	Savic et al. - Survey Q1-Q8
***Format name and version*:**	.csv and .xlsx
Creation dates:	*from* 2016-04-25 *to* 2016-07-18
Language:	English
License:	CC0 Waiver - no rights reserved
Archive name:	DANS EASY Archive
Publication date:	2016-09-15

Potential Reuse of the Data

The data collected in this survey allows for potential reuse and further analysis not only because all rights have been waived and the data is publicly accessible, but also because of its interest to other communities of practice pertaining to long-tail research on policy development. In recent years other Declarations in the field of information such as the Lyon Declaration[7], the Glasgow Declaration[8], and the Santiago Declaration[9] have been drafted and published. At some point in time they may also be assessed. This then would not only allow for comparative results but would also demonstrate the value of such Declarations. On a more critical note, the data is limited by the number of respondents to the survey – 60 in total. While the percentage of responses to the survey (45,1%) is well above an accepted level, it remains a fact that the number of respondents does not formally allow for the expression of results in percentages. The data however remains preserved in a national archive, which carries the CoreTrustSeal[10] and by way of this data paper demonstrates compliance with the FAIR principles[11].

Linked References

[1] http://www.greynet.org/images/Pisa_Declaration,_May_2014.pdf

[2] http://greyguide.isti.cnr.it/index.php/greyguideportal/pisa-declaration/pisa-declaration-22-language

[3] http://greyguiderep.isti.cnr.it/pisadecla/iscrivi.php

[4] https://www.surveymonkey.com/

[5] https://easy.dans.knaw.nl/ui/datasets/id/easy-dataset:68541

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Pisa Declaration

on

Policy Development for Grey Literature Resources

May 16, 2014

Twenty-Second International Conference on Grey Literature

'Applications of Grey Literature for Science and Society'

National Research Council of Italy
Rome, Italy • 19-20 November 2020
Piazzale Aldo Moro 7

Call for Papers

While Grey Literature encompasses all fields of study, over the years a number of areas have been more forthcoming in their production, publication, and uses of grey literature. Together, these underscore the title of GL2020, 'Applications of Grey Literature for Science and Society'. GL2020 is open to all sectors of government, academics, business and industry and welcomes content contributions worldwide. ***http://gl2020.cnr.it/cfpa.php***

Why you should submit to GL2020

Grey literature has a long-standing tradition and it is a mosaic of different documentary types: from scientific papers to a wide range of technical or administrative materials, produced by public or private institutions, associations, industries, and foundations at local, national or international level.

In the age of Open Science, which aims to broaden the boundaries of knowledge and make them accessible to the general public, grey literature maintains a crucial role. Indeed, it is inclusive of a wide range of documentary materials that are not always easily accessible. It contributes to the knowledge and deepening of wide-ranging themes of great interest for the citizenry, such as environmental protection, health and justice, bringing to light urgent social needs and priorities.

GL2020 offers an important opportunity to meet an international community that has been studying grey literature and its evolution for decades. The community is large enough to be diversified and lively, but small enough to allow wide interaction between participants and friendly participation in the events offered.

Areas of Interest (Communities of Knowledge and Practice):

- Agriculture, Forestry, and Fisheries
- Economics, Information science, Legal issues
- Bio-Medicine, Health Science
- Earth Sciences, Environment, Natural Resources
- Other fields related to Grey Literature

Submission Guidelines

Participants who seek to present a conference paper dealing with grey literature are invited to submit an English language abstract. The abstract should address the problem/goal, the research method/procedure, as well as the anticipated results of the research. Abstracts are the only tangible source that allows the Program Committee to guarantee the content and balance in the conference program. Abstracts not in compliance with the guidelines will be returned to the author for revision.

Due Date and Method of Submission

Abstracts can be submitted starting February 7th 2020. The extended closing date is April 7, 2020.

• Click http://greyguiderep.isti.cnr.it/userarea.php?langver=en
• Select GLA: Conference Abstract - International Conference Series on Grey Literature
• Complete the online template and remember to press the submit button!

The author will receive verification upon its receipt. Shortly after the Program Committee meets on April 24, 2020, the authors will be notified of their place on the conference program. This notice will be accompanied by further guidelines for submission of full text papers, biographical notes, accompanying research data, PowerPoint slides, and required Author Registration.

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