Twenty-First International Conference on Grey Literature

Open Science Encompasses New Forms of Grey Literature

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Foreword

OPEN SCIENCE ENCOMPASSES NEW FORMS OF GREY LITERATURE

For more than a quarter century, grey Literature communities have explored ways to open science to other methods of reviewing, publishing, and making valuable information resources publicly accessible. This Twenty-First International Conference on Grey Literature seeks to demonstrate how the principles of science and advancements in information technology have impacted the field of grey literature and in turn how grey literature by implementing these has contributed to the open science movement.

Open science is defined as the movement to make scientific research, data and dissemination accessible to all levels of an inquiring society1. Grey literature by definition seeks to make publications produced on all levels of government, academics, and business openly accessible different from those controlled by commercial publishing. As such the open science movement incorporates the work carried out by grey literature communities and renders an even broader framework encompassing newer forms of grey in both textual and non-textual formats.

Open science encompasses the life and physical sciences as well the social sciences and humanities as does grey literature. Open science recognizes the value of grey literature in the process of knowledge generation and as such acknowledges contributions made by researchers, authors, and their communities of practice. Open science changes the way research is done and allows for convergence with the field of grey literature. It is within the open science movement that grey literature and its wealth of information resources are valued and properly exploited for society as a whole.

Dominic Farace
GREYNET INTERNATIONAL

Amsterdam,
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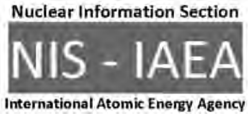

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Professor Dr. Sören Auer

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Program Outline

DAY 1 - Tuesday, 22 October	DAY 2 - Wednesday, 23 October
Leibnizhaus, Holzmarkt 5, Hannover, Germany	***Leibnizhaus, Holzmarkt 5, Hannover, Germany***
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Program Chair

Margret Plank
Head of the Competence Center for Non-Textual Materials, TIB

Margret Plank is currently the Head of the Competence Centre for Non-Textual Materials at the German National Library of Science and Technology in Hannover (Germany). The aim of the Competence Centre for Non-Textual Materials is to develop emerging tools and services that actively support users in the scientific work process enabling non-textual material such as audiovisual media, 3D objects and research data to be published, found and made available on a permanent basis as easily as textual documents. Previously she was responsible for Information Competence and Usability at the TIB. She has also worked as a researcher at the Institute of Information Studies and Language Technology at the University of Hildesheim. She represents TIB on a number of boards including IFLA Steering Committee Audiovisual and Multimedia Section as well as ICSTI / ITOC. Margret Plank holds a Master degree in information science and media studies from the University of Hildesheim, Germany.
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Welcome Address

Prof. Dr. Sören Auer
Director of the German National Library of Science and Technology

Prof. Auer was appointed Professor of Data Science and Digital Libraries at Leibniz Universität Hannover and Director of the TIB in 2017. Prof. Auer has made important contributions to semantic technologies, knowledge engineering and information systems. He is the author (resp. co-author) of over 100 peer-reviewed scientific publications. He has received several awards, including an ERC Consolidator Grant from the European Research Council, a SWSA ten-year award, the ESWC 7-year Best Paper Award, and the OpenCourseware Innovation Award. He has led several large collaborative research projects, such as the EU H2020 flagship project BigDataEurope. He is co-founder of high potential research and community projects such as the Wikipedia semantification project DBpedia, the OpenCourseWare authoring platform SlideWiki.org and the innovative technology start-up eccenca.com. He is founding director of the Big Data Value Association and member of the advisory board of the Open Knowledge Foundation.
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Keynote Address

Barbara Rühling
CEO at Book Sprints Ltd.
Berlin, Germany

Barbara Rühling is the Keynote Speaker at this year's Twenty-First International Conference on Grey Literature that deals with Open Science and Grey Literature. The title of her defining presentation reads 'Unbreaking our Knowledge Sharing Workflows?'

Barbara Rühling has been the CEO of Book Sprints since 2016, and focuses on streamlining our service and workflow, developing new formats and diversifying the company's client base. Previously the lead facilitator at Book Sprints for three years, she continues to facilitate Sprints. As a facilitator, Barbara's background in cultural anthropology and documentary film makes her observant and attentive to each group's unique process. She facilitates in English, German, and Spanish.
barbara@booksprints.net

OPENING SESSION

SESSION ONE – OPEN SCIENCE PRINCIPLES PROMOTE THE FIELD OF GREY LITERATURE

SESSION TWO: CONFRONTING OBSTACLES AND CHALLENGES TO OPEN ACCESS

POSTERS SESSION

SESSION THREE – OPEN RESOURCES FOR EDUCATION IN LIBRARY AND INFORMATION SCIENCE


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

Dobrica Savić,
Nuclear Information Section; International Atomic Energy Agency,
NIS-IAEA, United Nations

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, 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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Abstracting and Indexing as an enabling interface between open science and grey literature – The approach of the Aquatic Sciences and Fisheries Abstracts service

Tamsin Vicary, Food and Agriculture Organization of the United Nations, Italy
Ian Pettman, Freshwater Biological Association, United Kingdom

Abstract:
We examine the role of one Abstracting and Indexing (A&I) service (Aquatic Sciences and Fisheries Abstracts - ASFA) as an interface between open science and grey literature. As an A&I service known for its coverage of grey literature, ASFA is evolving its technologies and partnerships to capitalize on the opportunities presented by Open Science. A Grey Literature strategy was implemented to ensure ASFA made the necessary changes to its monitoring, recording and reporting of grey literature coverage on its database. We describe how the strategy incorporates the Open Science movement into ASFA, by making use of the opportunities such as the increased number of repositories and literature; and vice-versa by providing increased access to grey literature and working with institutions to ensure their literature is captured on ASFA. Specifically we describe how ASFA is: (1) increasing access to grey literature by working in partnership with OA repositories (including harvesting from OAI-PMH compliant repositories); (2) using open source software to manage its indexing and search tools, allowing them to be utilized by, and receive contributions from, a greater number of users to aid the discoverability of grey literature; (3) ensuring comprehensive and timely coverage of grey literature among its global partnership, and providing funding for small specific projects which meet ASFA's grey literature priorities regards subject scope and content type; (4) working with the Open Science community in a Virtual Research Environment (VRE) – such as iMarine – to ensure a two way interaction between the Open Science movement and the promotion of grey literature in the future. We demonstrate that by taking the above steps to capitalize on the opportunities presented by Open Science and new technologies, an A&I service such as ASFA becomes a valued interface between Open Science and grey literature – ensuring the recording and discovery of grey literature from aquatic sciences and fisheries institutions around the world.

Introduction

The ASFA database was first published as a monthly abstract journal in July 1971. An international cooperative, input to the database is today provided by 64 national and international partners, 43 collaborative centres, and the commercial publisher ProQuest. Each of ASFA's Partners has signed an agreement with FAO, stating that they will be responsible for monitoring serials and non-conventional (grey) literature relevant to the scope of ASFA published in their own countries and for preparing bibliographic citations, indexing and abstracts of relevant literature for input to ASFA. In the pre-digital age of ASFA's origins, this model ensured both primary and non-conventional and grey literature was adequately covered. For example, in 1979, ASFA Board members estimated that 40,000 publications within ASFA's subject scope were issued annually, and set ASFA a medium-term target of covering 30,000 records, so roughly 75% of all relevant literature. As the commercial publisher concentrated on primary literature, GL input was provided by ASFA Partners who in 1974 provided 50% of records added to the database[1]. In recent years, that percentage has changed in favour of ProQuest who, in the last five years has provided an average of 86% of the input to the ASFA database (57,6693 records out of 63,7428 records in total, from 2014-2018). As ProQuest continues to concentrate on monitoring primary literature, ASFA's GL coverage remains dependent on input from its Partners. Without standard reporting and analytics, the actual composition of GL being added to the database

[1] Varley (1995)

was unknown. Whilst ASFA's historic coverage of GL remains undisputed and a key way of differentiating it from other information products, has ASFA kept pace with the digital age and influx of material resulting from Open Science initiatives to still adequately cover GL as it did in its early years? Has the ASFA Partnership adapted its technologies to react to and benefit from opportunities provided by Open Science, and how should its business model change to reflect changing user expectations? These are questions we attempted to address, whose answers resulted in a strategy to improve the coverage of GL on ASFA as well as recommending revisions to ASFA's business model to better meet Open Science principles[2].

Foremost among these revisions, is increasing access to ASFA information products and services. In 2018, FAO implemented an Open Access policy, advocating "the application of suitable open licences to FAO copyright material in accordance with the principles of openness and sharing envisioned under Open Access, and consistent with the mandate of FAO.[3]" All ASFA Products (including the database) are owned by FAO, and as a project supported by FAO, ASFA must comply with FAO policies and move to ensure openness of its products. ASFA must also adapt to increase its support to FAO strategic objectives and the UN Sustainable Development Goals.[4] Monitoring progress on all SDGs "requires constant scientific input and would not be possible without opening access to relevant data"[5] – meaning that by enabling access to relevant data ASFA has a role to play in supporting SDG 14, Life Below Water.

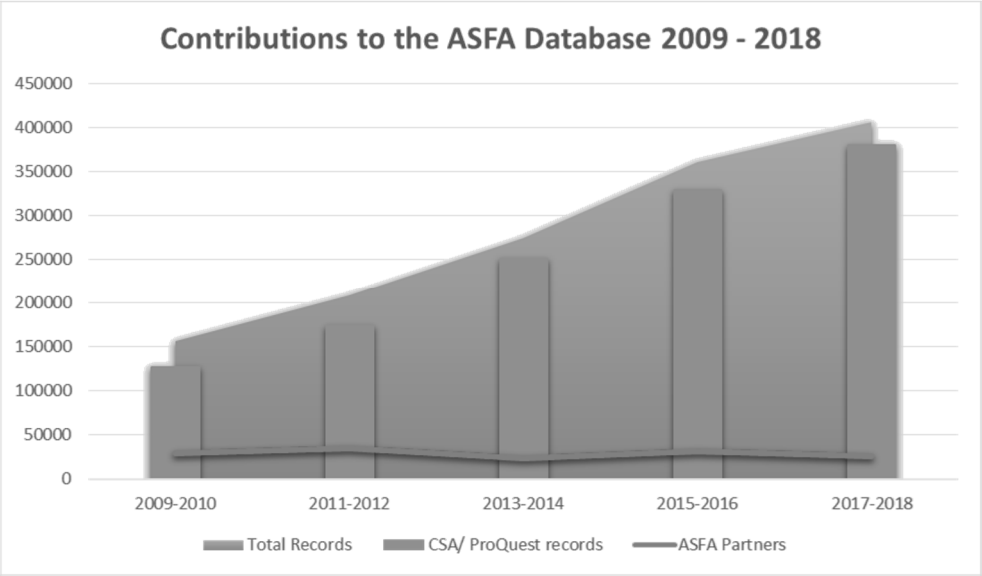
Open Science therefore presents both challenge and opportunity to ASFA, and has forced ASFA to adapt and improve its policies and technologies, both learning from and becoming an educator on the benefits of GL to Open Science to both authors and users. Together, these changes have led to the formation of a GL strategy the embraces Open Science principles and delivers the benefits to ASFA Partners and database users. However before addressing the changes needed, it is first necessary to assess ASFA's GL coverage to understand its strengths and weaknesses and in order to provide a baseline to which future improvements can be measured against.

Assessment of ASFA's GL Coverage

As noted, ASFA has a reputation as a provider of GL, however little has been done to define or quantify coverage on ASFA, or to outline how ASFA Partners should monitor GL. At the 2018 ASFA Advisory Board Meeting (Ostend, Belgium), Peter Pissiersiens (Head, IOC Project Office for IODE) commented on ASFA's GL coverage, asking whether the increase in available literature had been matched by an increase in records being added to the ASFA database, and whether ASFA had a definition for grey literature. The ASFA Secretariat took the first tentative steps in making this assessment.

The below graph shows that the total number of records added to the ASFA database has steadily increased since 2009, however that the increase is due to ProQuest adding more records to the database and not due to an increase in ASFA Partner efforts, which have remained stable. Although the number has fluctuated there has been no significant change in the number of ASFA Partners, therefore the number of records per partner has stayed roughly the same from 2009 -2018. From this we can conclude that any increase in available information in the last ten years has not been matched in an increase by Partners, however, this does not mean that Partners have not increased their GL input, as it may be that ProQuest has taken on monitoring responsibility for commercially published journals in this period, allowing Partners to focus more on grey literature. We therefore need to assess Partners' grey literature input to the database.

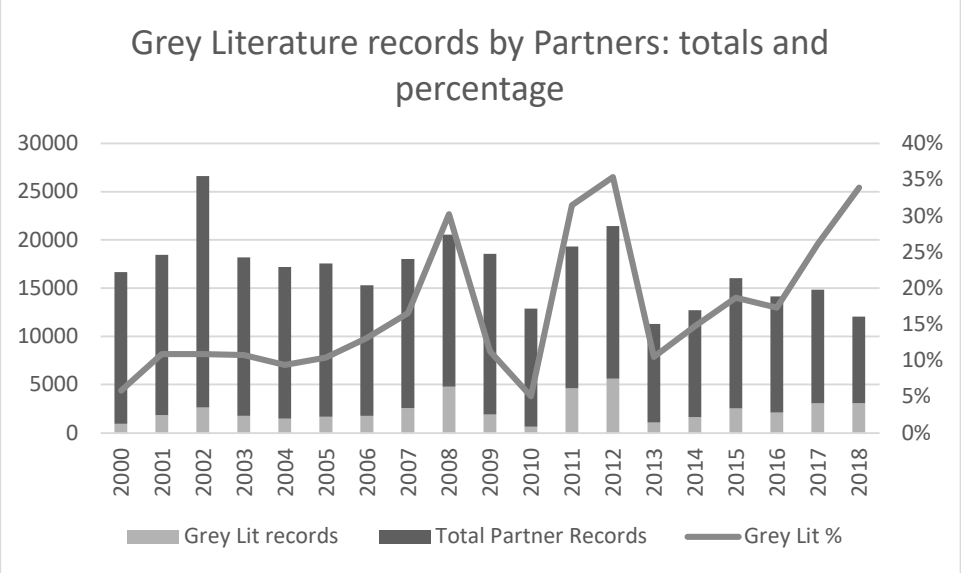
[2] Open and Collaborative Science in Development Network (2017)
[3] FAO (2018)
[4] United Nations (2019)
[5] United Nations (2018)



In order to get an indication of how much grey literature is being added to the database, we used the below search string, based on the Source type metadata field. Although not fully accurate, by searching defined source types we can at least measure how much literature that falls under the GL framework is being added to the database by Partners.

Search string (for 2016):
Input centre: All ASFA Partners, excluding ProQuest records
Source type: Conference Papers and Proceedings; Dissertations and Theses; Government & Official Publications; Reports; Working Papers; Other sources.

As the below graph shows, the percentage of GL added to the database as measured by Source Type has fluctuated, from a low of 621 records (5% of records) in 2010, to a high of 5605 records (35% of Partner records) in 2012.



According to these figures, there has been an increase in both the percentage and total number of GL records added by Partners since 2013. ASFA Partner GL records rose from 1073 grey literature records (10%) in 2013, to 3055 grey literature records (34%) in 2018. Though the period 2008 - 2013 fluctuated, the increase since 2013, and its comparison to 2000 - 2007, indicates that ASFA Partners coverage of GL has increased, when measured by percentage of total records. ProQuest has taken on responsibility to cover primary journals that were previously monitored by Partners, which enables Partners to spend more time monitoring GL. The potential of ProQuest further increasing its primary journal coverage to

allow Partners to concentrate on GL was discussed and will form part of ASFA's strategy to improve its GL coverage.

To assist Partners with monitoring the GL in their countries, a discussion session was held at the ASFA Advisory Board Meeting (Malaysia, 22-25 September 2019), to define what constituted GL for Partners, and what would be most useful to cover for ASFA. A quiz was held, which asked Partners what they believed constituted GL and what did not, with the following results showing significant divisions among partners:

	Technical Guidelines	**Video – online course**	**Infographic**	**Dissertations / Theses**	**Journal article in *Nature***	**Monograph by university press**
Yes	11	13	21	18	4	3
No	6	11	2	1	19	22

Lack of understanding of what constitutes GL by Partners is likely to lead to them not monitoring GL for ASFA, and not being able to report on their coverage. ASFA has initiated several knowledge sharing initiatives among ASFA Partners and beyond, in order to improve understanding. These include the ASFA Newsletter (Issue 2 focused on Grey Literature) and a Conference on GL which was held in Malaysia after the Board Meeting (discussed below). It is hoped these measures will ensure Partners better understand the importance of GL and will look to include more on ASFA.

Following the quiz, Partners discussed and agreed a working definition of GL and decided to prioritize certain content types to help improve coverage of GL on the ASFA database. The following definition, based on the Prague definition, was designed to be broad enough to include a variety of GL content types produced by various GL publishers, and specific enough to be of use to ASFA Partners and database users:

> *Grey literature is information presented in any number of physical or digital formats, under the subject scope of aquatic sciences, fisheries or aquaculture, of sufficient quality to be preserved and of public good but produced outside the control of commercial publishers.*

Reports by Partners and discussions at ASFA's 2019 Advisory Board meeting concluded that the following content types would be prioritized:

> Conference Papers, Technical Reports, Research Reports and Dissertations and Theses.

Furthermore, two ASFA Partners (the FBA in UK and National Fisheries Resources Research Institute in Uganda) indicated that their institutions have data sets which are currently seeking a permanent storage solution. Following discussions, the decision was made to explore creating an OpenAIRE community that would store these data sets and be used as a pilot study to assess whether ASFA can incorporate grey data as well as literature. Much historical data on aquatic science is included in grey literature reports, often in non-digital format and residing in libraries - making this data accessible is essential to "deciphering past and current trends in environmental conditions and populations of living re-sources" (Wells, 2014).

Providing knowledge sharing activities, a working definition, prioritizing content types and exploring ways to cover new content types such as data, will provide a framework to ASFA Partners who are tasked with covering the GL of their institute, helping them to identify and record GL of value to end users. However, this framework will only be of us if ASFA technologies are updated to provide Partners with the necessary tools to efficiently capture and disseminate the literature in their country or region.

Technology as a driving force for ASFA's adoption of Open Science principles

According to OpenAIRE, Open Science has created a 'new modus operandi for science where stakeholders…are involved and research is organized, linked, verified, facilitated by new technologies and enhanced with collaborative and coordinative activities.'[6] The development and adoption of new technologies has undoubtedly enabled the Open Science movement to increase the volume and content type made available throughout the research cycle, clearly benefitting GL due to technologies such as repositories, search engines, Linked Open Data and controlled vocabularies. Together, these technologies have provided platforms and discovery services for many GL types that would previously have remained hidden on institutional networks or premises, leading to an explosion of available literature and data – in the last five years, the number of repositories on OpenDOAR has grown from 2743 to 4358[7] and the number of Science and Engineering articles has grown by an average of 3.9% each year between 2006 and 2016, according to the National Science Foundation, USA[8]. Whilst aggregation services have been successful in enabling searching of these growing number of heterogeneous repositories through one interface, the growth in the number of OA documents is now beginning to make retrieval precision a challenge for the open science movement – the aggregator CORE has 135,539,113 open access records (https://core.ac.uk/) but its simple metadata does not allow for advanced searching. A subject specific discovery service such as ASFA, which is able to provide precise retrieval through its detailed metadata structure and search platform, could have a role to play in Open Science by incorporating these new technologies in order to capture the increasing volumes and various document types being produced, placing them on a domain specific platform and enhancing retrieval by improving the metadata quality.

At the 2019 ASFA Advisory Board Meeting it was decided to investigate the potential of collaboration with the OpenAIRE aggregator and deposit service in order to improve the coverage and precision of recall for GL in the aquatic subject domain. An example may be the possibilities of an "Aquatic Community" area within OpenAIRE – which ASFA could potentially advance in collaboration with Aquatic Commons, OceanDocs and other relevant repositories in order to improve exposure of the GL. It is worth noting here, that not all technologies have been adopted by institutions equally across the world; many institutions in developing countries still lack repositories and infrastructure to adequately publish, store and disseminate their information. Of the top ten countries by number of repositories on OpenDOAR, only two (Peru and Brazil) are classified as developing countries, and together these represent less than 12% of the total number of repositories covered by the top ten countries[9]. In the past, ASFA has funded digitization projects in developing countries, providing both hardware and access to digital infrastructure. ASFA will continue to provide these services, however it will also look to increase its impact, particularly in developing countries, by adopting two technologies: (1) a Virtual Research Environment to handle the creation (by both manual input and harvesting), storage and publishing of records; and (2) open source software VocBench which is used to manage and maintain the ASFA Subject vocabulary. We argue that by adopting these technologies, ASFA becomes an interface between the growing volume of literature being produced under Open Science principles and the information users seeking specific, relevant and credible information.

Virtual Research Environment

Having used DOS based CDS ISIS for creating records in .ISO format, ASFA is now moving to an online system, a Virtual Research Environment (VRE). The VRE will provide ASFA partners with a single space to manage the creation and publishing of ASFA's bibliographic records, the import and harvesting of metadata from other repositories, the export of records to the

[6] OpenAIRE, (2019)
[7] OpenDOAR (2019)
[8] National Science Foundation (2018)
[9] OpenDOAR (2019)

ASFA publisher ProQuest, and the provision of API services to websites and services, including the FAO Fisheries and Aquaculture website, in order to integrate ASFA records with other platforms. Formed by a need to adapt to the changes Open Science engendered, the VRE services will contribute themselves to Open Science. The records Partners create will now be openly searchable and accessible on the VRE, the first time ASFA has provided an open platform outside of the commercial database published by ProQuest. Through API services, records can display on an institutional website with trials showing how the subject, geographic and taxonomic keywords can be used to link ASFA to existing FAO Fisheries and Aquaculture information systems, such as country profiles and stocks data at species level.

To facilitate its move to the VRE, ASFA mapped its metadata fields to Dublin Core, ensuring a high degree of interoperability with repositories such as OceanDocs. ASFA will harvest metadata from 10 ASFA Partners' repositories, which are OAI-PMH compliant. If successful this will be expanded to a greater number of repositories. The ASFA Software Working Group is presently reviewing our mappings to ensure, where possible, compatibility with repository metadata standards such as RIOXX and the OpenAIRE metadata fields. Due to ASFA's detailed metadata, harvested feeds will need to be monitored and edited by the responsible Partner, for example the insertion of taxonomic and geographic keywords. Though Open Science has increased the volume of available literature, metadata in many institutional repositories remains simple therefore limiting its recall and interoperability. Investigations are underway to automate this procedure, however as an A&I service, ASFA's high quality and detailed metadata is key to differentiating itself from other information products, therefore although automation is useful for quickening the process, a degree of human editing will always be important for ASFA to maintain its values of accurate and detailed metadata. This is particularly true on many university repositories, where a large degree of manual filtering is required in order to retrieve relevant results. Over the last two years, ASFA has been exploring some of the challenges in locating open access full text university theses relevant to the aquatic community. Some of the preliminary findings have been outlined in ASFA Newsletter issue 2, 2019[10].

ASFA's metadata structure is an investment and should not be limited to closed access, subscription only products. Therefore through the use of its VRE, ASFA is exploring ways to utilize its metadata to contribute and collarborate with other products and services. For example, plans are underway to use ASFA's taxonomic keywords to link to specific species and strains of Aquatic Genetic resources in a registry. An open, interoperable platform was initially seen as essential to increasing ASFA's individual presence and prestige, however having made the decision to move to an open platform, it is proving to be an assured avenue to collaborating and enhancing FAO information products and services, thereby ensuring compliance with FAO's Open Access policy.

ASFA Subject Vocabulary

ASFA is currently using the open source software VocBench to manage and maintain its subject vocabulary, used for indexing ASFA records. The vocabulary is an RDF/SKOS-XL concept scheme, and a Linked Open Data (LOD) set. It is available online on SKOSMOS to search and browse; as a file to download; via web services. ASFA has a working group of 15 members to manage and maintain the vocabulary, each of whom is provided with training and support. The VRE links to the vocabulary via web services, and the ASFA Secretariat is also working with AGROVOC (FAO's main vocabulary which covers all agricultural elements), aligning concepts to improve the fisheries and aquaculture coverage.

A well maintained thesaurus provides users with the option to filter searches and retrieve results with a higher level of specificity, which is a key way for ASFA to enhance the retrieval of the increasing volumes of GL that Open Science has enabled. The multi-lingual capability of the vocabulary will benefit both inputters creating ASFA records, and non-English

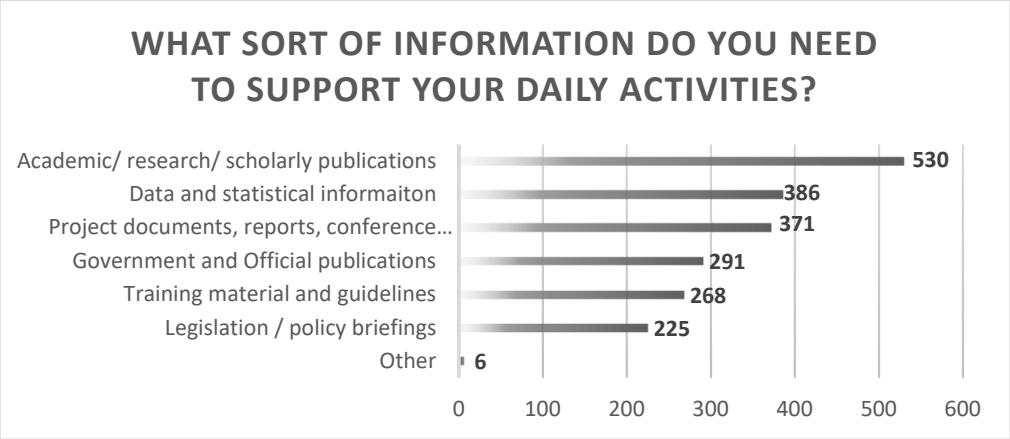
[10] Pettman, I. (2019)

speaking users when used in non-English repositories. The ASFA Subject Vocabulary thereby meets the Open Science principle of incentivizing "inclusive infrastructures that empower people of all abilities to make, and use accessible open-source technologies" (Open and Collaborative Science in Development Network, 2017).

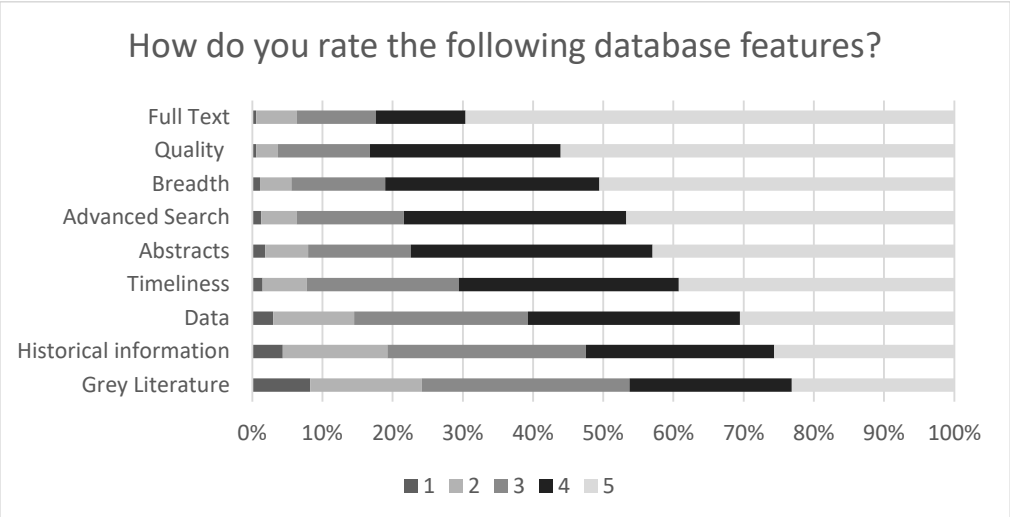
Through its VRE and Subject Thesaurus, ASFA is enabling the interaction between Open Science and GL as both of these technologies enable precise recall of aquatic sciences, fisheries and aquaculture information – but technologies alone do not ensure ASFA or Open Science meet their goals of increasing accessibility of literature. Education, the promotion of the value of grey literature to users and authors, is also necessary to ensure these technologies are used, and therefore must also be considered by ASFA as it formulates its Grey Literature strategy.

ASFA as an educator of Open Science benefits to GL users and publishers

During the course of a number of impact evaluation exercises, ASFA has attempted to assess user needs in the fields of aquatic sciences, fisheries and aquaculture. Having consulted those both inside and outside of the ASFA Partnership, it became clear that the term 'Grey Literature' was poorly understood and defined by both groups. For instance, GL content types were the third most required type of information for user survey respondents, however the inclusion of GL was least likely to be rated as an important database feature by the same respondents - this option also received the smallest number of 9 options presented to responders (total of 497 ranked inclusion of GL versus an average of 535 who ranked the other 8 options). This indicates there could be a lack of understanding on what actually constitutes GL.



Versus:



Lack of understanding by authors of GL is likely to lead them to not publish or make available their own GL. Educating both ASFA Partners and GL authors on the importance of GL is likely to help avoid unnecessary loss of information. ASFA has a role to play in educating users and authors of GL on the value of their information and encouraging deposition on an openly searchable repository, with the final step of adding a bibliographic record to the ASFA database to enable discover on a global platform.

Promoting the benefits of GL storage, publishing and dissemination

Information presented at the joint ASFA-UMT conference on GL in aquatic sciences (held 25th September 2019 at University Malaysia Terengganu) provided a number of ways for ASFA to promote the benefits of making their GL accessible to a wide audience. Firstly, a presentation by Dr Amirrudin B. Ahmad, of UMT, Malaysia entitled 'Mainstreaming Grey Literature in the Digital Age'[11] highlighted the importance of ensuring publication standards for GL whilst avoiding lengthy and unnecessary delays due to publication control. Dr Amirrudin stressed that the benefits of making GL available on an international platform such as ASFA, especially to students who are currently progressing through their dissertations and phd theses, saying that ASFA provided access to relevant, domain specific information in a precise way not achievable by using search engines. ASFA will continue to work with Dr Amirrudin to produce a 'Top Tips' guide to publishing grey literature, which will be openly available and share knowledge and expertise not only on why but how to publish GL.

A second presentation presented a bibliometric analysis of GL usage among Filipino aquaculture researchers. Based on citation analysis, it was found that:

- There is a higher number of GL citations when first author is Filipino and / or when journal is published in the Philippines
- Only 25% of top GL publishers included on ASFA
- Websites emerged as one of most cited sources

The presentation concluded by recommending that non-traditional sources were included on ASFA and that ASFA Partners seek to increase the number of publishers they monitor for AFSA. The analysis proved a useful way to identify GL of use to researchers and ASFA, and the methodology will be replicated in other ASFA Partner countries to form a global assessment of GL publishers and ensure better coverage on the database. This work will be coordinated by ASFA's Impact and Strategies Working Group.

Supporting Open Science by promoting Grey Literature

FAO's mandate is to "collect, analyse, interpret and disseminate information relating to nutrition, food and agriculture". Having provided the ASFA Secretariat since 1975, it is incumbent on ASFA to demonstrate how it meets supports FAO's mandate. Clearly, ASFA's support to a subscription-only database is not sufficient support to FAO's goals, and ASFA is in the process of revising its Business Model to revise its functions and priorities. This section covers the reasons why ASFA has chosen to focus its strategy on improving GL coverage, and how by doing so ASFA is meeting not only FAO goals, and how Open Science has influenced ASFA's strategic direction. Having developed the technologies to enable an open platform, ASFA will be contributing to two FAO projects to increase access to information.

1. PESCAO

ASFA is participating in FAO project PESCAO to make an inventory of primary and GL in CECAF (Fishery Committee for the Eastern Central Atlantic) countries. The PESCAO-CECAF Project is to improve regional governance of marine resources in the CECAF area using knowledge-based advice by strengthening the management processes to contribute to sustainable fisheries, food security, and sustainable livelihoods. The inventory will be openly

[11] Dr Amirrudin B. Ahmad (2019)

accessible and contribute to identifying research strengths and weaknesses across the CECAF region, thus contributing to the development of future fisheries research projects.

ASFA will use the exercise to identify and fill gaps, storing records on OA repositories. Use of Partners expertise and networks key to assessing research, as well as technologies to capture and store GL.

2. Aquatic Genetic Resources (AqGR) Registry

ASFA is ideally placed to contribute to growing knowledge and awareness of aquaculture resources. ASFA's subject thesaurus helps identify information of interest to AqGR, and the geographic and taxonomic terms can be used to specify where aquaculture research is taking place worldwide and on what species. For example, when an ASFA Partner creates a record on the genetics of Clarias gariepinus used for aquaculture in Nigeria, this can be linked to the appropriate record in the AqGR registry. Combining the ASFA bibliographic records with data in the AqGR registry therefore ensures a highly specific information stream on aquaculture species, alerting users of research conducted by research institutions, NGOs, academia, who all contribute to ASFA.

Though much scientific literature is openly available online, ASFA's use of controlled vocabulary terms to index its records mean it can deliver a level of accuracy and specificity to data and information systems such as AqGR.

Conclusion

By increasing access to information, Open Science has increased the expectations of users and forced ASFA to adapt its products and services. By adapting its technologies to provide openly accessible information products, such as its VRE and Subject Thesaurus, ASFA is demonstrating the value of an A&I service in the digital age; for example ASFA's detailed metadata can be used to enhance other information products and also lead to better search precision, an aspect which is likely to be of increasing importance as more and more information becomes available. Detailed metadata should not be the preserve of commercial only products and by collaborating and enhancing with other information products, as well as providing an open platform itself, ASFA is going some way to ensure the benefits of detailed metadata and its investment in new technologies, reach their maximum potential use.

Though A&I services are seen by many as old fashioned or obsolete, we believe that by embracing new technologies and policies as advocated by Open Science and Open Access policies, ASFA can ensure relevancy and usefulness in the digital age. ASFA's international partnership model ensures these technologies and information products are available to institutions worldwide. By providing a reputable and global database, ASFA helps to counter publication bias and ensures that valuable research performed in countries and regions underrepresented by traditional publishers is not lost to users.

In addition to its metadata and technologies, ASFA also has a role to play in knowledge sharing and promoting the benefits of GL. It is hoped that by interacting with its various stakeholders (ASFA Partners, database users, GL authors), ASFA will increase the amount of literature being captured and used in the fields of aquatic sciences, fisheries and aquaculture. This will ensure that the valuable information and data held in many GL reports around the world contributes to understanding and solving the critical problems facing the world's oceans and freshwater environments.

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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 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

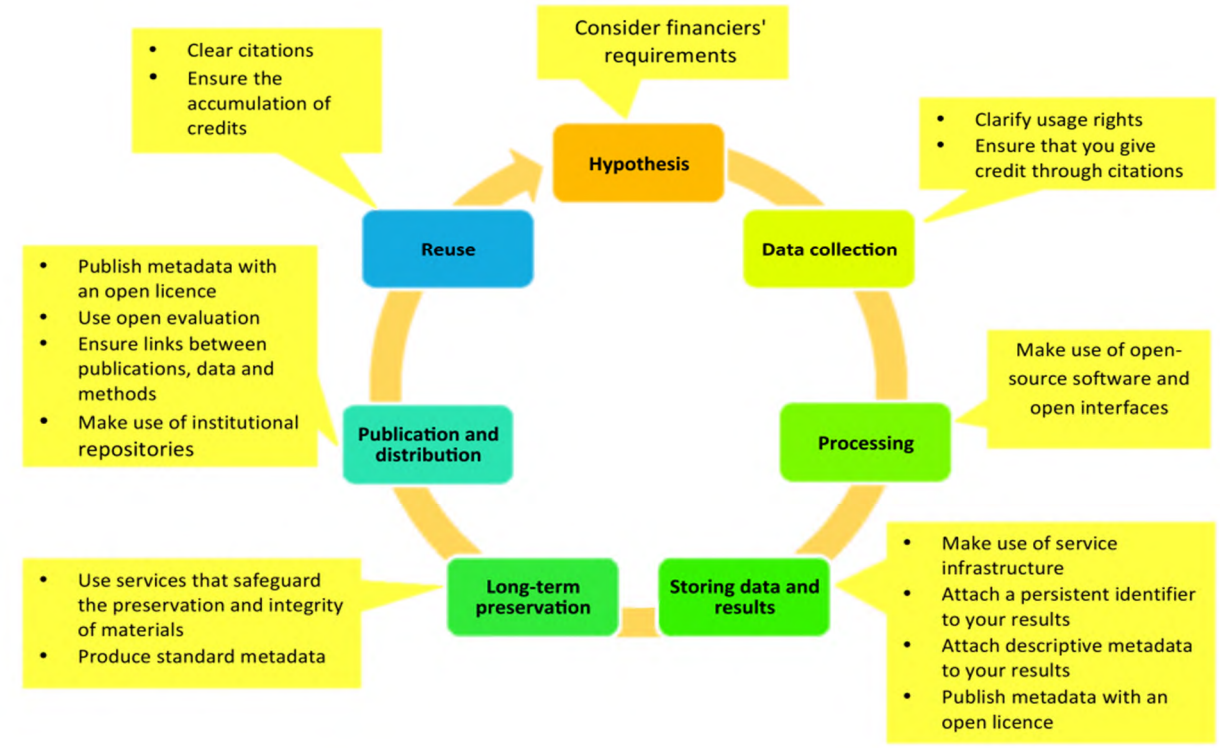

Figure 1. Promoting openness at different stages of the research process
https://www.fosteropenscience.eu/content/what-open-science-introduction

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.

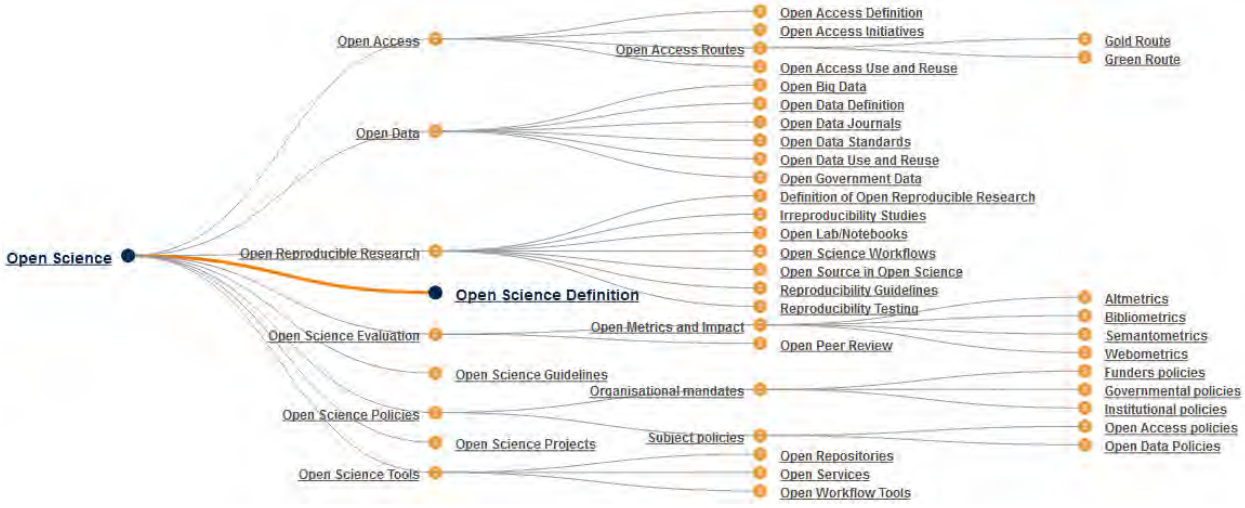

Figure 2. FOSTER Open Science Taxonomy
https://www.fosteropenscience.eu/content/what-open-science-introduction

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.

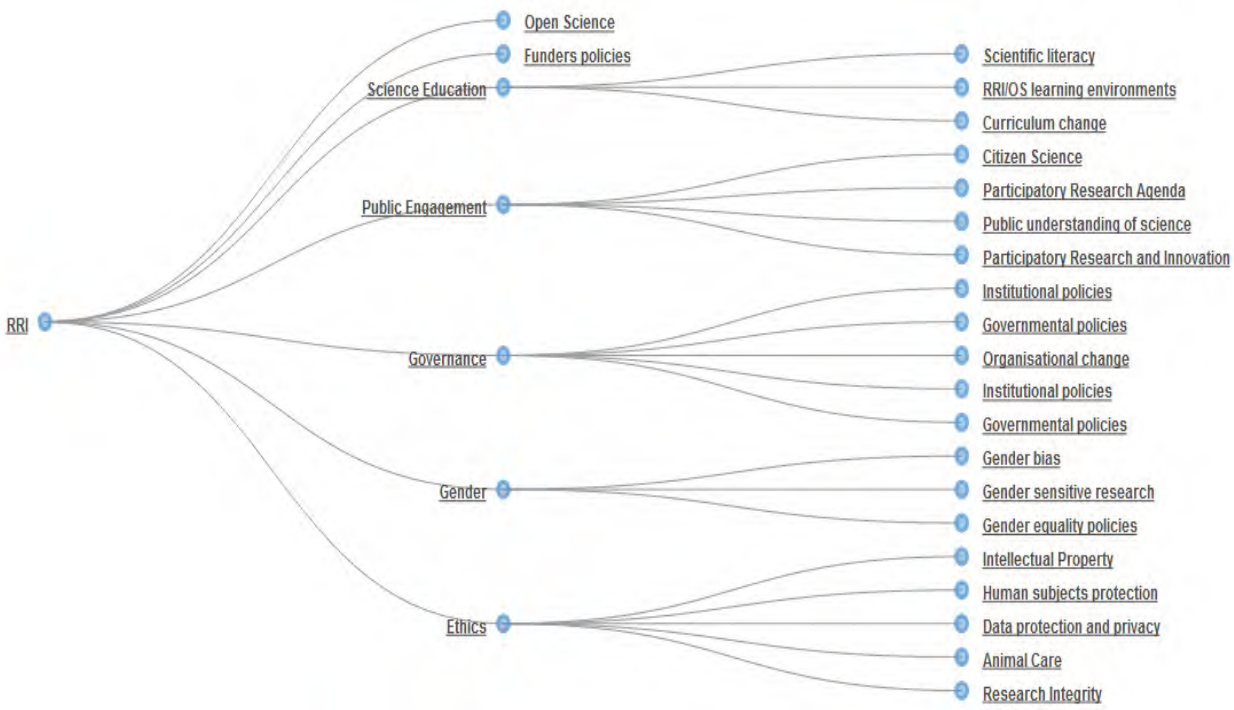

Figure 3. Responsible Research and Innovation
https://www.fosteropenscience.eu/taxonomy/term/7

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.

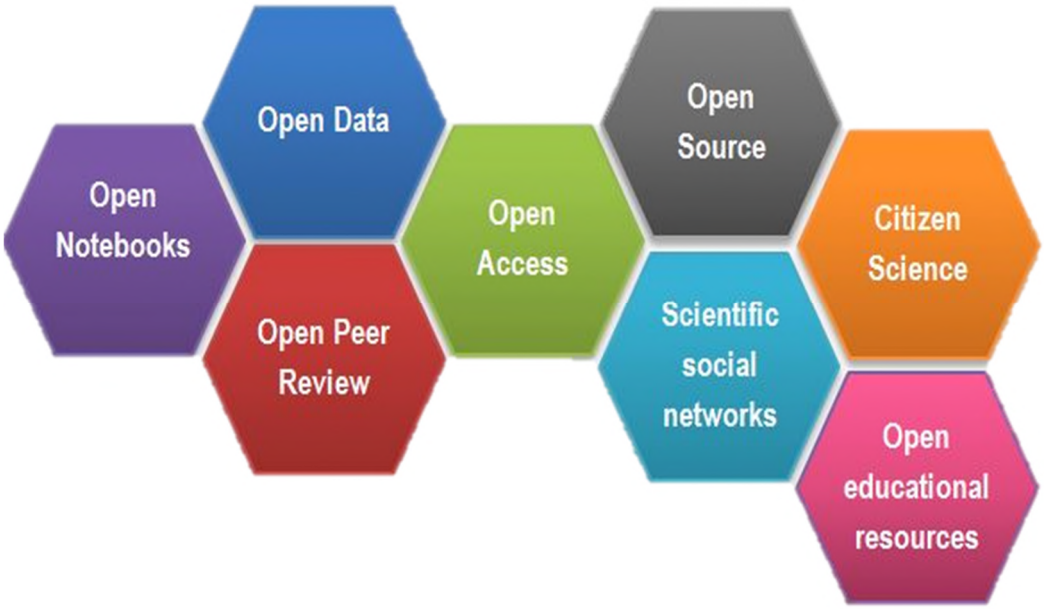

Figure 4. Open Science facets as a beehive
https://www.fosteropenscience.eu/content/what-open-science-introduction

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 (http://www.fao.org/agora/), Hinari (https://www.who.int/hinari/en/, and OARE (https://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

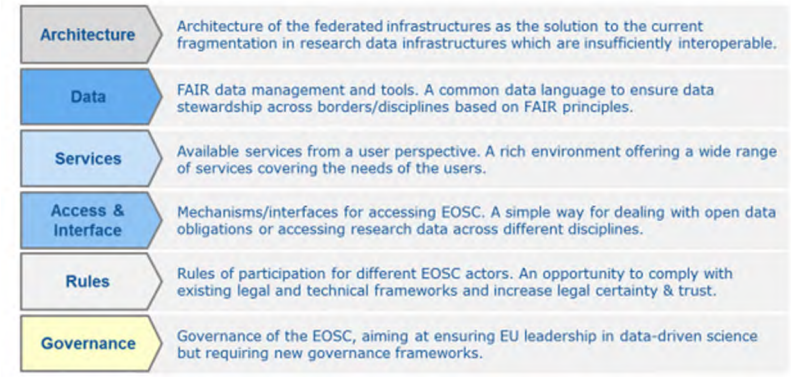

Figure 5. EOSC Model action lines
http://ec.europa.eu/research/openscience/pdf/swd_2018_83_f1_staff_working_paper_en.pdf

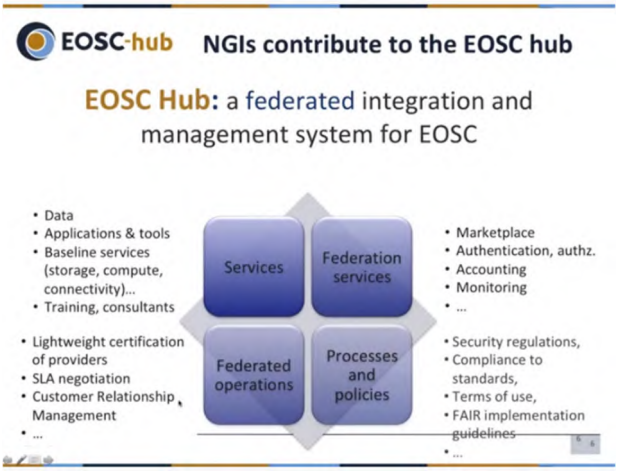

Figure 6. EOSC Hub
https://www.slideshare.net/OpenAIRE_eu/eoschub-and-the-ngis

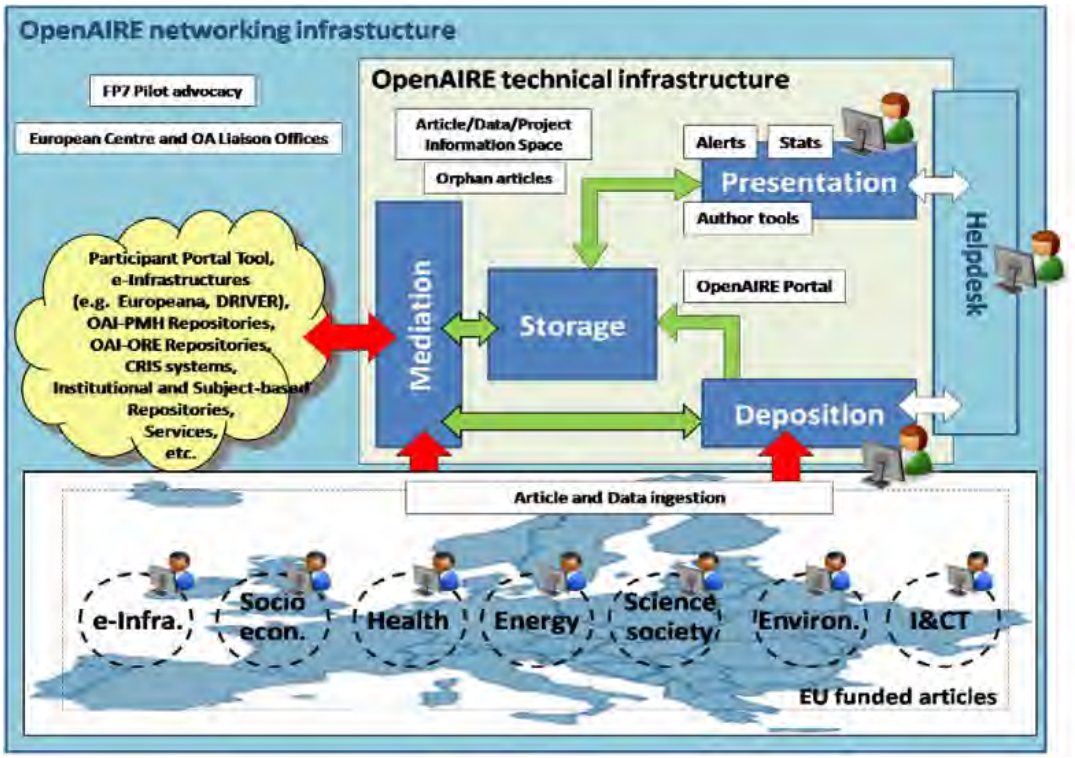

Figure 7. OpenAIRE networking infrastructure diagram
https://ercim-news.ercim.eu/en80/es/openaire

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.

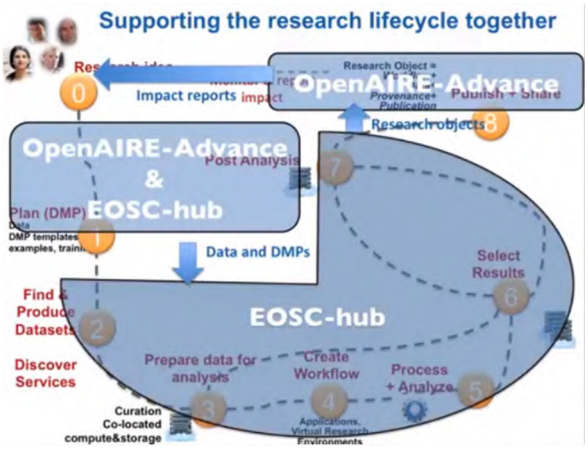

Figure 8. EOSC-hub and OpenAIRE diagram
https://youtu.be/wNXBew5OYWw

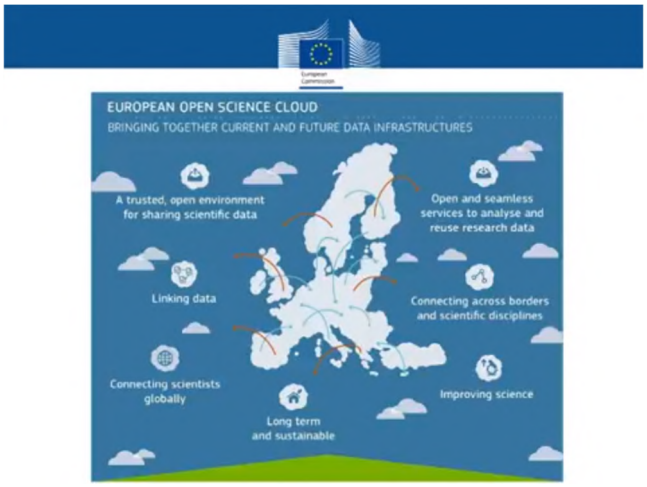

Figure 9. European Open Science Cloud
https://youtu.be/wNXBew5OYWw

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)

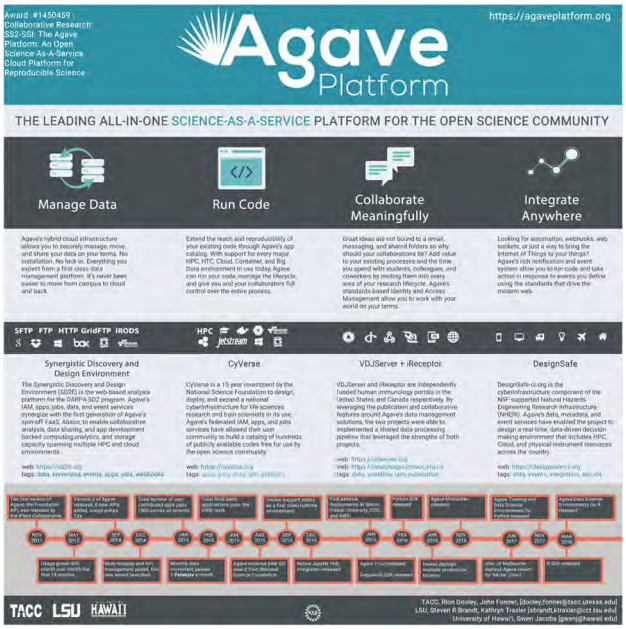

Figure 10. Agave Platform
https://figshare.com/articles/The_Agave_Platform_An_Open_Science-As-A-Service_Cloud_Platform_for_Reproducible_Science/4675765

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)

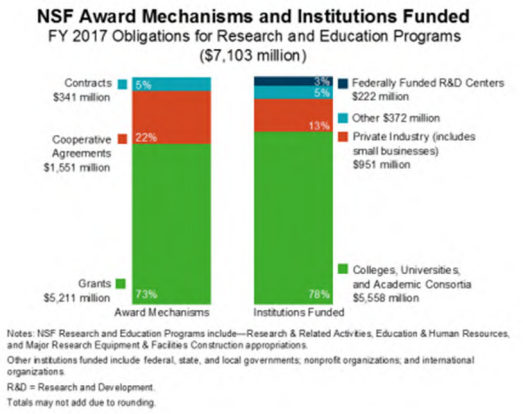

Figure 11. NSF Award Breakdown
https://www.nsf.gov/pubs/2018/nsf18020/pdf/nsf18020.pdf

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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ConfIDent – An Open Platform for FAIR Conference Metadata

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Abstract
Currently, information on scientific events such as conferences is often scattered and not available in the long term. With the project ConfIDent we want to develop a service platform for the quality-driven, collaborative curation of semantically structured metadata of scientific events. It will provide reliable and transparent data and workflows for researchers (organizers, speakers, participants) as well as other stakeholders of scientific events such as university administrations, libraries, sponsors, publishers or specialized societies. The sustainability of the service will not only be obtained a user-centered approach but also by connecting it to existing services enabling data exchange, and by the commitment to the FAIR principles. ConfIDent will reach the current desideratum of long-term findable, open, referenceable and reusable metadata on scientific events.

Introduction

Conferences are a central, in some disciplines indispensable element of scholarly communication. They allow a broad and quick overview about new research topics and areas and present an opportunity to

- network with your community;
- get informal and fast feedback from peers independent from long publication lifecycles, and
- publish articles as conference proceedings.

Information on conferences and their resulting outputs such as proceedings, videos, reports and other formats of documentation can be found on numerous platforms that function as disciplinary and interdisciplinary services. However, there are three major challenges with metadata on conferences:

1. *Availability* of scholarly event data: The data is often scattered over service platforms, temporary websites, newsletters, etc. Further services are used to publish and archive proceedings and their metadata. These services are not linked to each other and not a small size of data gets lost when conference websites disappear after a few months.
2. The second problem is closely connected to the first one and deals with the *quality* of scholarly event data. There exists no uniform standard for conference metadata. The data that is provided by service platforms is often insufficient, very little structured and/or not available in the long-term. This lack of sustainable event metadata makes the tracking of conference activities and their output a very time-consuming task.
   Moreover, non-uniform indexing standards make the disambiguation of conference titles more difficult. In particular, this supports the business models of predatory conference organizers to advertise their events with labels of prominent conferences. Especially for young scholars or scholars from foreign research fields it can be difficult to differentiate between serious and fake conferences. The assessment of the content of conferences and their quality requires the insider knowledge of field experts.
3. The commitment to conferences, e.g. by organizing them, presenting there, accomplishing review tasks, can take up a considerable part of the work of researchers without any *acknowledgement* of these activities as research output. The academic system still only rewards publications as evidence of scientific activity and tries to further condense them with the help of singular indicators.

An analysis of 27 conference platforms has shown that considerable deficits of existing services lie in the long-term findability, availability and accessibility of event metadata and content information. We chose platforms that are frequently used, highly advanced and/or have a broad community approach. The majority of platforms do not use any persistent

identifiers (PIDs) and metadata is often inadequate: In some cases they do not even provide core metadata such as the full title of a conference or a working URL for upcoming events. Often, events are treated as singular entities and are not related to superordinate event series. Links between contributors, contributions, proceedings and affiliations are an exception; most content information (e.g., abstracts, organizers, speakers, research topics) are either unstructured or can only be found on temporary event websites. Best practices can be seen in community driven approaches which seem to attract more users and to encourage better curation of contents.

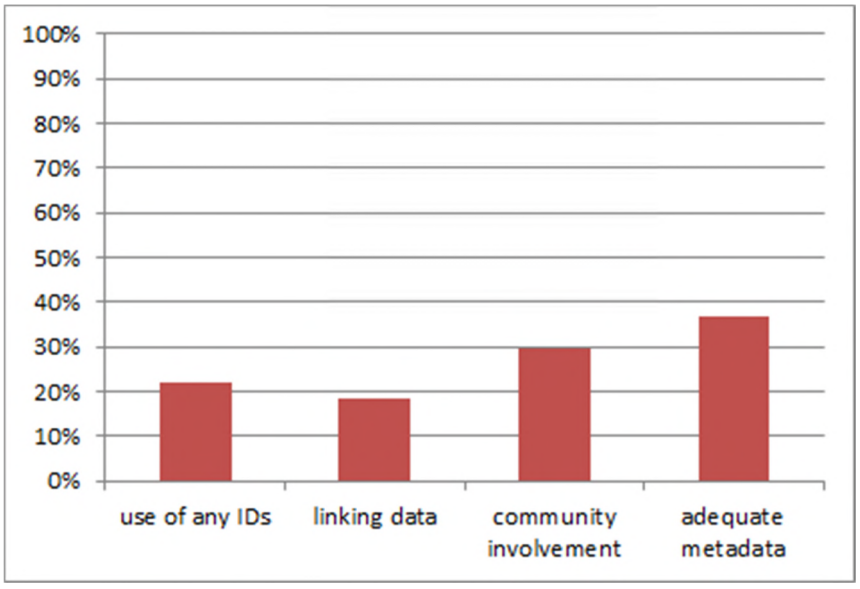

Figure 1: Analysis of 27 conference platforms services and their key components.

The ConfIDent Project

Objectives

In December 2019 ConfIDent started, a joined project of Technische Informationsbibliothek (TIB) Hannover and RWTH Aachen University which is funded by German Research Foundation (DFG – Deutsche Forschungsgemeinschaft).[1] The project aims to establish a service that provides data on scientific events which enables researchers to find, promote and archive information. It is designed as a pilot project developing a prototype for two research communities – a) computer and data science and b) research on transport and mobility – considering the specific relevance of scientific events within these communities. A user-centred approach supports the development of a service that reflects the information needs of the scientific communities. In addition, we want to empower the users to curate the data on their own in order to use their field expertise. A standardisation of event metadata will not only allow data exchange with existing databases but will also foster the assignment of PIDs to improve the quality of metadata. This is a prerequisite to meet the FAIR data requirements and make conference metadata findable, accessible, interoperable and re-usable in the long-term.[2]

User-centred approach

In order to develop and operate a service platform for event related scholarly metadata that is geared to community needs of specific target groups a user-centred design approach[3] is applied. This ensures that the platform will be easy and intuitive to use and that the user can effectively and efficiently achieve the desired result during the interaction with the system. First of all, information is collected with potential users from the target groups regarding

[1] Project Website ConfIDent: https://projects.tib.eu/en/confident (access: 20/01/14).
[2] FORCE11 – FAIR Data Principles: https://www.force11.org/group/fairgroup/fairprinciples (access: 20/01/14).
[3] ISO-Standard 9241-210:2019: Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems: https://www.iso.org/standard/77520.html (access: 20/01/14).

their typical usage behaviour, tasks, needs and expectations regarding the platform. In particular, the domain-specific characteristics of conferences will be taken into account. The target groups will be surveyed by typical user centred design methods such as brainstorming, task analysis, user stories, personas, focus groups and interviews. The analysis results of the user requirements form the basis for the identification of the functionalities and the visualisation of the platform. In an iterative approach potential users from the identified user groups will work together with the developers already in the early phases of specification. Two iterations of evaluations are planned during the development process of the platform. In that way errors and difficulties of the different user groups and stakeholders can be identified at early stages of the process. Central points of the evaluation are the effectiveness, the usability, and the user experience of the platform. Measuring and testing these aspects is achieved by a combination of different methods like task-based usability testing combined with eye tracking, thinking aloud, user interviews and questionnaires. We plan on a first prototyped version after six months of development. A revised and optimized version will be created in the first project year.
In order to become a long-lasting, reliable and accepted platform for science conferences and other scientific events and to reach a critical mass of users the development of a scholarly and a technical community around the ConfIDent project is an important objective. In order to accomplish this, we will establish connections of the ConfIDent platform to existing services including library catalogues, research information systems such as VIVO,[4] publishing platforms like Open Journal Systems e.g. Copernicus Publications[5] or the TIB AV-Portal[6] for the provision of conference recordings. By connecting the resources of various existing services, ConfIDent ensures permanent links between different resource types (such as proceedings, recordings, contributor profiles, organizers etc.). The provision of conference metadata and the assignment of persistent identifiers allow both researchers and infrastructure providers an improved disambiguation and quality assessment of scientific events.

Based on the requirements of users and researchers from the target communities as well as their usage behaviour, various business models will be developed within the framework of the project. These will be discussed and further developed in user workshops. Moreover, the project partners will raise awareness in the target communities for the benefits of ConfIDent by attending events, sending announcements and invitations. In particular, this effort will be supported by the German Informatics Society (GI)[7] in computer science.

The communities will also be engaged into contributing to the ConfIDent software and platform by inviting research communities to use the ConfIDent platform as a test bed for their developments and tools such as recommender systems, graph partitioning, and clustering methods.

Based on the result of the user needs analysis and in close cooperation with the communities, guidelines for potential content deliverers will be developed, which clearly define the portal's profile. Further user workshops, webinars and training materials such as explanatory videos will be developed to support the communities when using the portal.

Metadata quality, PIDs, and scientometric indicators
One of the core aspects of the project is to define a framework for high quality of metadata and content. Rich metadata helps to disambiguate event data and provides context information on events. PIDs strongly support the standardization of metadata, and are a prerequisite for FAIR data including long-term availability of information.[8]

[4] Conlon et al. (2019).
[5] Copernicus Publications: https://publications.copernicus.org (access: 20/01/14).
[6] TIB AV-Portal: https://av.tib.eu (access: 20/01/14).
[7] Gesellschaft für Informatik: https://gi.de (access: 20/01/14).
[8] Demeranville (2018).

ConfIDent maps existing machine readable metadata schemes as used e.g. by DataCite, Crossref, ORCID or ROR for PID registration as well as schema.org., the RDA Framework of the Integrated Authority File (GND - Gemeinsame Normdatei) used by the German National Library and the cataloguing system of the Common Library Network (GBV - Gemeinsamer Verbundkatalog).[9] In this way, interoperability with existing services should be achieved. Furthermore, we are actively engaged in the international Working Group initiated by DataCite and Crossref to develop a Conference PID.[10] This PID will provide a response to the specific metadata requirements for events as a resource type and will support a standardization of conference information which is still a desideratum. Standardization will help to support a quality assessment approach to conference information both on the metadata and the content level. ConfIDent will have a tiered metadata concept and differentiate between mandatory, recommended and optional fields. On the one hand, this modular approach offers a minimum, generic set of metadata that is necessary to identify events unambiguously; on the other hand it allows subject-specific adjustments as the event related information needs may differ from research community to research community. Content quality criteria for conferences can to a certain extent be represented by metadata as indicators. However, it must always be considered that

1. each indicator has a limited value in itself; and
2. quality criteria for conferences are extremely dependent on the professional culture of each research field or community.

Therefore, we want to define the metadata requirements together with experts from the pilot communities in order to take into account their information and quality requirements. Rich metadata offers more options to assess the quality of an event, but it also means more effort for data providers and curators. These users should also be recruited from the scientific communities, but we want to balance information requirements with the workload for the individual user.

Technical base

Building upon the experiences of both project partners with OpenResearch.org[11] (OR) – an experimental platform for the analysis of research information on events, papers, projects and other entities – the project will start with a prototype based on the open source software Semantic MediaWiki (SMW)[12] fostering openness and extensibility. The SMW prototype will be customized to metadata and user requirements identified in an iterative process as described by the user-centred approach. The software allows collaborative data curation and options for a high degree of transparency to display the provenance of data. Nevertheless, this collaborative approach challenges the objective of high quality metadata. ConfIDent aims to provide a mature rights and roles managements as well as guidance for data ingest and curation to allow easy use but prevent misuse. We want to provide an open platform with interfaces to allow data exchange with existing services and an attractive platform for individual users and their information needs.

Extensional use of data

The use of scientometric indicators to measure the impact of scientific output is heavily discussed, with some key documents defining the outlines of what is called altmetrics

[9] Crossref Metadata Schema 4.4.2 on conferences: http://data.crossref.org/reports/help/schema_doc/4.4.2/schema_4_4_2.html#conference; DataCite Metadata Schema 4.3: https://schema.datacite.org/meta/kernel-4.3/doc/DataCite-MetadataKernel_v4.3.pdf; GND Erfassungshilfen für Körperschaften und Konferenzen: https://wiki.dnb.de/pages/viewpage.action?pageId=90411359; ORCID Metadata Schema 3.0: https://github.com/ORCID/ORCID-Source/tree/master/orcid-model/src/main/resources/record_3.0; schema.org event: https://schema.org/Event (access: 20/01/14).

[10] Birukou (2018).

[11] Vahdati et al. (2016).

[12] Semantic MediaWiki: https://www.semantic-mediawiki.org/wiki/Semantic_MediaWiki (access: 20/01/14).

(alternative metrics).[13] These metrics track the use of research outcomes online, such as on social media, news sites, blogs and policy papers. Compared to conventional metrics such as citation counts, altmetrics provide among others a time advantage and the possibility to include mentions outside the scientific communities.[14]

Conclusion

The central objective of the project is to develop a sustainable service platform that provides reliable data on scientific events. ConfIDent will not only facilitate quality assessment of data with regard to a wide range of criteria and stakeholders' perspectives, taking into account broad context information. The platform will also foster a cultural change in science by providing a higher visibility of scientific events as an independent achievement of research beyond counting article citations and by promoting their impact. We see the initial community oriented approach as starting point for the development of a generic service that serves the scientific community as a whole. The service is supposed to be connectable to numerous projects and initiatives that aim to better capture the heterogeneity of scientific outputs and making them accessible.[15]

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[13] Fraumann (2018); Tunger et al. (2018).
[14] Hauschke et al. (2018); Hicks et al. (2015); Wilsdon et al. (2017).
[15] Auer et al. (2018); Collins et al. (2018); FORCE11 – The Fair Data Principles: https://www.force11.org/group/fairgroup/fairprinciples; PID Graph at FREYA Project: https://www.project-freya.eu/en/about/mission (access: 20/01/14).

Czech National Repository of Grey Literature

NUSL is

a digital repository for grey literature

Free

online access

Features

Provider:
National Library of Technology
Prague, Czech Republic

Records:
over 500,000 records

Collection provenance:
Czech Republic

Partners:
over 150 organizations (Academy of Science, Public Research Institutions, Universities, State Offices, Libraries, NGOs etc.)

International Cooperation:
OpenGrey, OpenAire, ROAR, OpenDOAR, BASE, WorldWideScience

Goals

- Central access to grey literature and the results of research and development in the Czech Republic
- Support of science, research and education
- Systematic collection of metadata and digital documents
- Long-term archiving and preservation
- Cooperation with foreign repositories

What else?

Conference on Grey Literature and Repositories
https://nusl.techlib.cz/en/conference

Informative Webpages
https://nusl.techlib.cz/en/

www.nusl.cz

NTK 90° 105° 25°
Národní technická knihovna
National Library of Technology

NUSL czech national repository of grey literature

Hidden Grey Heritage of Science and Research from Pre-Internet Era

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Abstract

Our presentation addresses in detail challenges concerning the availability of Czech grey literature documents from pre-internet time. Such documents form the grey heritage of science and research. Their importance is not widely accepted and they are often seen as outdated and as such, they are at risk of being discarded. The situation is usually worsened by the low quality of the metadata accompanying those documents. Due to the obsolete or not existing metadata documents often fall out of modern shared library systems and their availability further deteriorates.

Their value is described as both historical and practical with examples given. Special focus is put on describing the situation in small institutions and the state of their collections. Systematically Czech book production is collected by national institutions as The National Library and The National Archives. National legal deposit is well set by the library act (1995). But as is obvious, this doesn't concern grey literature.

Detailed observations of the situation of small specific specialized library with complicated and long time span institution history (1918-) lead to the widespread sources of uncovered grey literature discovered. Library collection evidence gaps are described including its reasons and range. The situation is documented and concrete examples are provided. Undertaken short interviews with other institutions of similar kind document general thesis.

Using documentary analysis some solution concepts are proposed. They comprise identifying not well documented sets of grey literature and their indexing as sets into already running complex solutions as National Repository of Grey Literature. The communication and proactive approach of national level institutions would be a key. The main aim is to increase the basic visibility and thus possibility of higher quality processing of this hidden literature with reasonable investments.

Dr. Savić in his article „Are We Ready for the Future? Impact of Artificial Intelligence on Grey Literature Management" presents challenges GL managers could face in the near future. In steep contrast the challenges of unresolved past are presented. Whole article is based on the experience of practical librarians and real situations. We cannot productively look forward without also looking back. And there is a lot of paper left behind.

What do we expect of today's library? In general, one assumes that all documents will be accessible via an automated library system. An online catalogue ought to contain entries structured in accordance with the functional requirements of bibliographic data records (the FRBR model), processed according to MARC21 - the latest version of the international Format for Bibliographic Data – indexed and shared with the Union Catalogue of the Czech Republic[1], the World Cat catalogue, internet meta-searchers and other advanced internet services. We expect that the meta-data is subtly granulated, reflecting the structure of a selected methodology or an analysis. The data allows us to search, borrow, share, make inventories and select documents for their digitalization. At conferences, such as the present one, we seek improvements and further advancements. We aim for the future – the future of library science, which implies future work with grey literature.

Unfortunately, the reality of this work often differs from theory. In this paper, we will step outside the boundaries of theory as reflected in regulations, rules, and standards. Instead, we will enter the obscure world of thus-far unrecorded paper collections and unfinished library work.

We may ask why it is that more papers containing better data on the current, real-life situation are not being presented. The fact that there is a strict division of work between our researchers and staff librarians may be one of the reasons. The two groups are paid to perform different tasks. Research librarians reside at universities, having the financial incentive to write professional research papers and develop advanced technologies. Staff librarians, who work and run libraries, are paid for their mechanical, repetitive work, thus lacking financial and other incentives to write papers that would bring their situation to light. Writing a paper of this kind might, moreover, imply that they engage in painful description of their own mistakes and shortcomings.

There Are Vast Differences in the Condition of Czech Libraries.

Our conversation with our fellow librarians has revealed that the vast majority of libraries have at best made partial progress toward future. Each library seems to be stuck at a different point of development. There are the university department library collections with typewritten registers, whose bibliographic data records consist of a single line of text per book unit. There are the library collections administered in Excel program. Other libraries present scanned paper registers without the OCR. There are the libraries that do have online catalogues, but the format of their records is outdated. There are the libraries that are the only remaining users and administrators of their software. There are the libraries with outdated communication protocols so that downloading and sharing of their records is impossible. Last but not least, there are those libraries whose collections remain to a large degree unprocessed, taking ages to decide whether the collection units ought to be registered at all. An anecdote to top off my list: I have seen a staff librarian getting upset with what she termed „lacking education in the young generation" because they had no idea of how to use a paper card catalogue!

Naturally, there are libraries that serve as examples of good practices, with up-to-date, largely used software and completely and thoroughly processed collections, such as the Economy Library of the Centre for Economic Research and Graduate Education, funded partially by the USAID foundation. Secure financing; short history and regular withdrawing of outdated units seem to be the key for success. Regretfully, it may be impossible to complete our statistics on the overall state of library technology; however, it is obvious that many libraries find it difficult to keep up with the current pace of technology updates.

The Condition of Our Own Library is Also Vastly Varied.

Our Surveying Library dates back to the Austro-Hungarian Empire. Since then, the collection has been passed on from one state Surveying Institution to another, as they were being consequently founded and abolished. Specialized literature items were hardly ever withdrawn from stock, and so the library features a fairly concise archival collection. However, we have also suffered a large number of evidencing errors. The remodelling of the library premises was a major success. Unfortunately, the metal cases that used to host paper card catalogues were destroyed during the remodelling. Those were the only complete catalogues whose data is now irretrievably lost. Transition to the Invenio 1.1.[2] system of Open Source Library, which may also be used as a repository, was a great success. Unfortunately, some data was lost during the file transfer from the outdated, proprietary Tinlib[3] automated library system to that of Invenio. In the five years that followed, Invenio underwent a series of rapid and important updates that we failed to download, and so our version of the program is neither being updated nor maintained. To a large degree, our records vary in quality. Connecting our catalogue to the Union Catalogue of the Czech Republic via the OAI-PMH communication protocol has been our latest great achievement. However, we were only able to transfer ten of the new bibliographic data records that were prepared for that purpose. A decision has yet to be made on whether to register about a thousand books that are still sitting on the shelves. Several years ago, the library narrowly escaped its closure[4] and was then successfully modernized. Our catalogue has been placed

online; electronic information sources, such as Web of Science, and Scopus, have been made available, while a small portion of the collection has been digitalized.

How does the above-mentioned, historically underpinned present situation affect the collection, the conditions of its processing, and its visibility? Instead of focusing on the collection, we are constantly updating our software and metadata formats. The fast rate in which the technologies become outdated exhausts our workforce and financial resources. We are still behind on our updates, in spite of the fact that they are our priority, while unperformed updates continue affecting the visibility of our data. Cataloguing of insufficiently processed collection, that is, generating new data, has been paused; there are no funds to do so. Grey literature is among the most affected, for the following reasons:

- Data and record-sharing cannot be used.
- The argument of broader usage cannot be utilized for quality data-processing.
- The value of early-dated grey literature is being questioned.
- Funds are distributed to areas other than those of re-processing and new processing of catalogue entries.

For the above reasons, the situation is much worse than that of your commonplace book market production, with its obligatory legal deposits and catalogue entry-sharing technologies.

What Kind of Grey Literature Is Available From a Specialized Library?

Research and technical reports, dissertations and theses, and unpublished government papers, traditionally listed as examples of grey literature[5], may no longer suffice, since the concept of grey literature keeps evolving. There is a tendency to broaden the definition of grey literature by including new, primarily electronic sources of information. In her paper, titled „Are We Ready for the Future? Impact of Artificial Intelligence on the Grey Literature Management“[6], presented by Dobrica Savić at the Prague Conference on Grey Literature and Repositories in 2018, the author addresses some of the future challenges. Savić provides an impressive list of „grey data“ that is generated outside the usual channels. Given that there is data generated by IoT (the Internet of Objects), computer communication (M2M), self-driving cars, robots, sensors, cameras and other systems and AI applications, the author argues that identifying grey literature, and defining the role of classical grey literature management, proves to be a challenge.

In spite of being the only Special library in our field in the Czech Republic, the above-mentioned geodata seems beyond our reach; moreover, we are neither equipped nor ready for its processing. Most data is unavailable to us because of the copyright laws; processing and storing happens exclusively within each respective field where the data has originated. In the field of Surveying and Cartography (the subject field of our library), there is an immense quantity of geodata, i.e.; data with spatial components, such as data generated by satellites, drones and mobile equipment with GPS. There is also the state-generated data concerning land cadastres. Furthermore, even though a research institution such as ours may run projects and receive grants, the data usually belongs to those who have commissioned the research, be it a governmental science and research agency, or a private company. However, it is logical and commendable that specialized organizations create specialized databases, ideally collaborating internationally, such as the ICA[7].

Sweeping attempts at broadening the scope of library activities make it seem as though we were looking for a new job, since all other work has been done. In fact, we are seeking to establish our new roles, while failing to fulfil our old ones. We are seeking elsewhere, looking toward future, without first checking in our own backyard. Let us pause now, and look back.

While the above-mentioned data is inaccessible to us, our library is an exclusive owner of data that is accessible; and yet, the data has not been adequately processed. Our library stores a large quantity of classic grey literature, the most prevalent being the history of the institutions in our field of specialization, and the history of our field of research and its interaction with the state. Out-of-date technical norms and specialized regulations are

particularly on demand, yet difficult to access. These documents are important for both legal and practical reasons. For now, the data may be made accessible through laborious effort; but thus far, the data has not been adequately processed.

How many specialized libraries of the Czech Republic are finding themselves in a situation comparable to ours, then? Roughly speaking, according to the 2017 statistics[8], there are 114 healthcare institution libraries, 65 university libraries, 58 Academy of Sciences libraries, and 235 museum and gallery libraries. Of particular interest is the situation of the Charles University and the Academy of Sciences. Both institutions have highly modernized central library hubs with coordination and education centres that secure the running of the in-house library and electronic systems. However, for historical and practical reasons, the physical collection is dispersed into individual sites in many different buildings. For example, the physical library collection of the Department of the Far East is stored in classrooms; book-lending is done by a secretary after an order has been placed in the online catalogue.

In the 1990s, the number of librarians and library acquisitions dropped because of lack of funding. During last year's conference on connecting small libraries with the Union Catalogue[9], I joined a discussion panel on small libraries. What I learned was that today, a small scientific library typically employs a part-time employee, who is usually a professional of the field in which the library is specialized, but lacks expertise in the field of library studies. In the 1980s, our library had eight full-time employees; today, there is one, part-time librarian. Therefore, care of the collection and its processing are often neglected because there are other, more pressing issues.

Why is it, then, that there are unprocessed documents in libraries? Evidence of malpractice from other institutions may not be provided here because of their fear of negative publicity. Therefore, the majority of individual cases refer to our own practices. Examples from other libraries that are presented here have been gathered from contributions to public conferences. However, far from being the main subject, the conference examples came in the form of footer notes and small complaints.

This paper also evidences the kinds of documents that have not been processed, providing concrete examples and the reasons why they have not been catalogued.

Picture 1. Unprocessed book

Gifts And Other, Unexpected Contributions. Accepting an Entire Collection and What May or May not Happen.

Naturally, it is great that these kinds of documents make it to a library. Unfortunately, if they are accepted by a small library, as is often the case, they are stored on a shelf for future processing, where they may remain for many years. Full-time employees are not available to process a large quantity of documents that may have arrived all at once. The situation is made worse by the fact that prior to accepting an older document, we need to check in the catalogue to see whether the same document is already in stock – which is difficult, given that we know our catalogue is incomplete.

In our institute, there is a great tradition of donating boxes of dated documents – instead of trashing them – when the employees are retiring, because they know that the documents will be gratefully accepted. Since the library is well-known to the professional community, we often receive calls from people who wish to donate a large number of specialized books. Just recently, we paid a visit - which turned out to be interesting and lively - to a ninety-year-old professor's home, from where the library, upon the professor's request, received a part of his collection of specialized books.

A private collection often represents a uniquely wholesome unit. The documents often feature personal notes and remarks, and there is the correspondence with other experts in the field. In general, libraries and educational institutions are well-aware of the importance of private collections. For example, there is the „Information Systems to Make Accessible Libraries of Leading Personalities as a Part of National Cultural Heritage" project that has been implemented by the Institute of Information Science and Librarianship of the Faculty of Philosophy of the Charles University of Prague, and funded by the Czech Ministry of Culture. The project was conducive to producing a web application, called „Libraries of Leading Czech Personalities"[10],that provides access to information about documents in the private collections of several outstanding Czech personalities (e.g.; Karel Čapek, Božena Němcová, Mikoláš Aleš, etc.)

Gifts also come in individually, often as a result of the lively international dialogue among institutions. Most recently, a delegation on an official library visit donated a beautifully printed, large-dimension (50 x 35 cm), three-part National Atlas of Korea. However, the atlas has been sitting on a table for over a year, since it is not compatible with the library collection. While writing this paper, I got the idea to call the Korean section of the Department of Far East Studies of the Charles University. A happy ending for this book.

Given that funding for new acquisitions is gravely restricted, the library obtains most of its new literature via the above-mentioned retrospective acquisitioning. Regrettably, decision-making concerning the placement of a large number of thus received literature in the collection takes a long time. In consequence, there are about 20 meters of shelved books and boxes marked with notes on post-its, such as „the gift of professor XY".

The historically underpinned incomplete processing is at fault here; a revision of the previously processed collection must first be performed, else there might be multiple copies of the same units. Naturally, the majority of the donations do not consist of recently published books. Even so, our specialized library collection may be made complete in the above-described manner within a certain timeframe, if only the processing did not take up so much time. The stream of incoming grey literature is alive and well; however, once in the library, it turns into a still marsh.

Accepting an Entire Library Collection from another Organization

State-owned and research organizations come to existence, live… and cease to exist. In best-case scenario, their collections have been transferred instead of being abolished. Picture 2. shows some of the institutions from which our library received their collections (from top to bottom, and left to right in the picture).

1. C.K. Czech Technical University in Prague. The Geodesy Library.
2. Central Archive of Land Cadastres: Zentralarchiv des Grundkatasters.
3. Landesvermessungsamt Böhmen und Mähren. Bücherei.
4. Triangulation Office of the Ministry of Finance of the Czech Republic.
5. Geoplan. Land Survey Cooperative, Ltd. Prague.
6. Geographical Institute of the Interior Ministry. Library.
7. State Administration of Land Surveying and Cadastre. Land Tax Cadastre Registry. Department of New Land Surveying.

Picture 2. Stamps of libraries transferred into our collection

However, new collections are often transferred with incomplete catalogues, while those catalogues that happen to be complete do not often comply with the current cataloguing regulations. The Union Catalogue has a set of quality standards, and so, understandably, low-quality entries are not accepted. For obvious reasons, the public mostly uses the Union Catalogue, whereby the visibility of dated, transferred documents is considerably restricted.

Thus far, the situation has not changed. This spring, we had a visit from a sister department of the largest technical university in the Czech Republic. Since the department was moving, we were asked whether we would accept books deposited in two rooms.[11] The books have not been stocked; in fact, there is furniture that is nearly entirely blocking their access. Register entries are typewritten on paper sheets. Keep your fingers crossed!

Documents from a Large International Project: Are they Likely to Survive upon the Termination of the Project?

Project documents and other project related materials that are of interest in the VÚGTK (Research Institute of Geodesy, Topography and Cartography) library may also come in the form of comprehensive collections. The rules of certain projects stipulate that an individual collection be generated and retained. The ICRCM project is a good example of a collection of this kind.

The ICRCM was an international project. The International Centre on Recent Crustal Movements – an operational agency that collects and distributes data on recent movements gathered by geodetic methods - was founded by the resolution of the Plenary Assembly of the International Association of Geodesy that took place in Grenoble in 1975. From 1976 to 1995, the Centre was based at the VÚGTK. In 1995, toward the end of the year, sources such as map sheets, digital files and about 2500 books and periodicals were deposited at the ICRCM. In addition, the ICRCM Bulletin was published every six months.

Upon the termination of the projects, the documents were boxed up. The digital catalogue register disappeared when the proprietary software, created solely for that purpose, stopped working. This incident demonstrates the importance of project document cataloguing both during and after the project.

Life Cycle of an Institution and Its Library, Provided there is One.

Offices, archives and libraries have radically different sets of regulations, ~~because~~ each institution uses its own software and formats. For this reason, the degree of their interconnectedness is not great.

In our view, maintaining the historical perspective – and so, implicitly, caring for the grey heritage of science and research – it's our library mission. Documents that have not been traditionally deposited in libraries for organizational reasons represent unique sources of information about times long forgotten. Such documents exist in the Surveying Library of VÚGTK thanks to the Library's longstanding interconnectedness with State governmental institutions. In particular, these documents offer historical framework on the development of specialized institutions and governmental organizations. The VÚGTK used to be part of Czech Office of Surveying, Mapping and Cadastre (ČÚZK). The Library was located next door to the ČÚZK (ČÚGK back then) headquarters. Later, the two institutions separated; the VÚGTK became an independent research institution, moved elsewhere, and kept the Library.

Being then part of the Office, the Library would also acquire documents pertaining to the Document Management and Destruction Rules. Only much later did the Library join the network of public libraries, registered with the Ministry of Culture of the Czech Republic. What's interesting about the life cycle of official documents is that disregarding the Rules may have positive outcomes. Oftentimes, documents that ought to have been destroyed according to the Rules have been kept. And so, the Library has a collection of consecutive, uninterrupted chain of travel reports made by the Office. Because they were not destroyed as required by the Rules, these documents contribute to presenting historical perspectives on the times of their origin.

A collection of directives issued by the Office, which are no longer in effect, represent yet another, unexpectedly valuable set. When examining old maps, a directive helps explain their content - the what and why - and the exactness of the map marks. The outdated Office directives, which are difficult to find, are also important when it comes to determining land ownership rights.

Documents like these are often withdrawn from libraries because they are outdated. However, the VÚGTK Library did not do so for a long time. When it came to remodelling and collection revision, rather than perceiving the documents as outdated, the Library then saw the documents as historically valuable sources of information whose public access was difficult. The VÚGTK Library is one of the few libraries that make the documents publicly accessible.

Today's historians publish interesting work in our field, such as the „History of Nomenclature Commissions in the Territory of Today's Czech Republic"[12]. At present, this historical research is essentially contingent on the support of the Office which is, fortunately, forthcoming. Even so, access to the source materials of this work may be made easier in a simple and efficient way. The source materials of the above-mentioned work pertain to the Central Archive of Land Surveying and Cadastre (ÚAZK). Our Library participates at making them accessible over the internet. At the moment, we are preparing the script so that their files may be transcribed from a simple excel sheet to library formats. In this way, they documents will be made accessible via our catalogue.

Routine Withdrawing of Documents.

Making sure that the collection is being used and up-to-date is an important part of the librarians' work. Most libraries withdraw outdated and low-circulation documents simply to gain more room. With the exception of large libraries, building up archival collections is not a priority. The National Library is what everyone relies on for the Czech Archival Collection.

After the change of the regime, there was hardly any time to make sweeping withdrawals of outdated documents; the lists are showing that it is only now that regular withdrawing of documents from the socialism era is being regularly performed. Even so, it appears that lack of funding and workforce has wielded positive outcomes.

During the library remodelling and the moving of our collection, we spent a lot of time withdrawing some greatly overdue documents. For instance, I would be withdrawing information bulletins of communist ministries, and address books of the nineteen-eighties institutions. For Christmas, we used the books to built an object[13] (Picture 3), thinking that no-one would find the books interesting enough. However, following the rules, we offered the books to other libraries. In fact, the National Library and the National Archive showed great interest in taking over the documents, since they were completing their collections retrospectively. I was proven wrong.

Picture 3. Withdrawn books

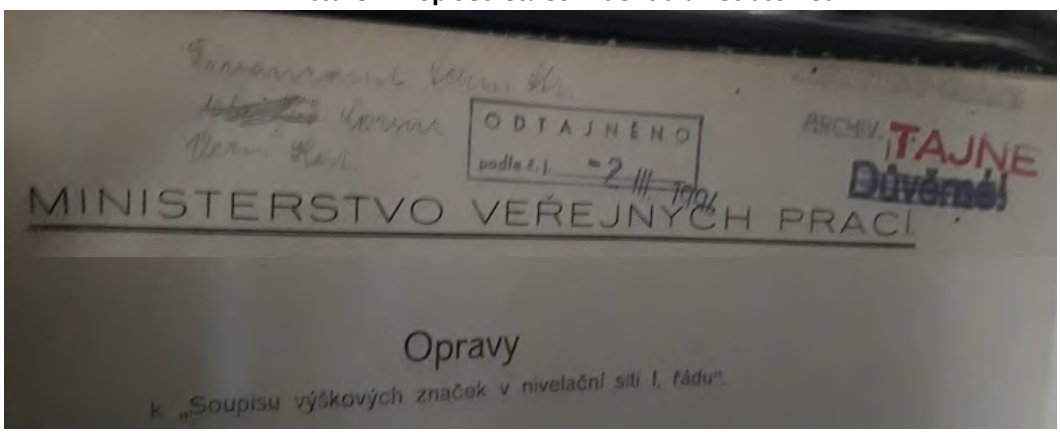
This real-life example shows the difficulties in determining the value of your collection to another party, and that too quick a decision to trash the stock might prove counterproductive.

It is likely that even the unwanted documents that we have recycled may be considered valuable one day. We have withdrawn many books on perforated card machines, and on the DOS and Windows 3.11. I cannot imagine that, in future, they might be found valuable, but even if so, they are gone…

Top Secret!

As an anecdote, I am giving here an example of documents labelled „Top Secret". There is the example of a publication issued by the Ministry of Public Works, shown in Picture 4, titled: „*Corrections to the List of Line Marks in the Levelling Network of I. Degree*". To the stamps reading „Top Secret" and „VÚGTK Confidential" was later added another stamp, reading „Declassified"; however, the several hundred documents were never entered in the electronic catalogue.

Picture 4. Top Secret! Confidential! Declassified…



Hidden Errors in Routine Cataloguing.

The Library of VÚGTK has moved and been remodelled several times. Most often than not, the physical condition of the collection improves by being moved from an unsuitable space to a better one; however, the collection may suffer losses as well.

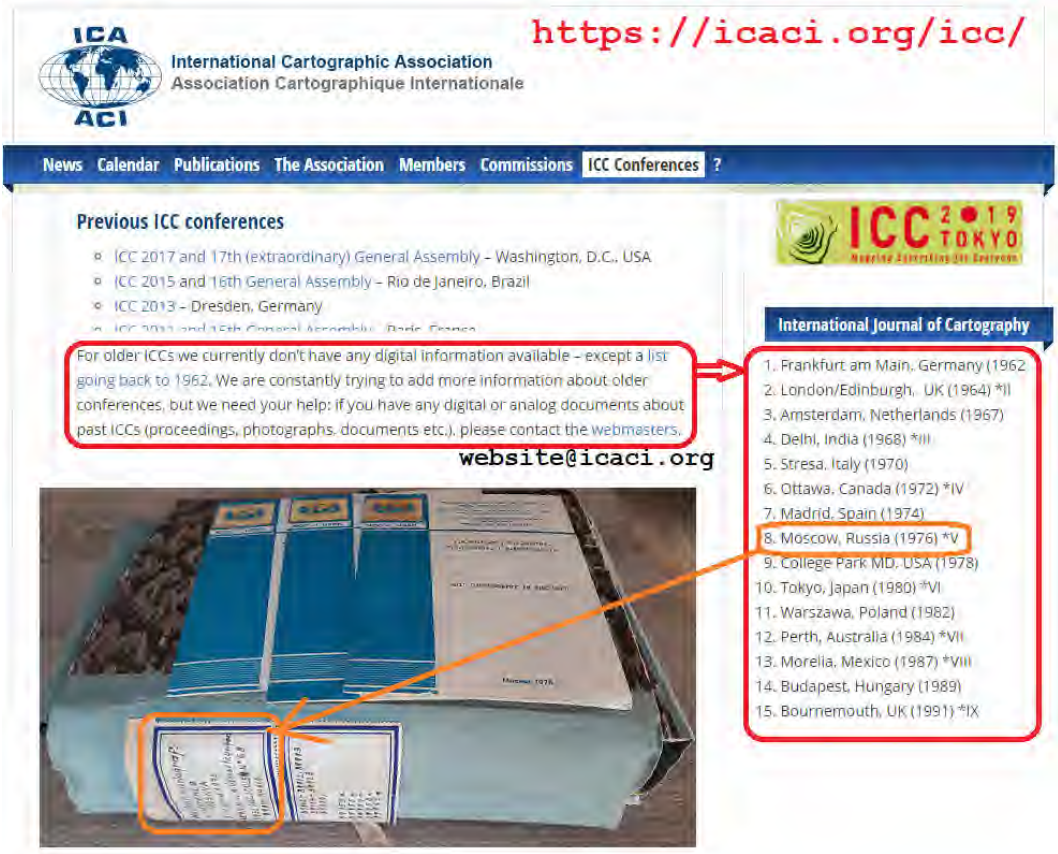
And so, during the remodelling, old metal cases that hosted paper catalogue cards were destroyed, because they were very heavy and could not be moved. The original assumption that the library collection was fully digitalized proved untrue because the records were not digitalized in their entirety. The changes due to several generations of librarians may result in information loss. For example, we know now that during the digital transcription of paper records, about one thousand entries were not digitalized; however, we have no idea which ones they were, as this information has been lost. The rates of cataloguing errors differ from one library to another; our library records demonstrate that differences in the error rate are also contingent on the time period. The paper presented by the Olomouc library talks about the shock suffered by a librarian when checking the documents on the shelf against a printed ALEPH catalogue, prior to boxing the books according to the catalogue listing. The librarian was much surprised by the rate of errors. The listed books were not on the shelf. The shelf hosted unrecorded books. Multiple-volume books were listed as one item. The publication information and author's names were so incongruous that the correctness of identification of a unit was questionable, to say the least. In the end, because of the time-consuming nature of this kind of book identification, the librarian gave up.[14]

The Longevity of an International Organization.

The ICA (International Cartographic Association) has a long history. The Association was founded in Bern, Switzerland, in 1959. The first General Assembly took place in Paris in 1961. However, only the papers read at International Cartographic Conferences (ICC) from1993 onward are accessible in their digital form online. Older papers were published by the local organizers, without being centrally stored.

Before the Surveying Library takes up the stage, allow me to point out one thing: a huge international organization, whose uninterrupted existence began in 1959, has only been retaining its own grey literature since 1993. The ICA is fully aware of this and so its website contains a call to anyone owning older materials – be it in digitalized or analogue form – to get in touch (Picture 5).

Picture 5. The history of an international organization



Indeed, we did so, because we found 82 papers in our collection, written for the 1976 International Moscow Conference; the papers had been carefully and individually entered into the catalogue. Their bibliographic format is outdated, but their physical condition is good. We thus responded to the ICA call; we received an immediate response, and so this undertaking will surely have a good ending. We just have to find the time to scan the documents.

One may ask how many similar documents that may be desirable elsewhere are to be found in the archives of smaller and lager institutions.

Conclusion.

In this paper, we have presented the experience of staff librarians of small, special libraries with long institutional history. The libraries contain a large number of badly processed and unprocessed documents. Only a part of their collections has been registered, catalogued, made visible online, and made accessible to the public. Having explained the reasons for this situation, we have attempted to quantify it.

Naturally, there are doubts concerning the value of these kinds of dated paper documents. However, doubting their value might threaten their existence. Many will probably disappear without being valued at all. In this paper, we have given several examples of how happenstance preservation of grey literature resulted in its appreciation by an unexpected user.

The Surveying Library of VÚGTK does not question the value of any such document; that is why we are in the process of building a specialized, archive collection pertaining to our research institute. It is our goal to preserve the historical evidence of the development of the field. Grey literature forms a large part of this field of science and research; being a special library, we cannot assume that the National Library would do our work for us. The national depository of grey literature, administered by the Czech National Library of Technology that we collaborate with, concentrates on making documents deposited in our library more visible, rather than collecting and catering to the collection per se.

It is therefore imminently important that documents deposited in our library be identified, processed and made accessible in the shortest possible time. For economic reasons, there is little chance that the collection items will be processed in accordance with every rule. A librarian, who is new to the job, tries his best at first, being aware of every rule and regulation. Upon calculating the hours of work it would take to be in compliance, he becomes disillusioned, bringing the agenda to a standstill. The available work hours are spent on maintenance, and on the necessary updating that keeps things running.

The fight for funding is never-ending, whereby desperate libraries resort to desperate measures - which might prove creative at times. For example, the local museum is looking for students who would process their collections free-of-charge (Picture 6).

Picture 6. A local museum is looking for students to help…

Present Solutions and their Insufficiency.

In theory, book withdrawal has so far been the most popular solution. In the Czech Republic, the book withdrawal protocol works well, given that libraries are obligated to offer their withdrawn items to other libraries. This is done via email conferences. While the technology may be obsolete, it is perfectly adequate for the task, and so all libraries without exception are able to handle and use it; therefore, this type of solution may be viewed as an example of good practice.

In reality, however, book withdrawal is not a universal solution, given the above-described issues. Oftentimes, there are books that have neither been included in the collection, nor has there been a decision made about their inclusion. If they are not included, the motivation to withdraw them in the administratively correct way is lacking. Of course, individual donated items that we deem unsuitable for our collection may be offered to other libraries via the email conference. Finding and justifying the time it takes to process larger quantities of items is, however, difficult. Books of this kind should not exist in the library at all, because they signalize that either there is some unfinished work, or that there is a problem.

Automatic transfer of the Central Library catalogue entries may represent yet another present solution. However, this does not work for grey literature because only recently published, unspecialized items are entered. But what we are talking about here is grey literature: documents with questionable value that often represent unique items.

While the above-mentioned solutions are considered satisfactory in theory, in reality, they are often obviated, because they are time-consuming and thus financially draining. At each conference that we have recently visited, issues of unsatisfactory registering and insufficient cataloguing have resurfaced, only to be quickly dismissed for not pertaining to the main topic of the conference.

For example, at a conference on cataloguing, many hours were spent explaining the theoretical model of Functional Requirements for Bibliographic Records (FRBR) to the librarians. In highly contestable and, at times, entertaining cases (e.g.; the book was officially written by Obama's dog; while the editor's name is provided, who do we enter as an author?), understanding the model might facilitate a correct solution. Here, however, we may ask the regional library for help, which will be provided. On the other hand, I have yet to find a solution to the riddle about how to reach a satisfactory level of cataloguing of a large number of old books in a short period of time.

In order to find the right solution, one has to ask the right questions, and define the problem correctly. We are dealing here with a large number of unprocessed documents. The goal is to increase their visibility with as little cost as possible. We need a methodology to tackle the above-described situation, and set achievable goals and priorities without holding on to the illusion that every library might generate perfect conditions and find funding.

The following are some of the main criteria:

- financial viability
- increased visibility
- simplified processing

Auxiliary strategies may be as follows:

- multilevel book registering
- identification and registering of an entire collections
- inclusion of incomplete information in union searchers
- stabilization instead of innovation
- using the simplest technologies possible

For example, the Union Catalogue of the Czech Republic has established a set of sub-minimal requirements for an entry into the Catalogue; none of our entries is up to par. We do think that the sub-minimal entry requirements of the National Library are logical and inviolable, else the catalogue be plagued with a large number of duplicates and wrongly indexed books, thus losing its usefulness as a catalogue.

As a manner of an auxiliary solution, we propose that CASLIN or another meta-search engine searches through our inadequate records, placing a note toward the end that reads: In case you have not found the requested document in our catalogue, we offer you a link to documents of questionable quality, outside the CASLIN domain.

The Czech Republic has a high-quality regional system, whereby regional libraries help smaller libraries with their methodological work. Given this framework, an experienced librarian might visit a small library to help out, assessing their collection, and setting up their list of priorities. The visiting librarian might also be able to inform the local employees of a small special library –who are often unprofessional –of the kinds of documents that might be of interest to the National Library and the National Archive.

A „single-line description" might be used for documents whose value is uncertain. The twenty-year-old Dublin Core might serve as an example to follow. It contains fifteen properties, none of which is obligatory. A simple, permanent display of this kind might help detect an interested party, or prove that the documents are of no interest to anyone.

Naturally, being a small library, we are not qualified to propose wholesome solutions; this paper may only be taken for what it is: a call for help for forgotten books.
Understandably, the two supporting legs of the library science must be firmly lodged in both theory and real-life practices. While the former runs forward, the latter limps behind. As a staff librarian, I find it ironic that funding for this paper has been found, whereas funds for the cataloguing of our endangered collection are still lacking. While we are engaging in theory, the grey heritage of science and research is being quietly taken to the recycling centres.

References

[1]Summary Catalogue of the Czech Republic (abbreviated as SK ČR) is a database that itemizes documents deposited in the collections of Czech libraries, listed in the Directory of Libraries And Information Institutions in the Czech Republic. The database is administered by the Department of Union Catalogs of the National Library of the Czech Republic. The electronic version of the Union Catalog has been running since 1995. http://www.caslin.cz/

[2]Invenio: Open Source framework for large-scale digital repositories. https://invenio-software.org/

[3]Tinlib was an integrated library system based on a database management system named Tinman. The system was developed for MS-DOS and UNIX. Tinlib was developed in 1985 and lost market share with the introduction of graphical interfaces like Windows and OPAC.

[4]DROZDA, Jiří a Hana HUBÍNKOVÁ. Jak (ne)zrušit knihovnu aneb úplně (ne)normální starosti (ne)obyčejné knihovny. In: *INFORUM 2012: 18. ročník konference o profesionálních informačních zdrojích* [online]. Praha: Albertina icome Praha, 2014 [cit. 2019-06-03]. ISSN 1801–2213. https://www.inforum.cz/pdf/2012/drozda-jiri.pdf

[5]Grey literature. In: *Wikipedia: the free encyclopedia* [online]. San Francisco (CA): Wikimedia Foundation, 2001- [cit. 2019-06-03]. https://en.wikipedia.org/wiki/Grey_literature

[6]SAVIĆ, Dobrica. Are We Ready for the Future? Impact of Artificial Intelligence on Grey Literature Management: Jsme připraveni na budoucnost? Vliv umělé inteligence na management šedé literatury. *NUŠL: Digitální repozitář* [online]. 2018 [cit. 2019-05-20].

http://invenio.nusl.cz/record/387433

[7]*International Cartographic Association*[online]. [cit. 2019-06-03]. https://icaci.org/

[8]Survey of Select Indicators of Certain Library Networks in the Czech Republic (from 1993 onward): Přehled vybraných ukazatelů některých sítí knihoven v ČR (od r. 1993). *IPK - informace pro knihovny* [online]. Praha: Národní knihovna ČR, 2018 [cit. 2019-06-03].

https://ipk.nkp.cz/statistika-pruzkumy-dokumenty/statistiky/prehled-vybranych-ukazatelu-nekterych-siti-knihoven-v-cr-od-r.-1993

[9]HORÁKOVÁ, Barbora. Small Museum in Big Catalog: The Regional Museum of Vysoké Mýto: Malé muzeum ve velkém katalogu: Regionální muzeum ve Vysokém Mýtě. In: *11. výroční seminář SK ČR: 26.11.2018* [online]. Praha: Městská knihovna v Praze, 2018 [cit. 2019-06-03]. https://www.caslin.cz/caslin/dokumenty/rok-2018/horakova

[10]*Knihovny významných českých osobností*[online]. Praha: Ministerstvo kultury ČR [cit. 2019-06-03]. http://www.osobniknihovny.cz/

[11]Topic: discussion on the possible transfer of book collection pertaining to Faculty of Civil Engineering of ČVUT. Information from Jana KUKLÍKOVÁ. Zdiby 15.3.2019

[12]MATÚŠOVÁ, Jana and coll. History of Nomenclature Commissions: 100 years of Processing of

Geographical Names in the Territory of Today's Czech Republic: Historie názvoslovných komisí: 100 let zpracování geografických jmen na území dnešní České republiky. 1. vydání. Praha: Český úřad zeměměřický a katastrální, 2018. 70 stran. ISBN 978-80-88197-06-5.

[13]Building Christmas trees from books has become a tradition of a sort. More trees may be viewed on the internet, for example:

IKAROS, redakce. Knihovnické vánoční stromky. *Ikaros* [online]. 2012, ročník 16, číslo 13 [cit. 2019-05-23]. urn:nbn:cz:ik-14019. ISSN 1212-5075.

http://ikaros.cz/node/14019

[14]KORHOŇ, Miloš. *Hromadné odkyselování v praxi Vědecké knihovny v Olomouci* [online]. In: . 2019 [cit. 2019-06-03]. http://kramerius-info.nkp.cz/wp-content/uploads/2018/11/Korhon_prezentace-odkyselovani.ppt

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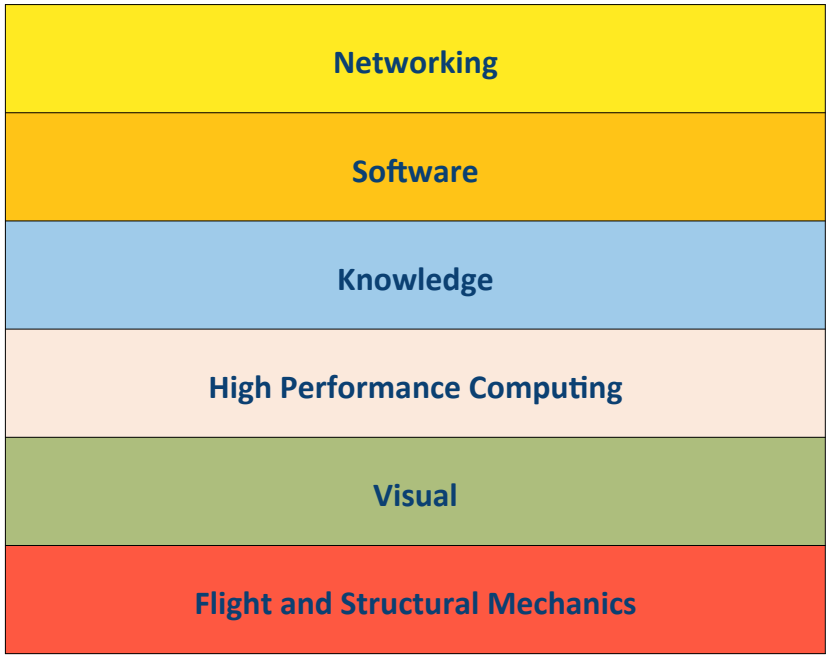

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Open Access – A never-ending transition?

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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

[1] https://www.coalition-s.org
[2] http://www.amelica.org/en/

Gutenberg 1971)[3] the time has now come to take a clear stand to obtain the complete realization of Open Access.

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.

[3] https://www.britannica.com/topic/Project-Gutenberg
[4] https://www.budapestopenaccessinitiative.org/read
[5] https://www.gutenberg.org/wiki/Gutenberg:The_History_and_Philosophy_of_Project_Gutenberg_by_Michael_Hart

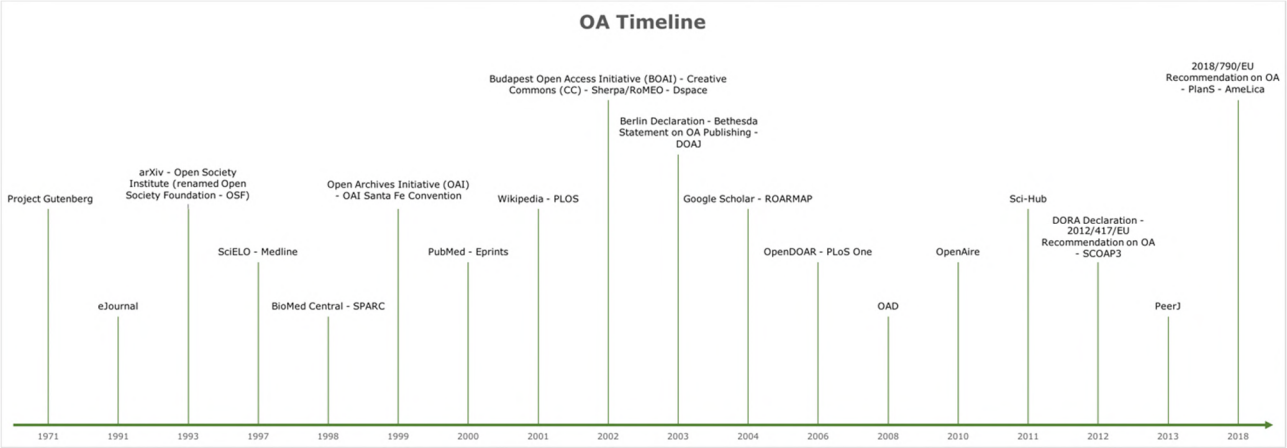

Figure 1: main initiatives in the OA landscape

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

[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/

common goal of 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

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

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*?"

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.

[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.accelerateopenscience.nl/what-is-open-science/.

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.

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].

[20] Cf. http://cde-genova.unige.it/openaccess
[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/

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, 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,

[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

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).

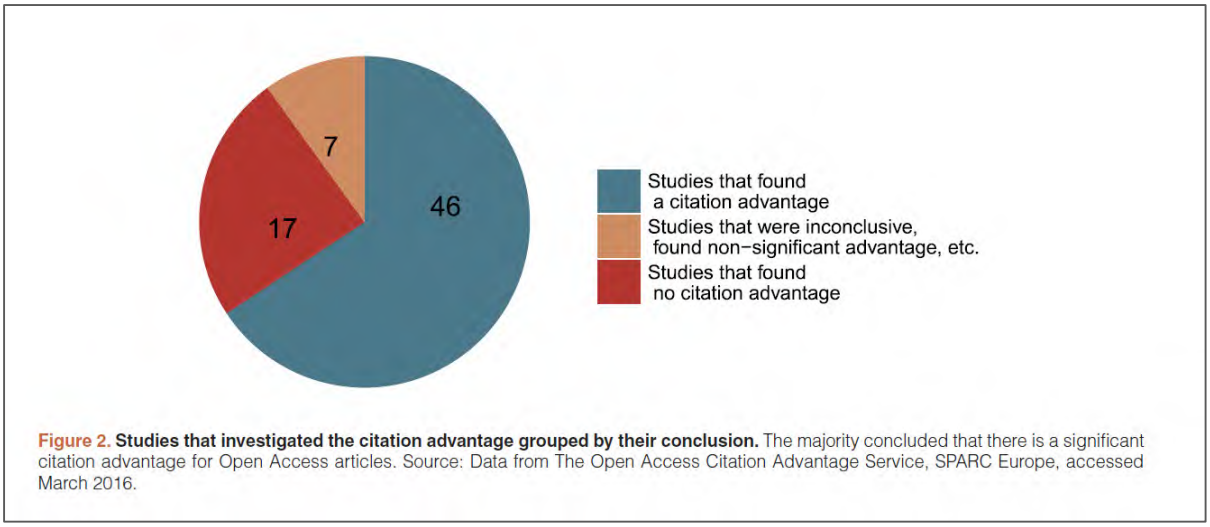

Figure 2. Studies that investigated the citation advantage grouped by their conclusion. The majority concluded that there is a significant citation advantage for Open Access articles. Source: Data from The Open Access Citation Advantage Service, SPARC Europe, accessed March 2016.

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

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

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.

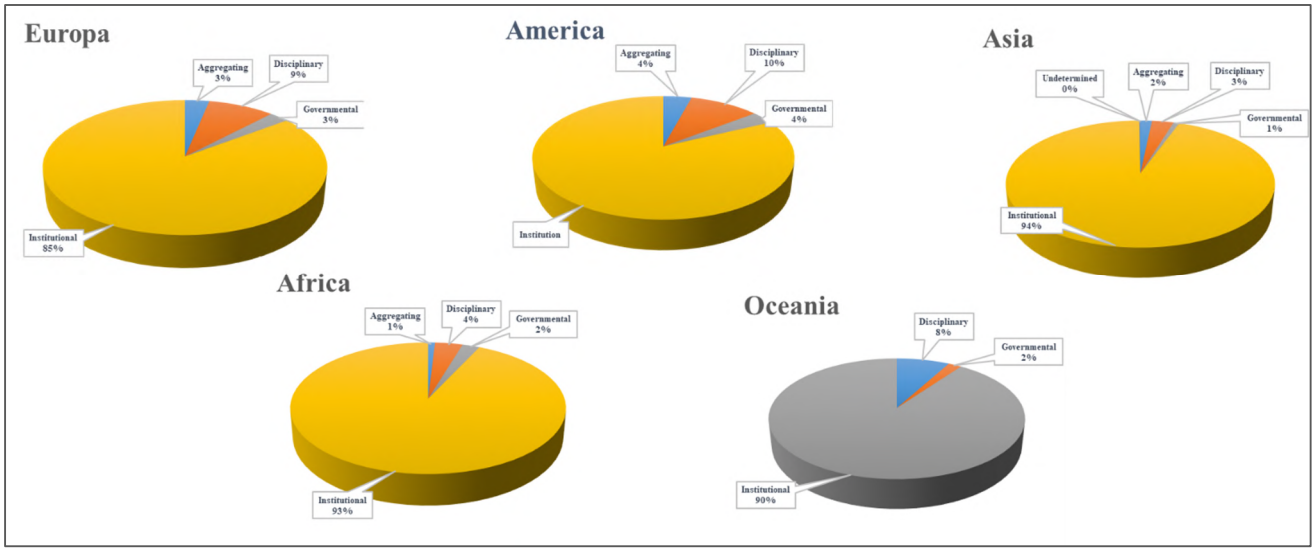

Figure 3: Distribution of repositories worldwide

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%.

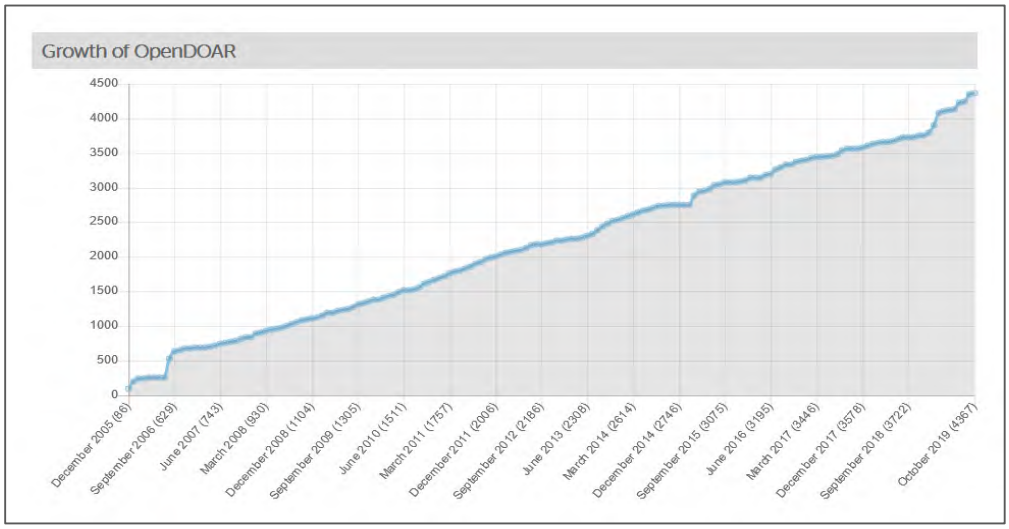

Figure 4: Growth of repositories in OpenDOAR (2005-2019)

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.

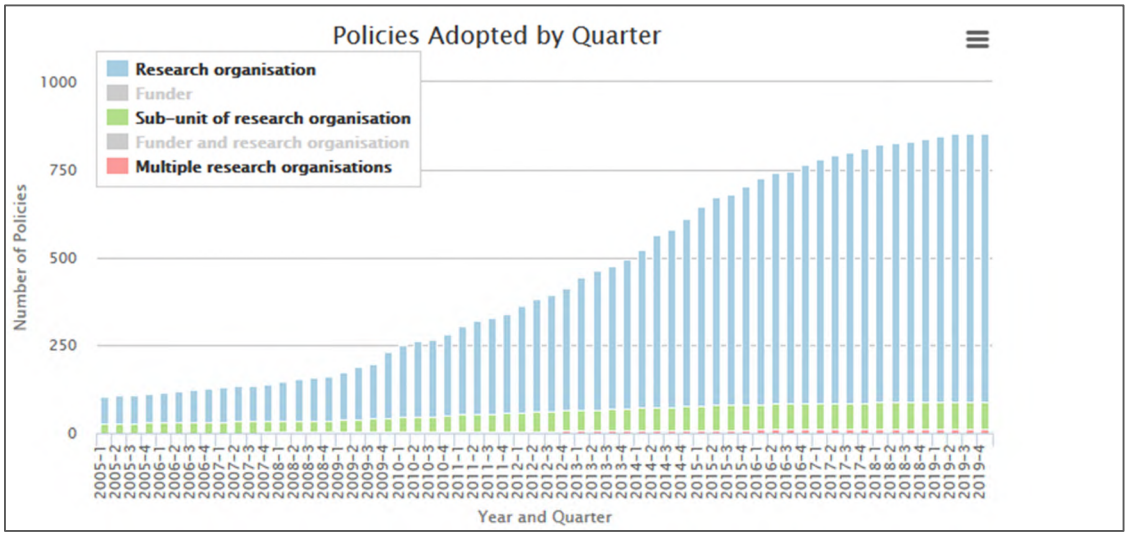

Figure 5: Number of policies in OpenDOAR 2005-2019

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

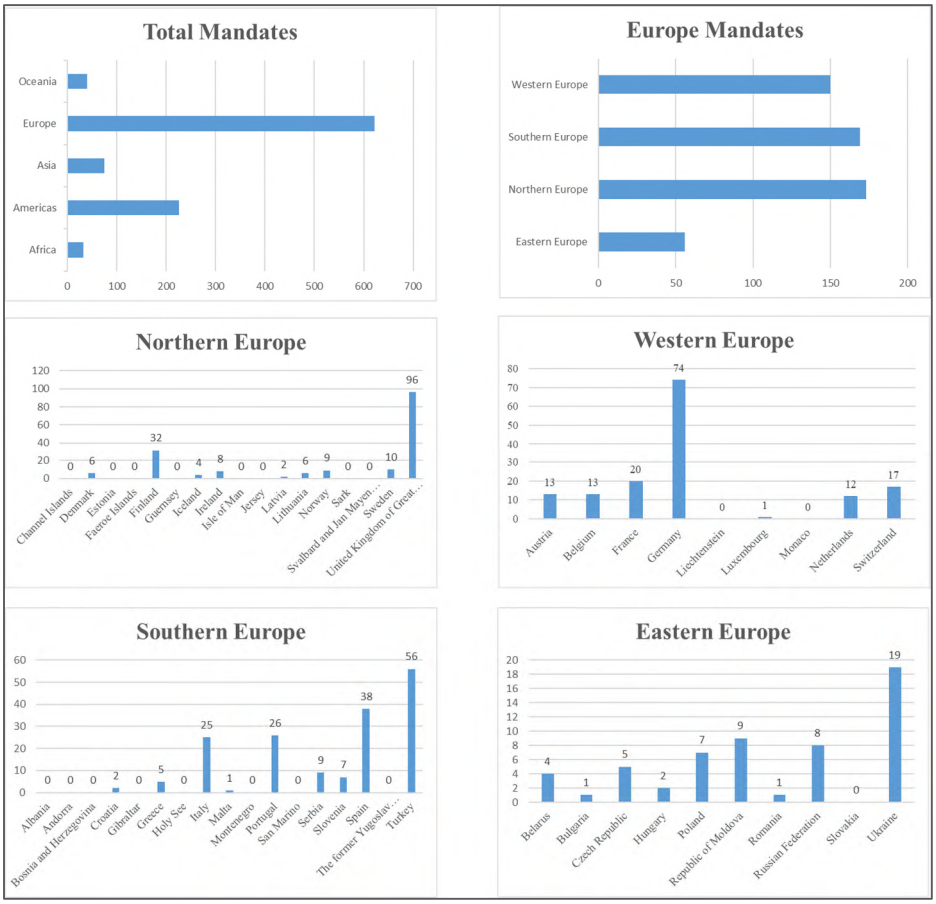

Figure 6: Distribution of policies in Europe

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.

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

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" 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)

[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/

[37] https://www.intact-project.org/openapc/

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.

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.

[38] https://www.coalition-s.org/about/

- 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 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.

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

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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AccessGrey: Securing Open Access to Grey Literature for Science and Society

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Abstract

Persistent identifiers such as a DOI[1] for a publication and an ORCiD[2] for an author/researcher can be approached from both the demand-side as well as supply-side of information. It appears however that the former attracts more attention. Here emphasis lies in the access to and preservation of research output. Yet, it is on the supply-side regarding the acquisition of research output that persistent identifiers may by the same token have influence in identifying and populating prospective data archives and repositories. This study will look at the influence persistent identifiers have in securing the acquisition of grey literature for public access.

The goal of this project is twofold. First, to carry out a survey within the grey literature community as to the opinions, uses, and applications of persistent identifiers. And second, to initiate a project geared to populate a new collection housed in the GreyGuide Repository[3] by using the DOI as an incentive. Resources in Grey Literature (RGL) is as a generic, multidisciplinary collection that will serve for this purpose.

Using GreyNet's distribution channels and social media, stakeholders in the field of grey literature are invited to enter one or more of their publications in the RGL collection. Each new entry will receive a DOI minted by GreyNet International and further stored and preserved in the DataCite registry[4]. Also, a system generated citation will be added to each new entry in order to facilitate record use. The types of grey literature documents eligible for entry in the RGL collection are numerous[5].

Brief guidelines for record entry require that it be self-archived using the existing online-template and that both the metadata record and accompanying full-text document(s) are in English. An additional descriptive field does allow for entry in another language. And, a translation of the document can also be uploaded in the repository. Finally, it is understood that by submitting the metadata record and file(s), they become open access compliant under Creative Commons license CC-BY-SA[6].

The initial phase of the project commenced in April 2019 and closed in October 2019. Records harvested during this period along with the results of the survey will be analyzed in its second phase. In the final phase, the project's outcome will be published. Results should indicate whether the AccessGrey Project be extended to other collections in the GreyGuide, and if this project would be of value to other communities of practice in the field of grey literature.

Introduction

The goal of the project was twofold: 1. To learn the opinions, uses, and applications of persistent identifiers within the grey literature community and 2. to explore the use of persistent identifiers, namely the DOI, in the acquisition of grey literature. The method of approach was first to construct a questionnaire that would be used in an online stakeholder survey among a defined population within GreyNet. And, secondly to initiate a campaign among GreyNet's diverse stakeholders by using the DOI and a system generated citation as incentives to deposit documents in the GreyGuide Repository.

AccessGrey Project – Stakeholder Survey

Survey Questionnaire

A search was first carried out in the Collection of Conference Papers on Grey Literature[7] using the search terms "persistent identifier" and "DOI", which retrieved 16 full-text documents. Ten questions were then drafted based on the search results. Nine of the survey questions were standardized and one was open ended. All of the questions however did include a comment field. The questionnaire was then entered in SurveyMonkey[8] from which a link was generated.

Survey Population

The population of the stakeholder survey was drawn from GreyNet's Distribution List spanning entries from January 1, 2014 to April 24, 2019 - the date when the link to the online survey became operational. Only personal names with both surname and first name or initial were selected. The total population of survey recipients was 509. During the 5-week period in which the link to the survey was online accessible reminder emails were sent out. In total, there were 56 respondents to the survey accounting for an 11% response rate.

Survey Population	Survey Respondents	Survey Results x
509	56	11,0%

Survey Results and Shared Analyses

The results of the survey are included as an **Appendix** to this paper. However, to maintain the anonymity of the respondents, responses to Question 10, which include names and email addresses, have been removed. Once the online survey was closed to further response, a data paper was drafted and published alongside the survey data in the DANS Easy Archive. Of the 56 survey respondents, 29 chose to provide their contact details. Those who did, were then invited to analyze the data. Five of those respondents submitted their analysis and rightfully share in the co-authorship of this paper.

Excerpts from three of the five analyses are recorded as follows:

[**Excerpt 1**]

Persistent identifiers such as DOIs are making research more efficient. Additionally, as the existing protocols become more widely adopted, there will be even more improved access to information. Persistent identifiers are not only useful for identifying data but can also be used to store relationships and point to where other data may be stored. They were developed to prevent link rot and to ensure that objects remain available and unchanged. In this way they improve access to information and increase trust in scholarship and research.

It is assumed that the DOI would be only one factor to be considered as adding quality to a research publication. Other factors such as peer review, citations, impact factor, what other researchers say about the paper, author, date, etc. would also need to be considered to indicate quality of research. The assignation of DOIs to metadata records would not necessarily attract more content providers. However, the Open Access (OA) policies of the repository would definitely play a role in attracting content providers. The Grey literature community of respondents to the survey appear to be on the forefront of knowledge about the importance of using PIDs and DOIs. Research in the field of grey literature and its related data will become increasingly accessible as the research information infrastructure becomes more standardized and widely adopted. (***June Crowe***)

[**Excerpt 2**]
Researchers often search for references that are listed at the end of relevant articles. Over the years the URL links to some sources such as grey literature - often only accessible online - may not work anymore. If there is a persistent identifier, the access to grey literature remains stable and allows continuous access over time. The process of selecting sources that are scientific and relevant to the work of researchers is becoming more important than the ability to find and collect countless sources. In academic circles, when a mentor or professor checks the references listed and sees the DOIs next to sources that are grey literature, these resources actually "count" (even though in their eyes, grey literature may not be a scientific publication). There is a possibility that persistent identifiers such as DOIs, which are recognized worldwide, would encourage researchers to cite their local sources more often. If this is the case, then in some fields such as education, where work and training are led and informed by government guidelines and evaluations – all of which are grey literature (White et al., 2013) – then the results of this survey are encouraging. DOI by itself does not inform us about the quality of the document or data. It does, however, (in cases like a dissertation and a thesis) increase the possibility of connecting the research data with the thesis, which can be seen as a quality indicator, since the content becomes more scientifically provable when the data are available. The creation of the DOI depends on the policy of the repositories and is not directly connected with the quality of the individual record. If Slovenian repositories added the DOI identifier to each thesis, then all would have a DOI - not only the best ones. However, this is not yet the case. Where we now stand is that less experienced researchers may find it difficult to recognize a trustworthy piece of grey literature. In such cases, an international and well-known identifier such as DOI could assist them. (***Ana Češarek***)

[**Excerpt 3**]
A DOI is not only a persistent but also actionable, because one can plug it into a web browser and be taken to the identified source. In this way, persistent identifiers are strategic to research data outputs because they can be re-used for new research. The persistent characteristic is a guarantee even if the location of a data file may change when an academic changes institution, or when data archive systems become replaced. Examples, not uncommon to Grey Literature. Concerning the question, whether persistent identifiers serve as an incentive in the acquisition of grey literature, a near 27% of the respondents were uncertain. The comment "Probably right" by one of the respondents may be interpreted as a "selling point" to those who were not certain - given the fact that over 30% of respondents strongly agreed. When asked if a repository or data archive that assigns DOIs to metadata records is more likely to attract content providers – one comment was eloquently formulated "In practice this is the case, but the mere fact of assigning DOI's should not replace the other more intrinsic reasons for content providers to choose a certain repository". This question is in need of further insights to better understand and decide future choices for repositories and digital platforms. This holds particularly in the open access environment where Grey Literature could be a strong pilot light. When asked in the final survey question to provide contact details along with any other comments or recommendations. It is only after being asked to analyze the results of the survey, do I come to recommend perhaps an online course such as a MOOC (massive open online course) that would deal with the meaning and functions of persistent identifiers, their structure, environments, uses and different types. As but one of the 50+ respondents in the survey, we are all assumed to be interested and somewhat experienced. Imagine all the other authors, librarians, and documentalists who work with grey literature. Training in persistent identifiers such as DOIs and ORCiDs would no doubt prove worthwhile.
(***Antonella De Robbio)***

AccessGrey Project – Acquisition Campaign

The second part of the project dealt with the acquisition of metadata, full-text records using the DOI and a system generated citation as incentives for authors to deposit their grey literature documents in the GreyGuide Repository.

Acquisition Groundwork

In order to channel records to a multidisciplinary collection in the GreyGuide Repository, the existing online template for the RGL (Resources in Grey Literature) had to be revised to include a DOI metadata field as well as a system generated citation. Since the RGL collection is multidisciplinary, it was decided that records in the earlier GGP (Good Practices in Grey Literature) would be merged with the RGL Collection and DOIs would then be assigned to all existing records.

Acquisition Guidelines

Guidelines reflected in the metadata fields of the online template clearly indicate that submissions rely on self-archiving, that the metadata and full-text are in required in English. While other languages can likewise be included in designated fields. Furthermore, it is understood that all records are open access compliant via the CC-BY-SA License.

Acquisition Strategy

Strategies applied in the acquisition of new records have up until now relied on GreyNet's existing channels, namely its Distribution List, The Who is in Grey Literature[9], Authors who published in the International Conference Series from 2015-2019, GreyNet's Social Media (Facebook[10] and LinkedIn[11]), and the International Directory of Organizations in Grey Literature[12].

Acquisition Results

To date, the acquisition of new records has been far less than initially anticipated. The RGL Collection[13] accounts for only 56 full-text records. However, this sample does indicate that the records are multidisciplinary, they represent works from various sectors of government, academics, business, and NGOs. Furthermore, the sample records are published by some 26 corporate authors, from 13 countries worldwide, and together illustrate 17 different grey literature document types.

AccessGrey Project – Outcome and Way Forward

While the results of the Stakeholder Survey clearly indicate the value of persistent identifiers for grey literature, the campaign for the acquisition of records with the incentive of a DOI and system generated citation has until now been considerably less than expected. Given the amount of technical development that has been invested in the start-up of this project, it is considered worthwhile to extend the duration of the AccessGrey Project into 2020. New strategies for the acquisition of records in the RGL Collection reaching beyond GreyNet's current catchment will need to be considered. And, the GreyGuide Repository in which the

RGL collection is housed should apply for registry in OpenDOAR[14], a quality-assured global directory of academic open access repositories. For it is established that the Open Access (OA) policies of a repository definitely play a role in attracting content providers.

References

[1] https://www.doi.org/

[2] https://orcid.org/

[3] http://greyguide.isti.cnr.it/

[4] https://search.datacite.org/works?query=greynet

[5] http://www.greynet.org/greysourceindex/documenttypes.html

[6] https://creativecommons.org/licenses/by-sa/2.0/

[7] http://greyguiderep.isti.cnr.it/listtitoli.php?authority=GreyGuide&collection=GLP&langver=en&RighePag=100

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

[9] Who is in Grey Literature, http://greyguiderep.isti.cnr.it/listtitoli.php?authority=GreyGuide&collection=BIO&langver=en&RighePag=100

[10] https://www.facebook.com/greynetinternational

[11] https://www.linkedin.com/groups/3718857/

[12] http://www.greynet.org/internationaldirectory.html

[13] Resources in Grey Literature, http://greyguiderep.isti.cnr.it/listtitoli.php?authority=GreyGuide&collection=RGL&langver=en&RighePag=100

[14] https://v2.sherpa.ac.uk/opendoar/

APPENDIX: SURVEY RESULTS

Q1 Persistent identifiers increase access to grey literature

- Answered: 56
- Skipped: 0

Strongly Agree	55.36% (31)
Agree	33.93% (19)
Uncertain	10.71% (6)
Disagree	0.00% (0)
Strongly Disagree	0.00% (0)
TOTAL	56

Comments (5)

They can also distract from the main metadata themselves / Clarify the existence of the material and information itself and guarantee access to unstable content / Only if people know how to use them / Document become more trustworthy for readers / Especially DOIs via CrossRef.

Q2 Persistent identifiers serve as an incentive in the acquisition of grey literature

- Answered: 56
- Skipped: 0

Strongly Agree	30.36% (17)
Agree	39.29% (22)
Uncertain	26.79% (15)
Disagree	3.57% (2)
Strongly Disagree	0.00% (0)
TOTAL	56

Comments (1)

Probably right, may be seen as a "selling point"

Q3 Persistent identifiers increase the citation of grey literature

- Answered: 56
- Skipped: 0

Strongly Agree	55.36% (31)
Agree	33.93% (19)
Uncertain	8.93% (5)
Disagree	0.00% (0)
Strongly Disagree	1.79% (1)
TOTAL	56

Comments (6)

Possibly, but they could also introduce a bias / Although it is one of the methods of increasing citation, improvement of quality is also required at the same time / Perhaps the DOI code / Still a lot of work to be done in encouraging best practice in citation / If we use it (because it is more trustworthy), we have to cite it as well. (logical course) / DOI is helpful for reference (and citation) management.

Q4 Persistent identifiers allow for the preservation of grey literature

- Answered: 56
- Skipped: 0

Strongly Agree	41.07% (23)
Agree	41.07% (23)
Uncertain	14.29% (8)
Disagree	3.57% (2)
Strongly Disagree	0.00% (0)
TOTAL	56

Comments (4)

Digital Preservation is the management and maintenance of digital objects / Allow is maybe the wrong word, perhaps assist? / Preservation depends on the IT team / Probably.

Q5 Persistent identifiers are vital in linking and cross-linking data

- Answered: 56
- Skipped: 0

Strongly Agree	58.93% (33)
Agree	26.79% (15)
Uncertain	12.50% (7)
Disagree	1.79% (1)
Strongly Disagree	0.00% (0)
TOTAL	56

Comments (2)

The term "vital" gives too much emphasis to the phenomenon / DOIs are essential for linking data

Q6 A DOI is a quality indicator that increases the value of grey literature

- Answered: 56
- Skipped: 0

Strongly Agree	30.36% (17)
Agree	33.93% (19)
Uncertain	23.21% (13)
Disagree	10.71% (6)
Strongly Disagree	1.79% (1)
TOTAL	56

Comments (6)

Could be, but I wouldn't vouch for it / It is but it shouldn't be as it isn't really any guarantee of quality / I don't think the DOI is indicative of quality, plenty of peer reviewed content with DOIs gets retracted, so where's the quality aspect there? / For me (I am a young researcher) this is true / For as much as I know it's not a quality indicator / It is an investment, and it adds value via the referencing and linking.

Q7 A repository or data archive that assigns DOIs to metadata records is more likely to attract content providers

- Answered: 56
- Skipped: 0

Strongly Agree	33.93% (19)
Agree	46.43% (26)
Uncertain	12.50% (7)
Disagree	5.36% (3)
Strongly Disagree	1.79% (1)
TOTAL	56

Comments (1)

In practice this is the case, but the mere fact of assigning DOI's should not replace the other more intrinsic reasons for content providers to choose a certain repository.

Q8 Do you have an ORCiD or other author/researcher unique persistent identifier?

- Answered: 56
- Skipped: 0

Yes	66.07% (37)
No	23.21% (13)
Not Applicable	10.71% (6)
TOTAL	56

Comments (5)

https://researchmap.jp/public/about / ORCiD / I am going to get it soon / And don't like it / Also other IDs (Web of Science, Scopus, HAL...)

Q9 Does one or more of your publications have an assigned DOI?

- Answered: 54
- Skipped: 2

Yes	74.07% (40)
No	16.67% (9)
Not Applicable	9.26% (5)
TOTAL	54

Comments (2)

I am not sure / I don't know

Q10 Please enter your name, email address, and any other comments or recommendations that would be of benefit to this survey

- Answered: 55
- Skipped: 1

I choose to remain anonymous	47.27% (26)
I include my full name and email address, below	52.73% (29)
TOTAL	55

Comments (29)

Going Green – Publishing Academic Grey Literature in Laboratory Collections on HAL

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Abstract
HAL is the national open repository for documents and data from French scientists. The deposits are organized in institutional portals and collections from research laboratories and projects. The paper analyses how grey literature is represented in the collections of French research laboratories on HAL. We assess the grey literature deposits on HAL from the 66 research laboratories affiliated to the University of Lille, covering all STM and SSH fields. The focus is on conference papers, reports, working papers, theses and dissertations. The study distinguishes between deposits of documents and records without documents, compares deposits from different disciplines, different laboratory collections and different document types. Typical strategies (or lack of strategies) on the local level of research laboratories are identified. Conditions and variables that may explain these differences are discussed, together with potential effects on the visibility, impact and evaluation of the laboratories' research output.

Keywords*: Open science, open access, open repositories, research laboratories, grey literature, reports, conference papers, working papers, theses and dissertations*

Introduction

Last year, in 2018, the French Minister of Higher Education, Research and Innovation announced a National Plan for Open Science[1]. The plan defines open science as the practice of making research publications and data freely available, open to all, without hindrance, without delay, without payment. The first commitment of the plan is to generalise open access to publications through open access platforms, whether in journals or books or through an open public repository such as HAL[2]. This commitment includes the confirmation of the main role of the HAL open repository in the French ecosystem of open science infrastructures. Launched in 2001 by the Centre for Direct Scientific Communication (CCSD) of the CNRS, the multidisciplinary HAL archive (= "Hyper Articles on Line") has become over the years one of the most important platforms of the "green road" to open access to scientific information.

Green road means the self-archiving of scientific publications by the authors themselves, on a dedicated open platform or repository (Harnad et al., 2004). The green road strategy is set up on two stakeholders: the authors, insofar as they hold the intellectual rights to deposit their own publications (article, chapter, communication, thesis, etc.), and their institution (research organisation, university, school, etc.), insofar as it has the possibility of encouraging or enforcing self-archiving and since it also has the resources and legitimacy for an institutional archive (Lynch, 2003). In France, the green road is facilitated by the 2016 Law for a Digital Republic and the creation of a secondary exploitation right for French researchers (Article 30, cf. CNRS-DIST 2016).

HAL is the "green heart" of the French open access infrastructure. Currently (September 2019), the repository contains more than 1.9 million items, mostly articles (55%) and conference papers (30%) but also book chapters (9%), dissertations (5%) and other text and

[1] National Plan http://www.enseignementsup-recherche.gouv.fr/cid132529/le-plan-national-pour-la-science-ouverte-les-resultats-de-la-recherche-scientifique-ouverts-a-tous-sans-entrave-sans-delai-sans-paiement.html
[2] Hyperarticle en ligne https://hal.archives-ouvertes.fr/

data files in all disciplines. 32% of the items are document deposits, the other 68% are records, i.e. metadata without text or data files.

Like its American model, the arXiv e-prints service, the HAL repository was initially designed on the principle of direct communication among researchers, to facilitate and accelerate the exchange of scientific results even before they are published in a journal or book. With time, in particular after the signature at the Academy of Sciences on 2 April 2013 of the "Partnership Agreement in favour of open archives and the shared HAL platform" between French universities and research organizations, HAL has become a kind of national institutional repository, a "shared national infrastructure hosting institutional archives or towards which other institutional archives are firmly invited to release their content" (Bauin 2014).

Several hundreds of universities, research organisations, business and engineering schools and research laboratories have created their own portals or collections on the HAL platform as an institutional repository or as a digital showcase of their scientific output. Our focus is on the academic laboratory collections. In France, academic research is organized via university-based laboratories which are the researchers' working environment. The laboratories are the basic level of university research; research projects are organized around the laboratories, and researchers are evaluated by the High Council for the Evaluation of Research and Higher Education (HCERES) within the framework of their laboratories.

An open repository collection can contribute to the visibility and the impact of the laboratories' scientific production; it can produce some basic scientometrics (number and typology of scientific papers etc.) and altmetrics (views and downloads), and it can supply data for further assessment (internationality, network analysis etc.).

A preliminary study was conducted in 2018 on the HAL collection of the GERiiCO laboratory[3] in order to analyse some of these basic metrics and to assess not only the interest but also the required investment and potential shortfalls (Schöpfel et al. 2018). The following study takes this research a step further, with a sample of 66 laboratories covering the whole range of scientific disciplines, focussing on grey literature and open access strategies and comparing the 2019 situation with survey data from 2008 and 2009.

Methodology

The 66 research laboratories of the University of Lille were selected based on the university's public list[4]. For each laboratory, we determined the name, the acronym and/or number, the type of research unit (university structure or mixed governance with research organisations), the field of research (arts, social sciences and humanities; science and technology; medical sciences and public health; law, economics and management) and the discipline. This was done with information from the university's and the laboratories' websites.

25 labs (38%) receive funding (budget, equipment, staff) from the University of Lille only while 41 labs (62%) are located on the campus of the University of Lille but partly funded by other French research organisations, e.g. CNRS (multidisciplinary, fundamental research), INSERM (medical science) or INRIA (applied computer science).

These 66 labs cover the whole range of scientific disciplines. Best represented are medicine (20), biology (7), engineering (5), chemistry (4) and pharmacology, physics, informatics and economics (each 3).

[3] A research laboratory in information sciences, communication and cultural studies, affiliated to the University of Lille https://geriico-recherche.univ-lille3.fr/

[4] https://www.univ-lille.fr/recherche/laboratoires/ (accessed April 30, 2019)

In a second step, we determined for each laboratory if it had an institutional identifier in the HAL system[5] and if it had created a collection on the HAL repository[6].

Third, we assessed for each laboratory the number of deposited documents (documents with full text) and of records (metadata without documents) through a direct search in the HAL repository[7]. We also assessed the number of documents and records for specific types of documents, i.e. articles, communications (conference papers), book chapters, preprints, reports and PhD dissertations. This selection was based on previous research on open repositories and on a pragmatic definition of grey literature, considering preprints, reports, PhD dissertations and partially also conference papers such as grey (non-commercial, unconventional) literature and articles and book chapters generally such as white (commercial) literature. These figures were analysed with descriptive statistics (uni- and bivariate analyses). Chi-squared tests were performed on a p=.05 level.

Finally, we tried to get usage statistics from the people in charge of these laboratory collections, i.e. download figures for the last year (2018) as an indicator of impact for the whole collection and for the different types of documents.

Results

Collections and deposits

Except for a research unit at the Faculty of Medicine, all 66 research labs of the University of Lille are represented on the HAL repository. However, only 16 labs (24%) have their own collection, while 49 (74%) have but an institutional identifier which allows to link to related documents and metadata from their researchers. As figure 1 shows, the collections of research labs in arts, social sciences and humanities are significantly overrepresented, while there is no collection from labs in medical science and public health.

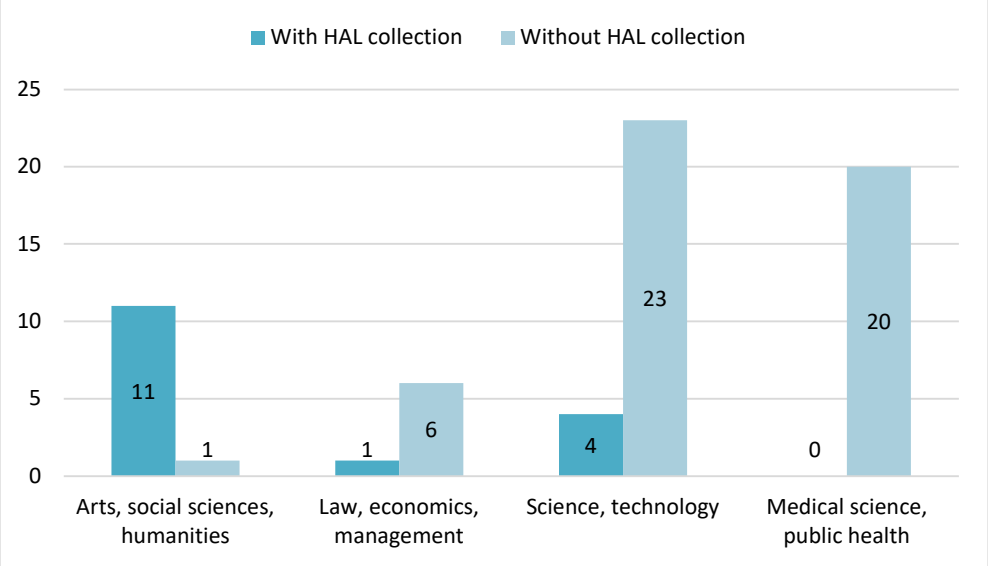

Figure 1. Number of laboratories with and without a collection on HAL (N=66 research labs)

This difference between scientific domains is even more significant on the level of deposits, i.e. the total of deposited documents and records without documents. The 66 labs of the University of Lille have 41,701 deposits on HAL; 26,158 deposits (63%) are produced by the 16 labs with a HAL collection (24%) while 15,543 deposits (37%) are produced by the other

[5] Accès unifié aux référentiels HAL https://aurehal.archives-ouvertes.fr/structure/index and index of research units https://hal.archives-ouvertes.fr/browse/structure (accessed June 10, 2019)
[6] Index of collections https://hal.archives-ouvertes.fr/browse/collection (accessed June 10, 2019)
[7] In the following, "document" means deposited item with full text, "record" means deposited metadata without full text, "deposits" means both documents and records.

50 labs without collections (76%). As figure 2 shows, the most significant differences are the distribution of deposits in art, social sciences and humanities (nearly no deposits outside of collections), in law, economics and management and in medical science and public health (both domains with few or no collections and a higher number of deposits outside of collections).

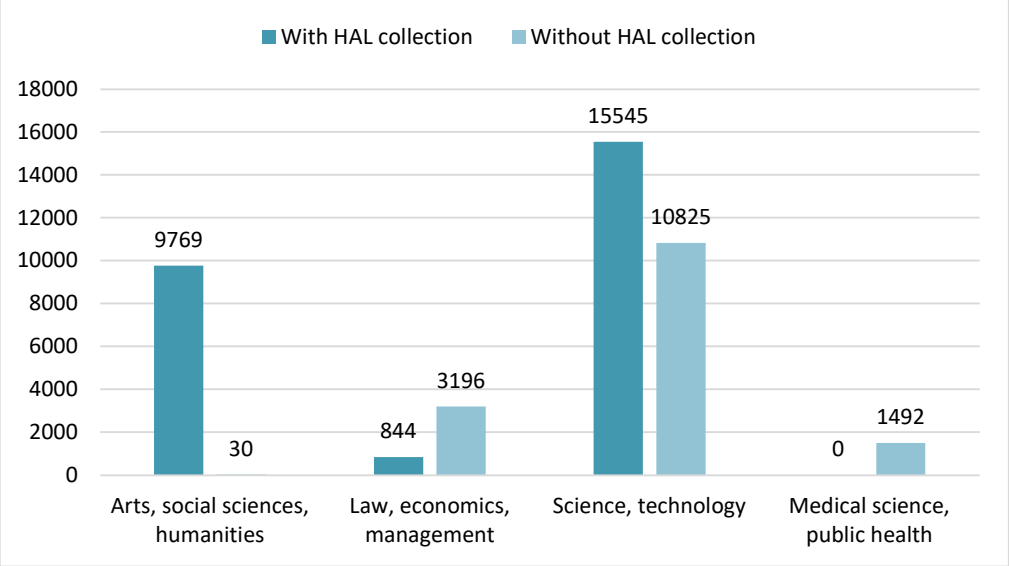

Figure 2. Number of deposits of laboratories with and without a collection on HAL (N=41,701 for all 66 labs)

The relationship between the creation of a collection on HAL and the number of deposits is significant. As figure 3 reveals, except for medical science which is without any collection on HAL, the median number of deposits per research lab is significantly higher for those with a collection than for those without (in brackets: only one lab). For all labs of the University of Lille, the median for those with a HAL collection is 764 deposits, i.e. 50% of the labs with a collection on HAL have deposited more than 764 documents and/or records. For those without a collection on HAL the median is 57 deposits, i.e. more than ten times lower. Figure 3 shows the situation for the four scientific domains.

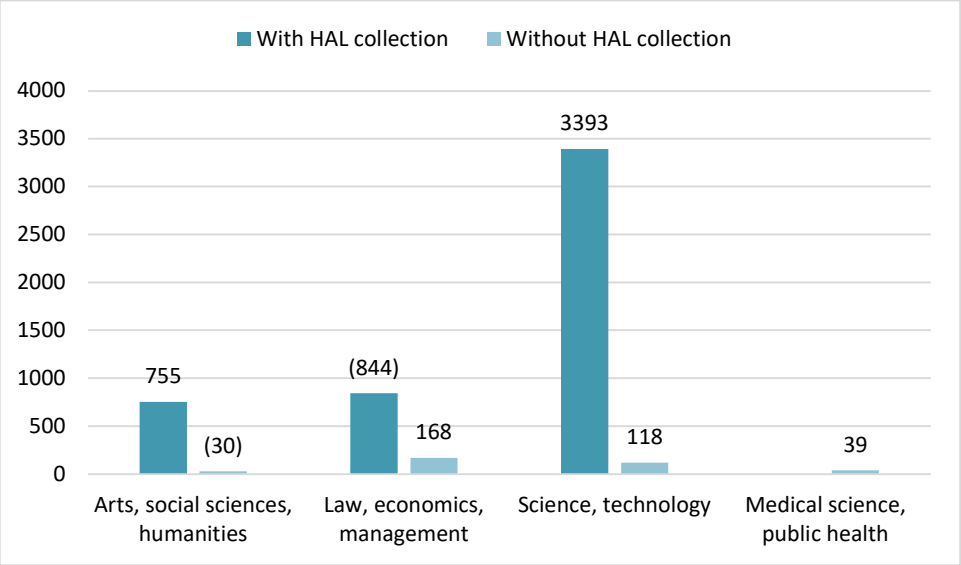

Figure 3. Median number of deposits per laboratory (N=66)

The high median number of deposits in the domain of science and technology is the result of the strong, institutional commitment to open access by two large research structures on the

Lille campus, i.e. CRISTAL in the field of applied computer science and IEMN in the field of electronics, microelectronics and nanotechnology.

Documents and records

As mentioned above, the HAL repository contains two types of deposits, i.e. documents (with metadata) and records (metadata without documents). 32,247 deposits of the Lille laboratories are records without documents (77%) while 9,454 deposits are documents (23%). This distribution is rather similar to the overall distribution of the HAL deposits, even if the part of deposits with the document is lower at Lille than the general average (figure 4).

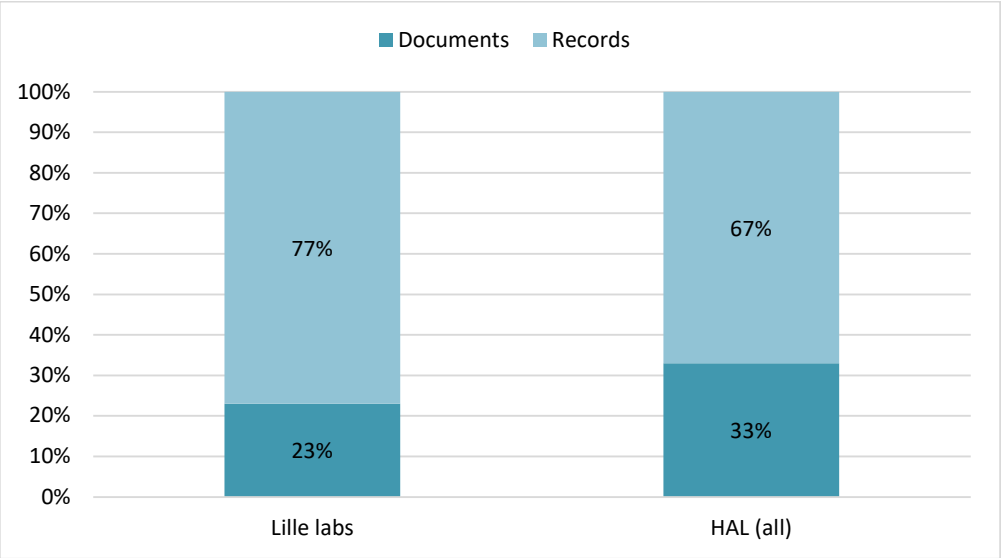

Figure 4. Documents and records of the Lille labs (N=41,701 deposits)

The numbers of deposits with and without full text are weakly correlated (r=.32).

The differences between the research domains are not significant (about 20% documents and 80% records), except for the small number of deposits from medical sciences and public health where half of the deposits are documents (figure 5).

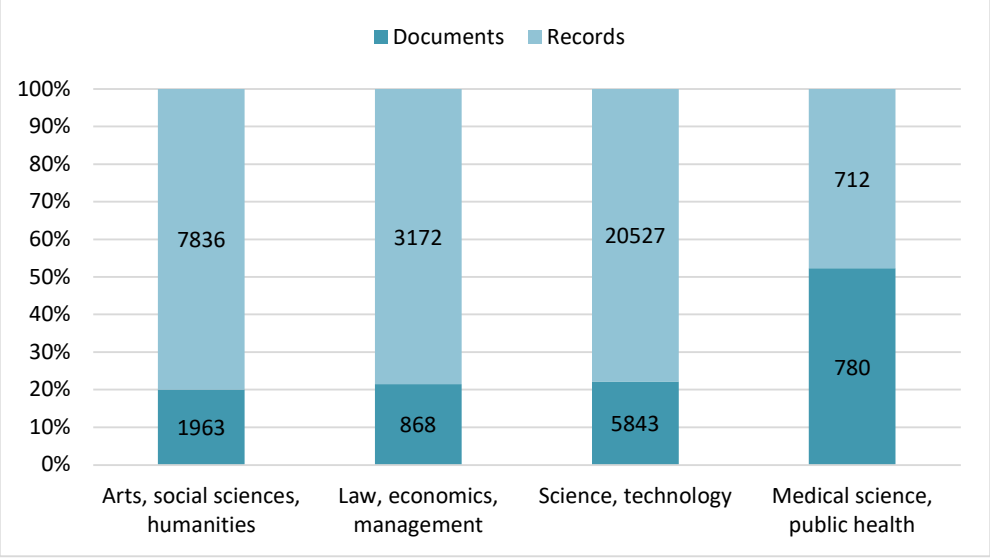

Figure 5. Documents and records per domain (N=41,701 deposits)

Now, what is the difference between the laboratories with and without collections on HAL, if there is any? The overall difference is not very significant: all collections together contain

21% documents, while the part for the labs without collections is slightly higher at 25%. However, there are some interesting differences between domains, as figure 6 shows.

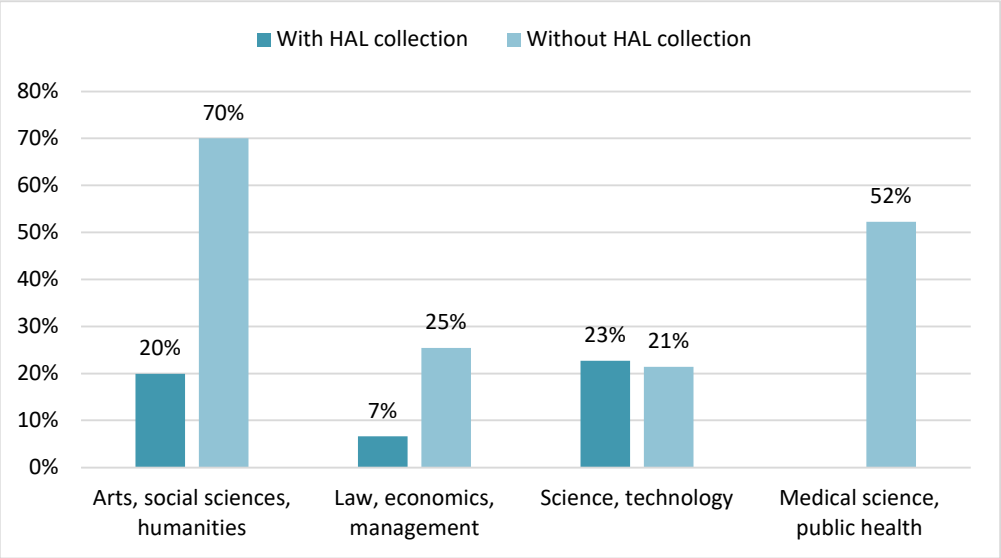

Figure 6. Part of documents (in %) of all deposits, per domain (N=41,701 deposits)

The collections of the research labs in arts, social sciences and humanities and in law, economics and management contain a relatively large part of records without documents, compared to the deposits from those labs without collections. At first sight this may appear paradoxical; yet, the explanation is easy (see below): when a research lab creates a collection on HAL, it probably will use the collection to make the academic production of its members visible, and this often means, to deposit records without the text or data files.

Grey literature

The HAL repository indexes 18 categories of publications, unpublished papers, academic works and research data. Some categories are clearly "white" or commercial literature (e.g. journal articles, books or book chapters), others can be described as grey literature (e.g. preprints, reports or dissertations) while other categories are mixed (e.g. conference papers), borderline (e.g. posters) or no literature (e.g. image files). Therefore, we didn't try to determine the exact number of grey documents among the deposits but we limited ourselves to evaluating some representative categories. Figure 7 shows the distribution of the selected categories, with their numbers and percentages; the most important categories of the deposits are journal articles (42%) and conference papers (communications) (33%), followed by book chapters (9%). Together, the selected categories represent 90% of all deposits from the Lille laboratories (N=37,546).

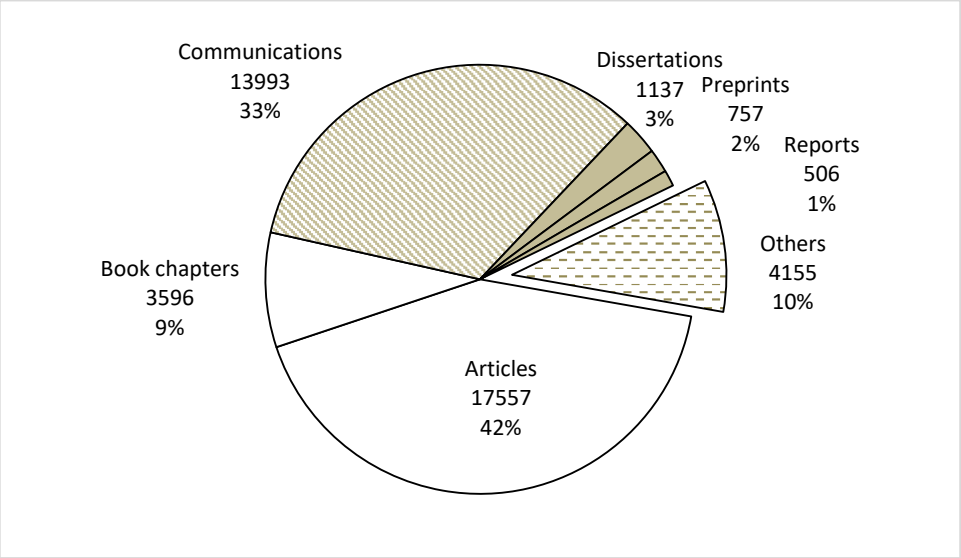

Figure 7. Deposits of selected categories (N=41,701)

Including conference papers (communications), the share of grey literature is 39%; without conference proceedings, grey literature represents 6% of all deposits. The problem with conference papers is that some of them are published in serials or books published by regular publishers while others are just PowerPoint presentations and will never be published, and it is difficult to say which percentage is really grey and which is not.

The next figure confirms the difference between conference papers on HAL and the other grey items. Figure 8 shows the relative share of documents and records (deposits without documents) for each category. While for most of the book chapters, communications and journal articles the full text is missing, 69% reports, 78% preprints and nearly all dissertations have been deposited with the document file.

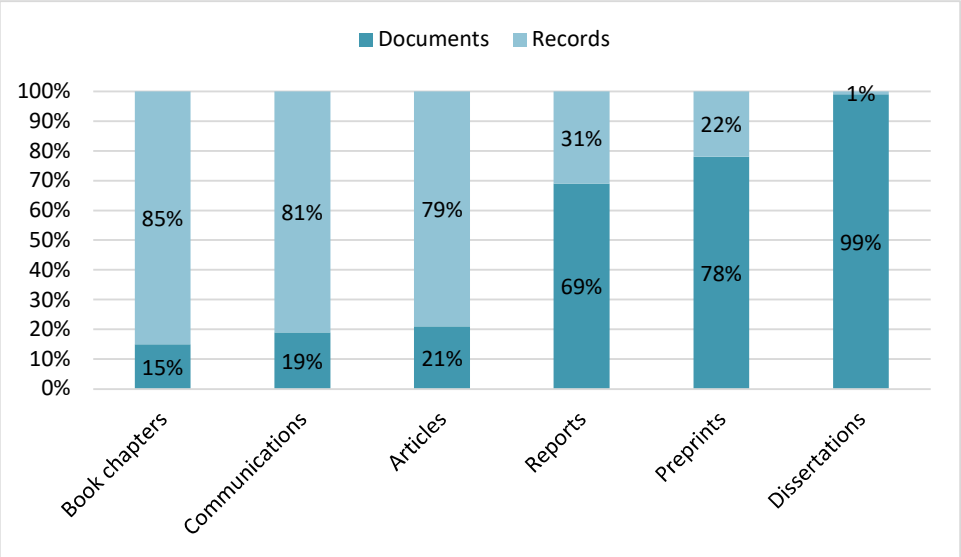

Figure 8. Records and documents per category (in %, N=37,546)

29% of the grey items is open access; without the communications, the part is 86%. For the "white" items (book chapters and articles), the percentage in open access is 20%.

Figure 9 shows a significant correlation between the number of grey deposits (preprints, reports, dissertations, conference papers) and the other items (articles and book chapters), with r=.84.

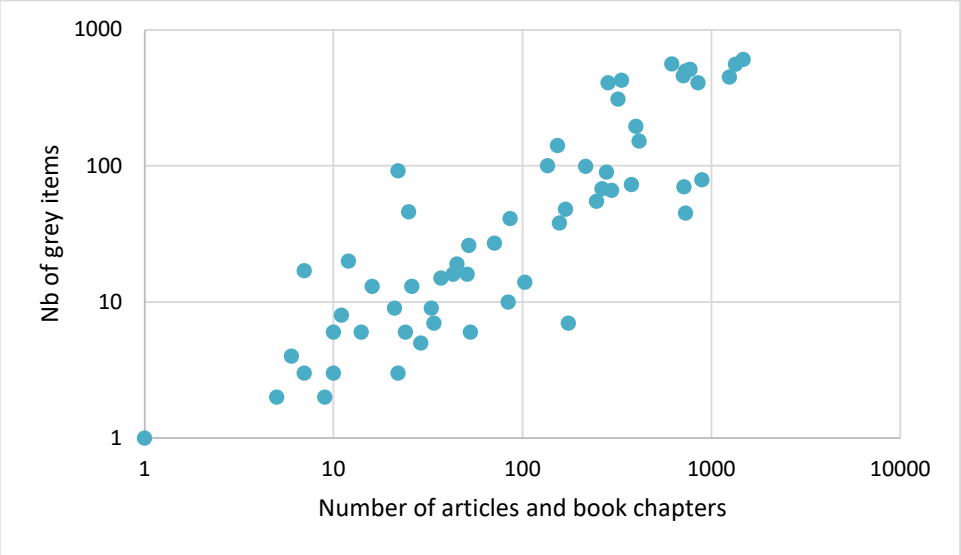

Figure 9. Correlation between grey and other deposits (N=66 labs)

It seems that the researchers or the technical staff who deposit the documents or create the metadata do not distinguish between different document types or prefer one or another. The difference is just that there are in average 3x to 4x more articles and chapters than grey items. Also, we cannot identify any significant differences between labs with and without collections, or between scientific domains.

The next figure shows the strong relationship between grey items and the total number of deposits (figure 10). In order to compare these statistics with former results (Stock & Schöpfel 2009), we calculated the z-scores for both variables.

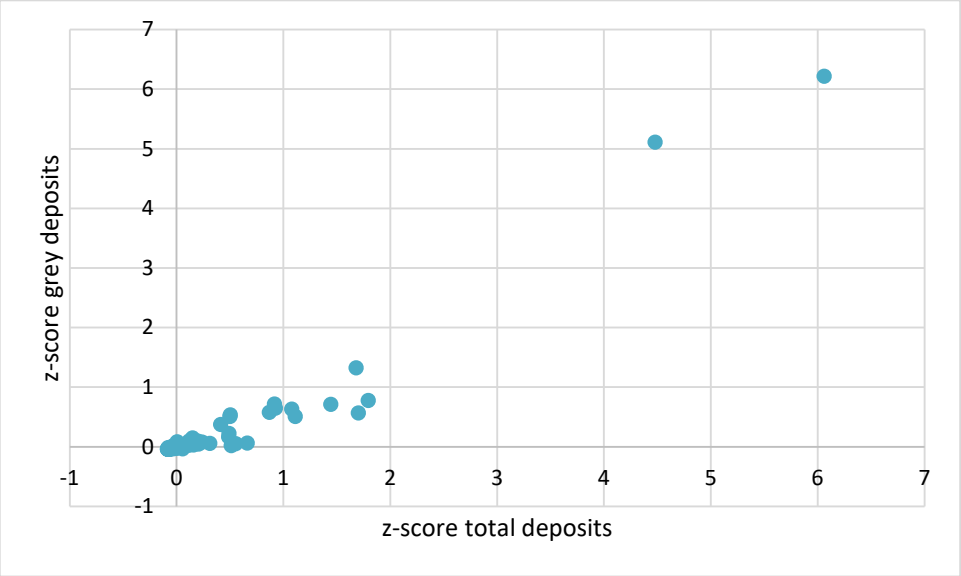

Figure 10. Grey deposits and total number of deposits (z-scores, N=66 labs)

The correlation between both variables is very high (r=.96). The higher the total number of documents, the higher the number of grey items. The two labs with the highest number of deposits are from engineering and informatics and have both created a collection on HAL. But, as above, we can't identify significant differences between labs with and without collections, or between scientific domains.

Clusters of laboratories

Finally, we'll try to distinguish different groups of laboratories regarding four variables: the total number of deposits, the degree of openness (deposits with full text), the existence of a collection, and the number of grey deposits.

Figure 11 compares the total number of deposits with the percentage of open access, i.e. of documents deposited with their full text.

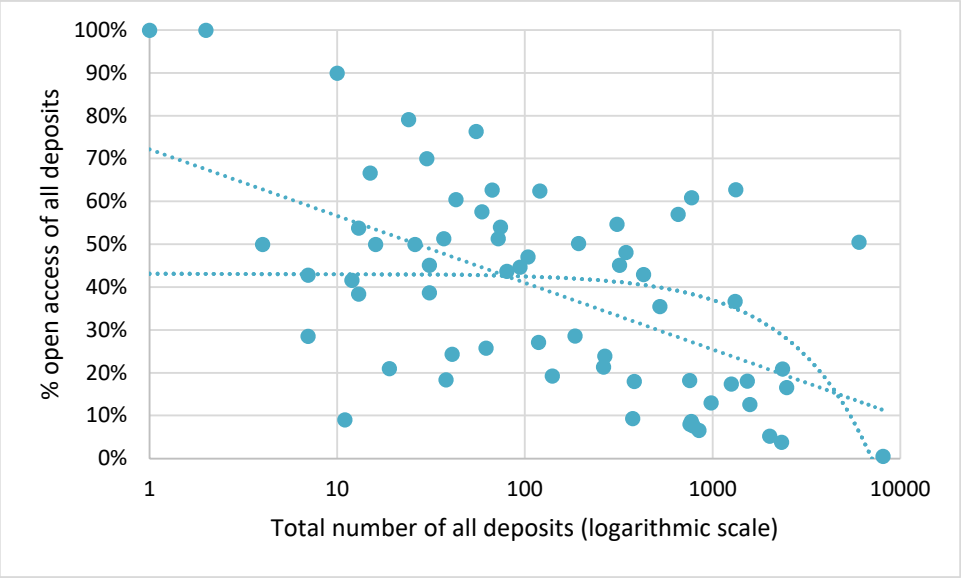

Figure 11. Total number of deposits and % open access (N=66 labs)

Figure 11 shows a weak negative correlation between the total number of all deposits (documents and records) and the percentage of documents in open access (r=-.34). In other words, we can observe a weak tendency in that the higher the total number of documents and records, the lower the percentage of freely accessible documents.

- Cluster 1. More than half of the laboratories (N=38) have less than 100 deposits on the HAL platform. Except for two, they did not create a collection on HAL. Probably, these laboratories do not have any significant strategy regarding open access and repositories, and the deposits are due to the scientists' personal choice, without "institutional curation".

These laboratories are clearly visible on figure 12 which presents the same figures but limited to those laboratories without a HAL collection.

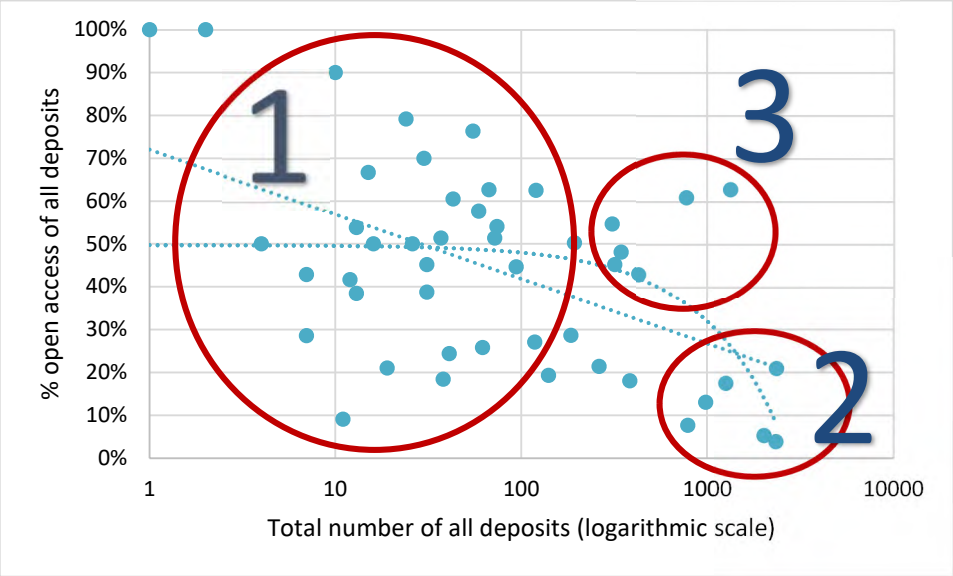

Figure 12. Total number of deposits and % open access for labs without HAL collection (N=50 labs)

Figure 12 shows two other groups.

- Cluster 2. A small group of laboratories (N=6) have a relatively high number of deposits (>700) but only less than 20% provide open access to the full text.
- Cluster 3. Another small group (N=6) have a higher number of deposits (>300), with more than 40% documents in open access.

The next figure shows the results for those laboratories which created their own collection on the HAL platform (figure 13).

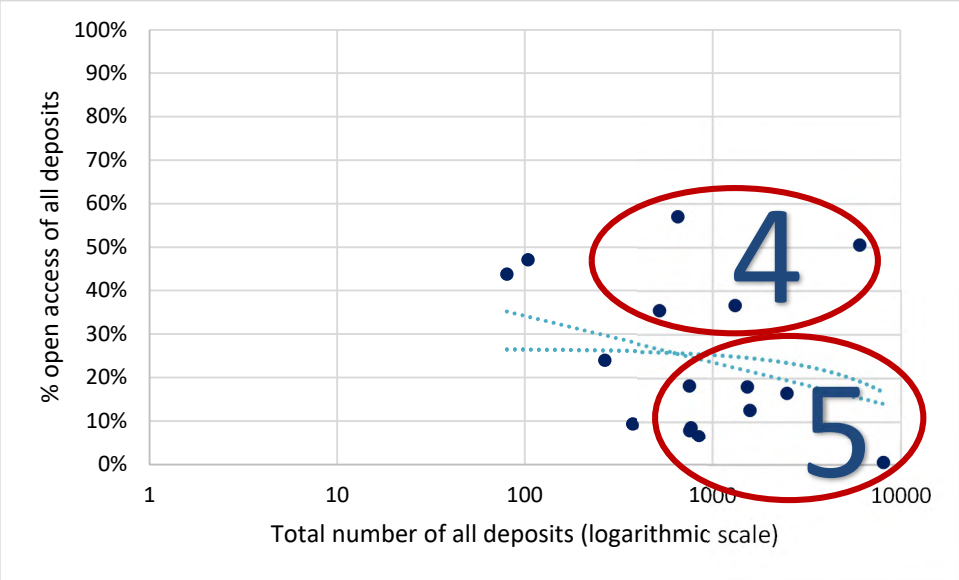

Figure 13. Total number of deposits and % open access for labs with a HAL collection (N=16 labs)

Following figure 13, we can distinguish two groups of laboratories.

- Cluster 4 (N=4). Four laboratories have a relatively high number of deposits (>500) and a percentage of open access above the average (>35%).
- Cluster 5 (N=8). A fifth group consists of laboratories with a large collection (>700 deposits) but a small percentage of open access (<20%).

As mentioned above, there are nearly no laboratories with less than 100 deposits.

Discussion

The scientometric assessment of the HAL deposits produces a lot of data, and the information based on these data may appear complex and difficult to understand. We'll try first to synthesize some significant results and then discuss them in terms of different strategies and policies. The main results:

- All research labs of the University of Lille are represented on the national HAL repository, except for one medical unit. Together, they have 41,701 items.
- One out of four labs have created its own, customized collection on the HAL server (24%).
- Together, these labs account for 63% of all items. The median number of items is higher for labs with collections than those without.
- Most collections have been created by research labs in arts, social sciences and humanities.
- The part of grey literature is 39%; most of these grey items are conference papers.
- The number of grey deposits is strongly correlated with the total number of deposits.
- 23% of the deposits are open access, the rest is metadata.
- This percentage is higher for grey literature (29%) than for articles and books (20%); without conference papers and presentations, this percentage is much higher (86%).
- Regarding the part of open access, there is a weak tendency in that the higher the total number of deposits, the lower the percentage of freely accessible documents.

The creation of a "lab collection" on the national repository HAL is a political and strategic decision to expose the scientific production of the laboratory's researchers elsewhere than on the laboratory website, on individual web pages or on the institutional repository. Often, this decision is part of a larger strategy to increase the visibility, outreach and impact of the laboratory's research results, which is important and relevant for individual and institutional evaluation, for funding, and for networking and cooperation.

In the following, we'll try to provide some possible explanations for the observed results.

Institutional policy

Institutional policy, i.e. an explicit and assumed open access strategy, can explain one part of the results, especially the overrepresentation of arts, social sciences and humanities. The Lille campus of social sciences and humanities (the former Lille 3 University) decided a couple of years ago to launch its institutional repository as a university portal on the HAL server and encouraged the campus-based research units to create their own laboratory collection on HAL. This encouragement included not only helpful advice and assistance but also, partly, the creation of metadata records.

There was no similar approach to open access in the other former Lille universities Lille 1 (science and technology) and Lille 2 (medicine, law and politics); they did not launch an institutional repository neither on HAL nor elsewhere, and they did not foster the creation of laboratory collections on HAL. This may explain why still today, nearly two years after the merger of the Lille universities, we can observe large disciplinary differences regarding the number of size of collections and deposits.

On the national level, the French national research institute for digital sciences (INRIA) has been promoting for a couple of years now an open access policy and has launched its own institutional repository on HAL[8], with today more than 60,000 documents, mostly conference papers. The INRIA scientific output is systematically entered into HAL and the INRIA researchers are encouraged to deposit their documents on HAL. One the INRIA regional institutes is located in Lille, and one of the INRIA research laboratories (CRISTAL) is based on the university campus, which explains the large collection of computer sciences

[8] HAL-Inria https://hal.inria.fr/INRIA

(14% of all Lille deposits are from CRISTAL) and also the relatively high part of documents with access to the full text (51%).

Research laboratories

Research laboratories have quite different ways to deal with the HAL repository, and up to now they are more or less free to decide if and how to manage their publications on HAL or elsewhere. To simplify, we can distinguish at least three different approaches:

No strategy (58%): no collection on HAL, and a low number of deposits (<100) or a high percentage of documents in open access (>50%), which probably indicates individual practice (=deposit of publications by the authors) but no collective, coordinated action. This is the cluster 1 mentioned above.

Reference management (29%): a higher number of deposits (>100) but a low percentage of OA (<25%). Half of these laboratories have more than 1,000 deposits on HAL, up to 8,000, well above the average. Half of them have a collection on HAL, the others have not. Probably, at least those with the collection but may also be those without. These laboratories make use of HAL for the monitoring of their scientific output, helpful for reporting and follow-up and especially for the national research assessment exercises. For instance, the Lille IEMN laboratory in civil engineering (mechanics) which represents 19% of all HAL deposits of the University of Lille is a pluri-disciplinary federation of 12 research units, affiliated with different research organisations and the University of Lille. Obviously, this federation makes use of the HAL repository as a public and free reference management tool. In fact, only 1% of the 8,103 items from IEMN are documents, the rest of the items (99%) are metadata without access to the full text. This makes no sense for an open repository, but this makes sense if the repository is diverted for reference management and output monitoring. Clusters 2 and 5 are part of this category.

Showcase (9%): a collection on HAL, a higher number of deposits (>100) and a higher percentage of open access (>30%). These laboratories have decided to create a collection, and obviously they make efforts to deposit their output and to increase the part of freely available documents on HAL. Obviously, their use of HAL is to show their papers and to provide a representative catalogue of their production. The impact of community seems evident – the laboratories are from psychology, literature, informatics, astronomy and information science (GERiiCO). These laboratories are mainly in cluster 4.

A small group of three laboratories (physics, medicine, law/political science) appears to be quite similar to this last group but did not create a collection on HAL. They are in cluster 3.

The reason to take one decision or another can be motivated by various factors, e.g. institutional policy or community practice, and also personal awareness and attitudes towards open access; sometimes the lack of human resources – one part of the university laboratories do not have their own librarians – may be a major obstacle to moving forward, i.e. creating and curating a HAL collection.

We added in brackets an estimated percentage. However, more information is needed to confirm the different approaches and the underlying reasons and objectives.

Disciplinary practice

Scientific disciplines do not adopt the new open science policy at the same speed and in the same way. The European Open Science Monitor, for instance, shows large differences between fields of science and technology regarding the percentage of open access publications[9]. Disciplinary practice and research culture may explain, for instance, the low

[9] https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science/open-science-monitor_en

percentage of OA deposits of chemistry laboratories (6%), sociology (19%) or law (37%) compared to computer science (50%), astronomy (61%) or mathematics (63%).

The CRISTAL collection in computer science shows another community effect beyond the institutional strategy of valorisation and evaluation. More than other academic communities, the researchers in computer science disseminate their results by means of conference papers. More than half of the CRISTAL collection is composed of conference papers, and more than half of these papers are available in open access, which is probably due to a combined effect of institutional strategy and disciplinary practice.

Grey literature

About ten years ago, we assessed the development of open repositories in France, particularly of institutional repositories (Stock & Schöpfel 2009, Schöpfel & Prost 2010). The three samples (and the sampling methods) are too different to allow for a direct, statistical comparison; however, it is possible to make some general observations.

First, the part of grey literature in the Lille sample is higher than in the national samples ten years ago. It was then between 16% and 18%; in our new study it is 39%, more than two times higher. This difference is essentially due to conference proceedings.
The same studies provided some data about the distribution of the different types of grey literature (figure 14).

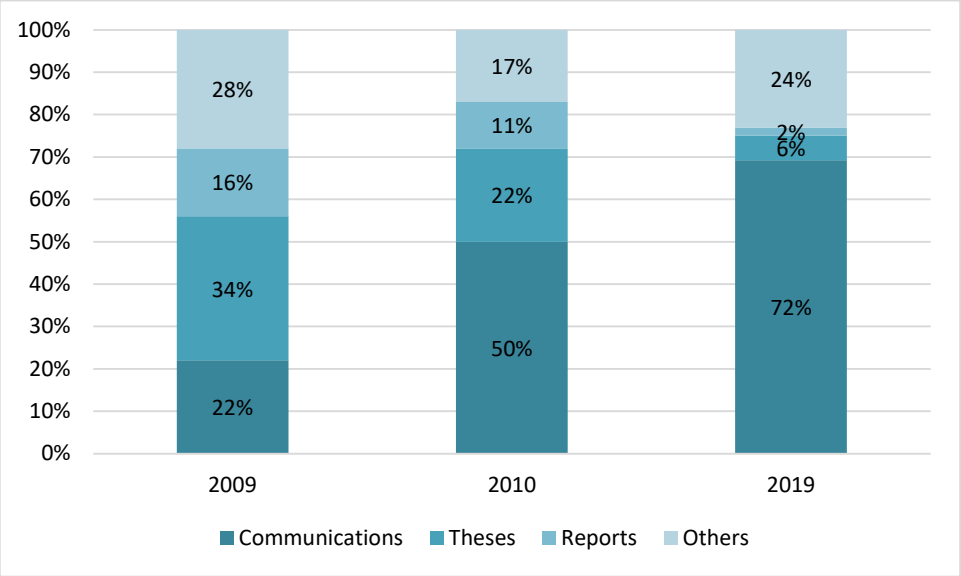

Figure 14. Distribution of grey literature categories in three samples (in %)

Again, because of the different sampling methods and characteristics, it is not possible to describe the differences in terms of development over time. Yet, it seems possible to say that the Lille sample is particular insofar as it contains a relatively large part of conference papers, as compared to theses and reports. The reason is probably the importance of the CRISTAL collection in informatics, with many conference papers, together with a high number of metadata records in civil engineering (IEMN) and from two laboratories in chemistry. In other words, the reason is probably a combination of community practice and laboratory strategy.

Five years ago, we assessed the part of freely accessible items in terms of degrees of openness in an international sample of 25 large institutional repositories, together with 2,068,622 deposits (Schöpfel & Prost 2015). We made two observations.

First, even if the correlation between the repositories' size and their degree of openness was weak, all large repositories had degrees of openness below the median while those

repositories with higher degrees of openness (above the median) were smaller. As mentioned above (figure 11), the same observation applies for the Lille sample: we can observe a weak tendency in that the higher the total number of documents and records, the lower the percentage of freely accessible documents.

Second, the comparison between different types of documents reveals different degrees of openness, in a consistent way: except for conference papers, the percentage of freely accessible documents (open access) is higher for grey literature than for books or journals. Again, the same observation applies for the Lille sample (figure 15).

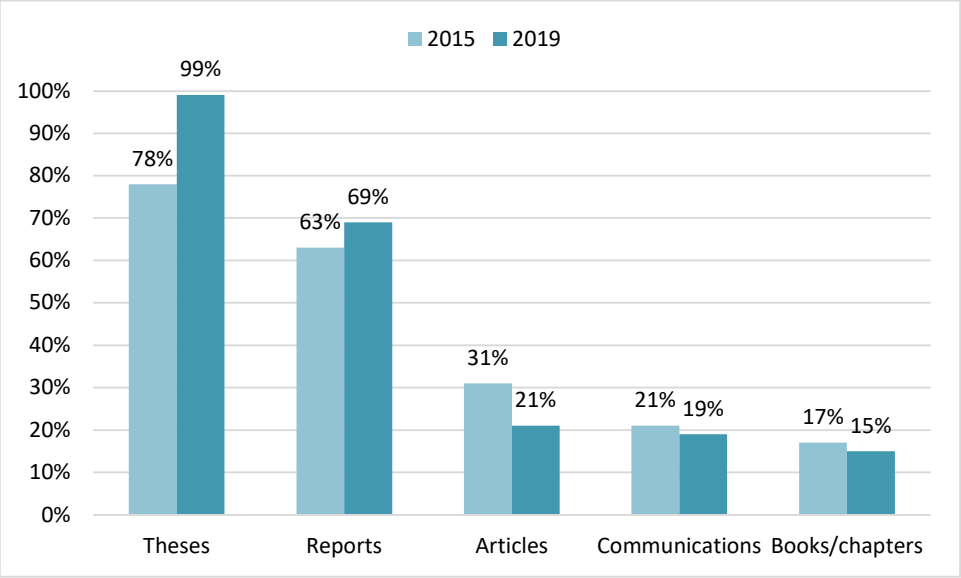

Figure 15. Degrees of openness for different document types

Again, we cannot make direct comparisons because of the differences of sampling, size and so on. But the similitudes are obvious. In the international sample of large repositories as well as in the collections and deposits of the Lille research laboratories in HAL, the degree of openness of theses and reports are significantly higher than of articles, books (chapters) and communications. The reason why in the Lille sample nearly all theses and dissertations are freely accessible (99%) is simple – up to now, HAL has not accepted the deposit of PhD theses without the full text. The explanation for the small percentage of conference papers in open access is more complicated. There are probably two reasons – many papers are published in (white) conference series or as special journal issues, and HAL does not consider the deposit of a conference presentation as a full text document but as a record with supplemental material.

Conclusion

The scientometric analysis of the deposits and collections from the University of Lille research laboratories provides rich statistical material and some insights into differences between document types, disciplines and laboratories. Grey literature represents nearly two out of five deposits, consisting mainly not only of conference papers but also of theses and dissertations, reports and other types, such as working papers, preprints and courseware. The degree of openness (% of open access) is significantly higher particularly for theses and reports than for articles and books, and also for conference papers.

The study provides a kind of static photo, taken at a given moment (Spring 2019) in a dynamic and quick moving environment. In fact, the situation may change quickly, for at least three reasons – local decisions (such as an institutional mandatory policy), national (and European) research policy with new laws and other rules, and new agreements with

academic publishers such as BioMed Central or Elsevier, allowing for automatic feeding of the HAL repository from the publishers' platforms.

In order to better understand the open access behaviours and strategies on the level of research laboratories, and to provide more insight into the impact of the global ecosystem of open science on the individual and collective decisions on the local level, more research is needed, and a different kind of research. For this reason, the GERiiCO laboratory is undertaking a new research project on laboratory collections and strategies on the HAL repositories, with a representative sample of the ten highest ranked French research universities, accounting for several hundred research laboratories, and applying a combined quantitative (scientometrics) and qualitative (surveys, interviews) methodology[10].

Acknowledgments

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Data availability

The dataset is available on EASY (DANS) at https://doi.org/10.17026/dans-xsq-bus7

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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.
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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Is the Production and Use of Grey Marine Literature a Model for Open Science?

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Abstract
Globally, grey literature is common. Large quantities of openly available grey literature have been generated since the latter half of the nineteenth century. It is a primary source of information used in many public policy and decision-making contexts, at all jurisdictional levels. In fact, public decision making and policy development would seriously falter today in the absence of such literature. Moreover, in some jurisdictions, legislation mandates transparent governance processes in which current research must be fully open. This lengthy experience with open practices in the production and use of grey literature offers insights to the open science movement.
In this paper, based on over fifteen years of interdisciplinary research, we demonstrate how open practices in the production and use of grey literature in marine environment science policy contexts could inform open science initiatives. The results from our numerous case studies about information use in decision-making processes, at local to global levels, address two conference themes, namely, the application of open science principles in promoting grey literature, and obstacles and challenges to such open access.
Information pathways in coastal and ocean management are complex and involve many actors (including researchers; managers; policy analysts; members of industry, professional associations, community groups, and non-governmental organizations; politicians; and citizens generally). Open grey literature offers numerous advantages in these settings, as an extensive variety of information needs, types, and formats are prevalent. Open grey literature can also be distributed without restriction by individuals and organizations. It can now be shared globally with ease, which is particularly beneficial to developing countries often unable to afford commercial information sources.
However, while produced and used widely, grey literature also presents challenges that open science also encounters. Openness, i.e., open access, does not ensure awareness and it does not automatically equate to usability by a wide variety of audiences. Because grey literature is assumed to be largely accessible, often limited attention is focused on promoting awareness or communicating information in broadly understandable terms. Furthermore, the massive quantity of literature can contribute to its seeming invisibility. The multiplicity of formats and content can result in perceptions of limited value of grey literature. Even though the information may be rigorously peer-reviewed, in today's information-saturated environment, open-access may be equated with uncertain quality.
Our research on the use and influence of grey literature in marine environmental decision making highlights the benefits and challenges of open access information. Thus, our findings may be particularly informative to current efforts to advance open science principles globally.

We live in a paradoxical information world. To say that we are awash with information is a substantial understatement today. Everyone, from private citizens to public decision makers, regularly encounters an overabundance of information and must implement strategies and filters to select or deflect incoming information (Walgrave & Dejaeghere, 2017). Barriers are frequently established to mitigate the deluge of information. In contrast, advocates of open science have recently been promoting *greater* access to information (Open science, n.d.; Open science, 2019; Vincente-Saez & Martinez-Fuentes, 2018). As the name implies, open science initiatives emphasize unrestricted availability to the data and information emanating from research activity. For several years, leading science journals, e.g., *Science,* have

required authors to submit the raw data generated by their research, for online publication as a supplement to research papers. Granting councils often require the same practice in their reporting requirements. Impediments preventing access are being removed by publishers today or are not set in place at all in new research work. In short, coping mechanisms are established to limit or obstruct information flow on the one hand, while on the other hand, mechanisms are being implemented to facilitate access to the original data.

As matters of concern, information overload and open science are not new phenomena. Both have existed in some form since at least the fifteenth century (Blair, 2010; Muffler-Wille & Charmantier, 2016; Ogilvie, 2003; Rosenberg, 2003; Tidline, 2002). However, the attention both are receiving currently is a reflection of the very rapid growth in the volume of data and information over the last half-century and major advances in widely available technologies that facilitate production of scientific data, e.g., faster computers, automated instruments, satellites, as well as widespread distribution and access to information (Allen & Mehler, 2019; Landhuis, 2016).

The history of science demonstrates that scientists and their professional associations have long been champions of wider access to research data and information, as well as experiencing at times the opposite pressures to control and manage access for complex reasons (Vermeir & Margócsy, 2012). The recent literature on the subject of open science illustrates numerous aspects on this topic: open access, open data, open reproducible research, open science evaluation, open science policies, open science tools, among others (e.g., Méndez, 2019; Open science definition, n.d.). However, a consensus about the definition of open science has not yet coalesced around any one of these terms. The organizers of this conference adopted the definition of open science as “the movement to make scientific research, data and dissemination accessible to all levels of an inquiring society” (following the explanation by Woelfle, Olliaro, and Todd (2011), now adopted by Wikipedia (Open science, 2019)). A recent systematic review of literature considered 75 studies on the subject and proposed the following definition: “Open science is transparent and accessible knowledge that is shared and developed through collaborative networks” (Vincente-Saez & Martinez-Fuentes, 2018). This succinct characterization of open science highlights two facets, collaborative knowledge development and wide accessibility of the results, whereas the previous definition involves widespread behavioural change that supports accessibility. Open science should consider all three descriptors in its definition.

In our collaborative research on questions about information production and its use at the science-policy interface in marine environmental and fisheries contexts (www.eiui.ca), we have observed and documented the extensive use of grey literature in decision-making processes. Collaboration in knowledge generation and numerous efforts to present information in meaningful ways to diverse audiences is evident in our findings. Large depositories of openly available marine data and information, published in various forms of grey literature, are generated specifically to support the operations of governments at all jurisdictional levels (MacDonald et al., 2013).

Today, advances in information technologies are contributing to a blurring of distinctions between some forms of grey literature and primary research literature. The publication and distribution of both now often follow similar practices. Our research has shown that the production and use of grey literature in marine environmental science-based decision-making contexts can inform open science initiatives. The results from our numerous case studies, at local to global levels, address two conference themes: the application of open science principles in promoting grey literature, and the obstacles impeding open access. Hence, this paper has two objectives: to illustrate how research about grey literature can provide insights for the open science movement, and to suggest that a sharp distinction between grey and primary literature is becoming less relevant as open science develops in theory and practice.

The Environmental Information: Use and Influence Research Program

For almost two centuries, governments in many nations have established research bodies to conduct scientific research, whether internal with a national focus or externally in collaboration with other countries (MacDonald & Soomai, 2019; Oppenheimer et al., 2019). Created for a variety of reasons (economic, cultural, environmental, etc.), the large number of research bodies found around the world have produced a "spectrum of types of research output, including print and digital formats, largely due to the diversity of audiences that governments aim to reach" (MacDonald & Soomai, 2019, p. 29). Substantial financial resources have been required to generate this volume of research literature and related publications emanating from the governmental and intergovernmental organizations. As a measure of accountability alone, governments often wish to determine whether various types of data and information have been used and to what impact (Wells, 2003).

The initial research conducted by the interdisciplinary Environmental Information: Use and Influence research program (www.eiui.ca), in which we work at Dalhousie University, was prompted by the question of accountability: were major international reports on marine pollution and the state of the oceans ever used? That first study (Cordes, 2004; MacDonald, Cordes, & Wells, 2004), which confirmed that the reports in question were widely cited, took us into explorations of the sphere of the science-policy interface and numerous case studies of information production and use by local and national governmental bodies, international intergovernmental organizations, and environmental non-governmental organizations. Our research findings have been presented at earlier iterations of this grey literature conference, to many other conferences in North American and Europe, and in oral briefings to governmental and non-governmental organizations. In addition, we have published our research results in marine policy and ocean management journals, information studies journals such as *The Grey Journal*, and in technical reports and a recent monograph (see www.eiui.ca; MacDonald et al., 2016).

Our research has shown that information pathways in ocean and coastal management are complex and involve many actors (including researchers; managers; policy analysts; members of various industries, professional associations, community groups, and non-governmental organizations; politicians; and citizens generally). Grey literature, much of which is designed for open access, is widely deployed for information transfer and communication in marine and ocean governance settings. The flexibility of grey literature publication options responds well to an extensive variety of information needs, witnessed by the numerous types and formats that are commonly prevalent. Grey literature is usually distributed without restriction by individuals and organizations and can now be shared globally with relative ease in the internet age. This development is particularly beneficial to developing countries often unable to afford commercial information sources. In our recent book about different dimensions of information use in integrated coastal and ocean management, we highlighted the significant roles that information published as grey literature fulfills in current management practices (MacDonald, Soomai, De Santo, & Wells, 2016).

Grey Literature as a Model for Open Science Practices

The production and use of grey literature, by many actors in marine management decision making over past decades, illustrates six characteristics that advocates are calling for in open science (Table 1). Research that draws on experience with grey literature can inform the application and promotion of these characteristics in open science initiatives.

Table 1. Grey Literature as a Model for Open Science

Features of Grey Literature Relevant to Open Science
Usability of the Information
Thorough Peer Review
Designed for Diverse Audiences
Synthesized Reports for Public Policy Contexts
State of the Environment Reports
Fisheries Scientific Reports
Reports and Documents Prepared by Environmental NGOs
Environmental Assessments and Impact Assessments
Data Published as Open Access
Accessible to Public Users

1. Usability of the Information

In 2002, a group of researchers in the United States published a report that identified three key features of information that ensures its usability, namely salience (or relevance), credibility, and legitimacy (Cash et al., 2002). Grey literature is used in many marine management decision-making processes because it displays these key characteristics of useful information. We know that governmental organizations at national, regional, and international levels rely heavily on using their own publications in decision making. One of us observed this use during a career with the Canadian government as a marine environmental scientist (Wells, 2016). This phenomenon was also seen during a study of major prolific producers of fisheries information: Fisheries and Ocean Canada (DFO), the national ocean governance authority; Northwest Atlantic Fisheries Organization (NAFO), a regional fisheries management body; and the Food and Agriculture Organization of the United Nations (FAO) (Soomai, 2017a; 2017b).

DFO in Canada and NAFO at the international level have well-defined processes for producing, communicating, and using information. Scientific information produced by scientists, often commissioned for specific decision-making purposes, is the primary source of advice. The fisheries science publications (grey literature) produced by employees of these organizations are preferred in policy-making as the information presented in this manner is timely, i.e., the publications are produced in annual cycles, and is relevant because it is in direct response to the fisheries management needs and questions. The scientific advice is prepared in response to specific managerial problems, and undergoes rigorous internal peer review, thereby resulting in the production of credible information available for immediate use in fisheries decision making. The decision processes also involve external stakeholders, e.g., the fishing industry, NGOs, and academic researchers, which reinforces the legitimacy and role of the information in the broader ocean governance process.

2. Peer Review

Peer review is widely viewed as an essential quality control mechanism. Peer review methods have been evolving over the past half century, and although none are entirely fool-proof, and some are contested (Bohannon, 2013; Haider, & Åström, 2017), peer review practices are considered essential in publishing credible research results (e.g., Baldwin, 2018; Lee & Moher, 2017).

The credibility of many research reports released as grey literature depends in large measure on the application of peer review. For example, for 50 years, the Joint Group of Experts on Scientific Aspects of Marine Environmental Protection (GESAMP), a leading international scientific advisory body, has been publishing substantial reports about the condition of the oceans (MacDonald, Cordes, & Wells, 2004; Wells, Duce, & Huber, 2002). GESAMP has published over 100 reports, including major periodic assessments, such as *The State of the*

Marine Environment (No. 39) (GESAMP, 1990) and *Protecting the Oceans from Land-Based Activities* (no. 71) (GESAMP 2001). Each report is drafted in one of the working groups. Report No. 64 (GESAMP, 2002), for example, was the result of six years of work by the thirteen member Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships. Each draft report is subjected to extensive review, by both external reviewers and detailed, page-by-page consideration by GESAMP members in the annual sessions. Report No. 71, for example, lists over 90 individuals who had various roles in its preparation (GESAMP, 2001). The extensive and rigorous treatment of GESAMP's reports is an example of the degree to which this grey marine literature is peer reviewed before publication. Given the challenges of peer review sometimes faced by the move toward open science, e.g., prevalence of predatory journals with flawed to non-existent peer review (Bohannon, 2013), the review process practised by GESAMP could be an example for addressing this issue.

3. Designed for Diverse Audiences

In part because grey literature is not constrained by particular styles, formats, or communication channels, this literature offers considerable flexibility for creators to design information products for diverse audiences. Flexibility is important when decision processes encompass many stakeholder groups and end users. For example, our case study of the publications of the Gulf of Maine Council on the Marine Environment (GOMC), an international, intergovernmental organization involving two Canadian provinces, three American states, and the national governments of both countries, highlighted a diversity of information products. They include annual reports, brochures and posters, conference background papers, conference reports and workshop proceedings, fact sheets, technical reports, serials, journal articles, and abstracts (Cossarini, MacDonald, & Wells, 2014; MacDonald, Cordes, & Wells, 2007). This range of publications formats reflects the breadth of projects that the GOMC pursues and the span of audiences that it intends to reach in the multiple jurisdictions within its ambit. Flexibility in format is a benefit when a single project aims to engage researchers, environmental managers, policy makers, and the public. Such was also the case with the *State of Nova Scotia's Coasts Report*, which was released in two languages, print and digital formats, and as a 245-page technical report, a 21-page summary, and six four-page fact sheets. Publishing this variety was a deliberate decision to provide accessible and credible information to professional, government and lay audiences (Soomai, MacDonald, & Wells, 2013).

By designing information products for different stakeholders, whose capacity to understand scientific information varies, creators of grey literature can be successful in achieving transparency and accessibility to both professional and amateur audiences, both key elements in open science.

4. Synthesis Reports for Public Policy Contexts

Synthesis reports intended for use in public policy contexts are a common form of grey literature. The major synthesis reports produced by the Intergovernmental Panel on Climate Change (IPCC) are some of the most widely known, but its reports are only one of many such publications produced each year and freely accessible.

Numerous examples of synthesis reports can be drawn from our studies.

a) State of the environment reports

i) *The 2009 State of Nova Scotia's Coast Report* (see Soomai, MacDonald, & Wells, 2013)

ii) *The State of the Gulf of Maine Report* (see Soomai, MacDonald, & Wells, 2013)

iii) The *State of the Scotian Shelf Report* (see Ross, 2014; Ross & Breeze, 2016)

The rigorous and transparent methods by which these reports were prepared and distributed could inform open science efforts. For instance, a suite of methods (print and digital) was used to promote awareness and use of the respective reports and the methods were selected to reach various audiences (as described in section 3 above).

b) Fisheries scientific reports

Fisheries management organizations (e.g., DFO, NAFO, and FAO) rely heavily on their own reports (grey literature) to inform national, regional, and international fisheries management decisions and policy making (as described in section 1 above) (Soomai, 2017a, 2017b).

c) Reports generated by advisory working groups or committees.
Interdisciplinary working groups provide an important platform for multi-sectoral collaboration in integrated coastal and ocean management. Such collaboration facilitates knowledge creation and knowledge brokering at the science-policy interface. These processes can inform the development of criteria for effective working relationships to promote open science (Eck, 2017; Soomai, Wells, & MacDonald, 2011).

d) Reports and documents prepared by environmental non-governmental organizations (eNGOS). Environmental non-governmental organizations often operate between governments and many stakeholder groups. These eNGOs "translate" and synthesize scientific reports and documents into accessible publications intended to inform and engage stakeholders and governments. The eNGOs function as boundary organizations and their publications serve as boundary objects. This activity and the related objects could serve as an example to open science programs that wish to promote transparency and produce information that is understandable by "all levels of an inquiring society." (Cadman, 2017; Cadman, MacDonald, & Soomai, in review).

e) Environmental assessments and Impact assessments
Environmental and impact assessments are tools used by governments at all levels (sub-national to international) for assessing potential environmental anthropogenic impacts. Such tools are a prominent example of where grey literature is relevant to open science. For decades, impact assessment processes have used grey literature in strategic, project-based deliberations, often involving a wide range of interested parties (Sadler &Dusík, 2016). In some jurisdictions (e.g., Canada), recent legislation has explicitly embraced open science as a policy and a methodology for mobilizing the grey literature generated within such assessment processes for collective democratic deliberation (Government of Canada, 2018). For relatively undeveloped contexts, e.g., Arctic regions, such new open science policies will have important consequences for how grey literature is used in open deliberative forums, including involving Indigenous communities (Stewart, 2018). The field of impact assessment and its publications may increasingly offer valuable test cases for considering how such grey literature contributes to open science mandates.

5. Open Access to Data

Large quantities of data are frequently produced in marine environmental science research conducted by governmental and intergovernmental organizations, such as from long-term monitoring programs that produce data over lengthy periods (Oppenheimer et al., 2019). Prior to advances in digital technologies, data files were often published in technical report series. Currently, data are maintained in digital files accessible through the internet. For instance, the Gulfwatch contaminants monitoring program of the GOMC has assembled large volumes of data and communicated findings to policy- and decision-makers in the Gulf of Maine and Bay of Fundy regions of the Northwest Atlantic since 1991 (Chase et al., 2001; personal observations of Wells). The Gulfwatch program has been a flagship initiative of the GOMC and the data have been released as raw data files, data reports, data summaries, and papers published in peer-reviewed journals (Chamberlain & Wells, 2014). The Gulfwatch data have provided considerable evidence for other reports and new research initiatives (Chamberlain, Wells, & MacDonald, 2018; Elskus et al., 2019).

To support use of the growing availability of large data sets, mapping tools such as digital coastal atlases have become important for information dissemination (O'Dea, Haddad, Dunne, & Walsh, 2011). Digital coastal atlases, as publicly available, web-based interactive tools, are increasingly valued by managers and other information users for their data visualization features. Participants in our study of marine atlases in Canada, Scotland, and

the United States stated that coastal web-based atlases allowed them to be more confident about their decisions, since they were able to access and analyze a large volume of credible data in a centralized location (McLean, 2014). Because the data in the atlases are publicly available, the managers were able to explain their decision-making processes more easily to the public. Digital atlases offer another example of grey literature practices that model the expectations of open science.

6. Public Users of Grey Literature

Our research about information intended largely for environmental decision-making activities shows that the costs associated with the production of grey literature are usually borne by governmental and non-governmental organizations. The publications are freely available, making the information accessible to many levels of society and thereby encouraging engagement in public policy decision processes. Assuming the content is understandable to a diversity of audiences, accessible grey literature promotes a community understanding of science. Science literacy is also stronger when availability is not restricted by paywalls or intellectual property constraints. Furthermore, accessible information products based on available scientific literature are a key means by which members of the interested public gather and disseminate marine knowledge, often later used in various aspects of the marine governance process (e.g., ocean literacy surveys, project consultations, legislative critique, community advisory committee participation, etc.). These observations are based on our recent study of place-based coastal values of members of a New England (USA) coastal community, pointing to the importance of understanding coastal perceptions (Ryder-Burbidge, 2017) and in a recent analysis of communication strategies employed by individual and non-governmental organization science communicators using two social media platforms (Martin, 2018; Martin & MacDonald (in review)). Free access, which is common with grey literature, is a feature emphasized in open science circles (Open science, n.d.) and the movement's push to make scientific information more accessible to all levels of societal inquiry is reflected both in science communication literature and by the interested public (Bickford et al., 2015; Martin, 2018; Martin & MacDonald, in review; Ryder-Burbidge, 2017; Soomai, MacDonald & Wells, 2013; Steel et al., 2005). Many ideas and innovations intended to open-up the scientific process, disseminate results therein, and effectively deploy analytic interpretations into policy-making processes can be drawn from recent research literature (Bickford et al., 2015; Lowndes et al., 2017; Martin, 2018; Martin & MacDonald, in review; Ryder-Burbidge, 2017; Wood-Charlson et al., 2015). Funding for these initiatives, however, continues to present an ongoing challenge. Our research suggests that financial models used in the production of grey literature could also inform open science models and help to sustain the continued development of knowledge translation projects.

Challenges about Grey Literature that Could Inform Open Science

Although produced and used widely in marine science (environmental and fisheries management) decision-making processes, grey literature presents challenges that open science also encounters (Table 2). Some challenges are long standing unresolved issues, whereas others are either mitigated or augmented by digital technologies.

Table 2. Challenges about Grey Literature that can Inform Open Science Practices

Challenges with Using Grey Literature Relevant to Open Science
Access (Physical and Understandability)
Awareness
Stigma about Data and Information
Production and Distribution Costs
Longevity of Websites

Examples of challenges include:

a) *Access*. While large quantities of grey literature are digitally available, various formats and platforms, etc., create access difficulties. A sizeable body of grey literature still exists in print formats only, or remains in proprietary digital formats, especially in the private sector. Moreover, when the grey literature is largely technical, the information may not be understandable by non-scientific audiences.
b) *Awareness*. The massive quantity of grey literature can result in reports or data hidden to potential users. Initiatives to promote awareness may be limited. In fact, there may be less incentive to promote awareness since "financial" rewards to promote awareness and use are not offered. One solution may be to encourage training in search strategies to find (or not find) the required information.
c) *Stigma*. The mistaken view that grey literature is always of lower quality than primary literature may also apply to open access (open science) primary literature. Today, this challenge is accentuated by the growing presence of predatory journals.
d) *Production and distribution costs borne by creators*. The production of grey literature has long followed the "creator pays" business model. While this model benefits users, i.e., the user does not pay to gain access to the literature, production and promotion costs, which are real, may pose a challenge for open science. Questions about who pays and who funds the production costs must be addressed.
e) *Longevity of the websites holding the data and the publications*. Website longevity is assumed but websites come and go, with information loss as the consequence. To date, no initiative has solved this problem. The Internet Archive, for example, captures large numbers of websites and other publications, but digital preservation of all websites has not been achieved (Baucom, 2019; Brügger & Laursen, 2019; Hill, 2016; Shein, 2016; Thelwall & Vaughan, 2004).

Openness does not ensure awareness and it does not automatically equate to usability by a wide variety of audiences. Because grey literature is assumed to be largely accessible, often limited attention is focused on promoting awareness. Furthermore, the massive quantity of literature can contribute to its seeming invisibility; specific publications may be unnoticed among the many available on a subject. The multiplicity of formats and varied content can result in grey literature being deemed of limited value. Even though the information may be rigorously peer-reviewed, in today's information-saturated environment, open-access may be equated with uncertain quality and questions of reliability (i.e., information vs. mis-information) and credibility arise.

Conclusions

Let us return to the question posed as a title of this paper, namely, "Is the production and use of grey marine literature a model for open science practices?" Our research suggests that it can be. We have observed and reported in publications arising from our studies that the long-standing motivations to produce grey literature and make it accessible are similar to the motivations driving open science. As seen in settings that explicitly invoke the use of grey literature in publicly deliberative moments (e.g., environmental impact assessments contexts), this similarity is increasingly being recognized (Government of Canada, 2018).

Proponents (creators) for both grey literature and open science aim to promote the use of information in order to advance research, to raise public awareness and understanding of science, and to facilitate evidence-based (evidence-informed) decisions on important societal issues.

The distinction between primary and grey literature is becoming less pronounced today, driven largely by advances in information technology and science generally. Often an immediacy to information needs overshadows the production processes. In public policy and decision processes, delays in making information available can be detrimental and costly.

Many definitions of open science are found in the literature on the subject. But a key observation from our research is that the distinction between grey and primary literature is blurring. Today, both types of literature emphasize greater open access. Moreover, it is important to note that significant marine environmental and fisheries research results must be published in a timely manner and distributed widely in formats suitable for diverse audiences.

Finally, we believe in the importance of ensuring that key marine information is published and made accessible, regardless of the location or the publishing method. Solving critical environmental problems by finding effective solutions and practicing sustainable fisheries should be the primary focus of research, management, and policy (Soomai & MacDonald, 2018). Attention given to the processes of information creation and delivery should be pursued with these urgent objectives in mind.

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GreyGuide

Repository and Portal to Good Practices and Resources in Grey Literature

Research and Knowledge Sharing in the Field of Grey Literature

2013 - 2019

Stefania Biagioni and Carlo Carlesi, CNR-ISTI-Pisa Italy
Dominic Farace, GreyNet International, Amsterdam, NL

Welcome to the GreyGuide: point of access to Grey Literature and Open Access Resources

Scenario

The GreyGuide - Repository and Portal to Good Practices and Resources in Grey Literature was launched in 2013 as a collaborative effort between GreyNet International and CNR-ISTI, Pisa, Italy.

Objective

To manage Open Source Repositories and provide a unique resource in the field of grey literature that is long awaited and which responds to the information needs of a diverse, international grey literature community adhering to Open Science guiding principles.

Ongoing Activity

- **Grey Guide Portal** managing and upgrading;
- **GreyForum Series** enabling access to material produced by the speakers;
- **DOI metadata field** for GL-Conference Papers and RGL documents in the GreyGuide Repository;
- **AccessGrey Project.**

2013-2017
- Repository
- Portal
- Document share

2018-2019
- **GreyForum** Series
- **DOI Minting** Service
- **AccessGrey** Project

http://greyguide.isti.cnr.it/

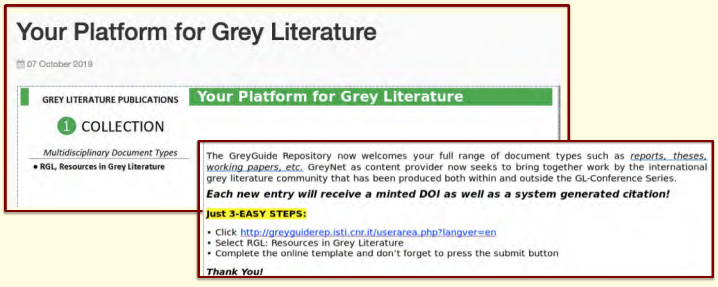
GreyGuide is GreyNet's Web Access Portal and Repository

With the recent addition of the RGL Collection (Resources in Grey Literature), the acquisition of generic, multidisciplinary, and diverse grey literature documents types is underway. Each new metadata, full-text record is assigned a DOI and system generated citation.

RGL Resources in Grey Literature:

✓ *Revise RGL online Template, Include DOI metadata field, Include System Generated Citation, Assign DOIs to existing records in RGL*

✓ *Merge GGP records with RGL Collection, Assign DOIs to the merged records*



AccessGrey Project

Securing Open Access to Grey Literature for Science and Society

Persistent Identifiers and Grey Literature

The Stakeholder Survey seeks to understand the influence that persistent identifiers have within grey literature communities.

Goal

- To learn the opinions, uses, and applications of persistent identifiers within the grey literature community
- To explore the use of persistent identifiers, namely the DOI, in the acquisition of grey literature

GreyForum Series Portal

GreyForum is a series of courses, seminars, and workshops where grey literature provides common ground for information professionals in the process of knowledge.

The GreyForum Series is now accessible at http://greyforum.isti.cnr.it

Share Research and Knowledge in the field of Grey Literature via GreyGuide Portal

New Entry

***A Directory of Grey Literature Research Guides, Online Courses and Webinars** is now online accessible via the GreyGuide Portal (Web Resources).*

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GLP: Conference Papers

RGL: Resource in Grey Literature

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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.

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.

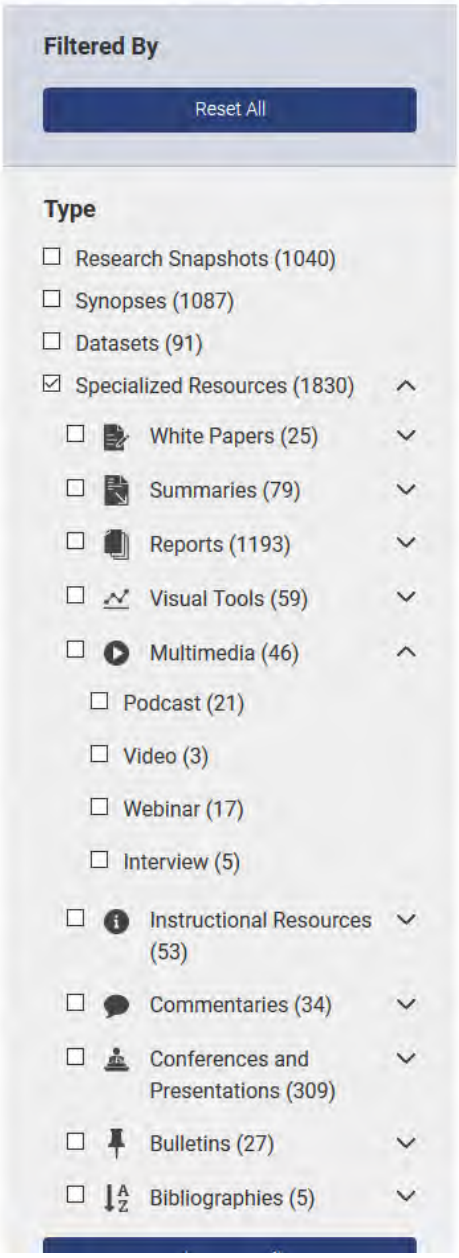

Figure 2 (Right): The Evidence Centre's revised grey literature filters, relabeled as "Specialized Resources". The category "Multimedia" is expanded to show an example of document types therein.

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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E-LIS between old and new forms of Grey Literature encompasses new forms of relationship between librarians in the different country

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Abstract

E-LIS ePrints for Library and Information Science is an international digital repository for Library and Information Science (LIS) Open Archives Initiative compliant. This 21th International Conference is focused on open science this year and "Grey literature by definition seeks to make publications produced on all levels of government, academics, and business openly accessible different from those controlled by commercial publishing." (http://www.textrelease.com/gl21conference.html) Thematic open access repositories as arXiv or E-LIS have years hosting this kind of academic materiales. E-LIS hosts documents in 22 document types (plus dataset recently added) including those belonging to the traditional gray literature world as Preprints, Thesis, Technical and dept. Reports, and those encompassing new forms of Grey Literature as Data and Datasets. These old and new forms of grey Literature constitute 40% of the whole content of the repository (working papers presented to conference, congresses and different events, presentation in PPT, tutorial and learning material for almost, report, thesis, …)

E-LIS is completely built with open source softwares is hosted by University Federico II.

After 16 years from its take-off in 2003, the disciplinary repository contains 22,000 open access articles, in 27 different languages. All the continents are now represented, with a distribution that actively involves over 60 different countries. There are over a million annual discharges requested by users all over the world, numerous from the United States but also from China and South America. The metadata of the deposited works (one hundred per month on average) are validated by the editorial staff divided by geographical areas. The pivot on which the editorial work gravitates is the classification by country which has conferred an international aspect to the archive, aligning it with the organizational model, possibly thanks to the voluntary collaboration of about 80 professionals, including editors and technicians. The collaboration with countries ignored for years by the librarianship tradition is what has made E-LIS particularly innovative on issues previously poorly represented or considered on the margins. Topics that reflect a "different" cultural approach in E-LIS finds space, generating an intellectual growth with respect to the comparison between identity and otherness, in particular respects to the presence of Grey Literature. The studies on the bibliometrics of Indian colleagues, the collaboration with Cuban librarians at the time of the US embargo, the request to include the Maori language by New Zealand colleagues, the emergence of contents from the East of the world, the ferment of the South American jobs for Open Access are just some of the inclusiveness traits of the multicultural character of E-LIS, one of the reasons for its success. Its organizational structure of international scope makes it a model for the construction of open digital libraries, exportable to other communities. Its technical structure, linked to the OAI context and the accompanying innovative tools, provides useful services for the scientific communication circuit: analysis of log files for the production of statistics by author and for single work. Recently the connection to the Zenodo server provides the management of research data in a transparent and integrated way in a new mode to communicate LIS disciplines.

E-LIS in the Open Access world

E-LIS is an international digital repository for Library and Information Science (LIS), including Communication. Created in 2003 and hosted by Università di Napoli Federico II in Italy, in a few years has been indeed as the largest international open repository in the field of library

and information science. The strength of our archive is that all the work is completely based on voluntary work. It has grown thanks to a team of 80 volunteer editors, LIS professionals as technicians, librarians and information specialists. The editorial team is formed by 67 editors coming by different countries plus a team of technicians and the Administrative Board which decides policies and rules.
After 16 years from its take-off, the disciplinary repository contains 22.000 open access contents in 27 different languages.

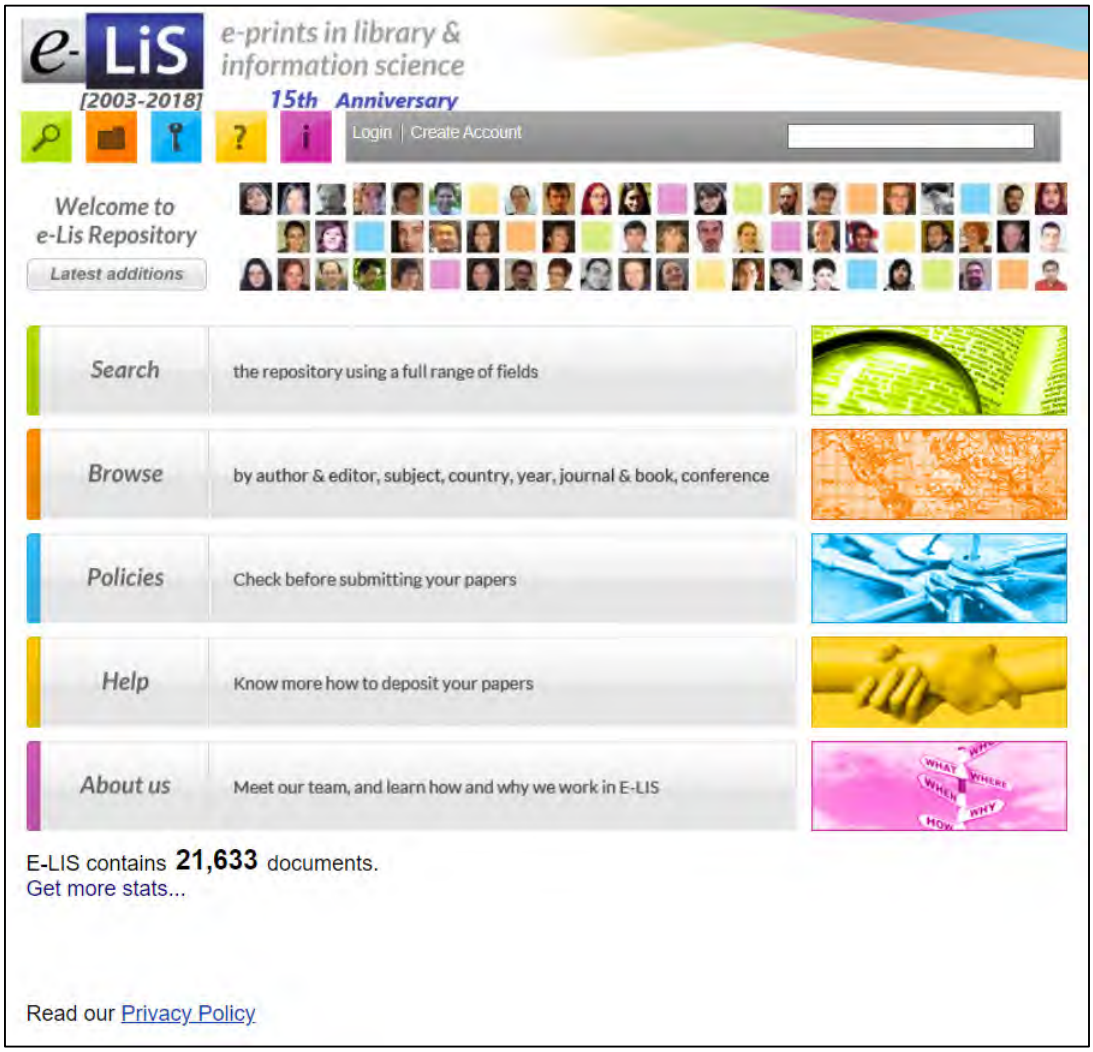

Illustration 1.

The library and information world is highly integrated with the areas of computing science and technology and it was felt that the LIS discipline should set an example to other communities by providing a state-of-the-art model for the OA movement and digital libraries, particularly in relation to the open archive model, within which E-LIS is a disciplinary repository. The extension of the OA concept to LIS works and the dissemination of material within the LIS community will contribute to the development of an international LIS network; E-LIS is mutually beneficial. For library and information science professionals Meta creation is costly and the growing trend of authors to self-archive in the OAI framework is proving an effective way to reduce some of those costs. For librarians as authors, archiving their work in E-LIS gives them an increased understanding of the process of self-archiving and the E-LIS archive ensures data preservation and a wide data visibility in addition to facilitating active participation in the international community of library and information science professionals.

Main focus of E-LIS is its organizational model and on the strategic issues correlated with Open Access (OA). Some of the challenges and opportunities consequent on a global vision for the Library and Information Science (LIS) field, envisages papers coming from all over the world and which gives E-LIS the impetus and motivation to stimulate participation in the venture and to further develop international research activities.
According to Foster Consortium, an institution of the European Union dedicated to the diffusion of Open Access idea, Open Science is “the movement to make scientific research, data and dissemination accessible to all levels of an inquiring society”. E-LIS is inserted in the Open Science context, uses Open Source software ePrints and is OAI compliant. All contents inside the repository are all full-text and open access.
Its main focus, however, is on the E-LIS organizational model and on the strategic issues correlated with Open Access (OA). It also delineates some of the challenges and opportunities consequent on a global vision for the Library and Information Science (LIS) field which envisages papers coming from all over the world and which gives E-LIS the impetus and motivation to stimulate participation in the venture and to further develop international research activities.

Metadata and Dataset management as quality guarantee
E-LIS puts a great attention on metadata quality**.** Cultural and memory institutions have a long tradition of setting up, publishing, and sharing vast amounts of metadata, such as library catalogues and archival finding, providing inventories of books and documents with detailed descriptions of individual items using many different formats and approaches and the editorial's team of E-LIS is mainly constitutes by librarians. Because librarians are so involved in open access advocacy, e-LIS is a key to encourage open access for all repositories, by giving librarians the experience they need to speak with confidence when talking with researchers and open access archives, and the experience to provide the best possible assistance to self-archiving faculty.
E-LIS Metadata are set on the basis of a 23 document typologies and then checked by the international editors committee in accordance with editorial guidelines. One of the first step of the European vision was to establish guiding principles for individual datasets. Since 2014, if possible, Data should be FAIR, that is, Findable, Accessible, Interoperable and Reusable, and policies, tools, infrastructures have to interoperate to fulfill these principles. One on the 23 typology of metadata concerns “dataset” which can be described and deposited as a item itself inside the repository.
When we talk about research data we mean all the recorded information necessary to support or validate a research project.We have to take into consideration also digital objects, simple or complex**.** If we want to manage digital objects in an Open Access vision, they must be available in structured collections or stored in a computer system. Data can be divided into general categories, according to the way they have been collected or elaborated, and these are the most common types.
Its technical structure, linked to the OAI context and the accompanying innovative tools, provides useful services for the scientific communication circuit: analysis of log files for the production of statistics by author and for single work. Recently the connection to the Zenodo server provides the management of research data in a transparent and integrated way in a new mode to communicate LIS disciplines. For documents that have a data set as useful kit for the validation of the LIS research, we have enclosed a new field as addition into papers metadata set named LINK TO RESEARCH DATA. Such link connect to Zenodo data repository a tool for Big Data management and extended Digital Library capabilities for Open Data developed by CERN in Geneve to support European research programmes. The name Zenodo is derived from *Zenodotus*, the first librarian of the Ancient Library of Alexandria and father of the first recorded use of metadata, a landmark in library history.

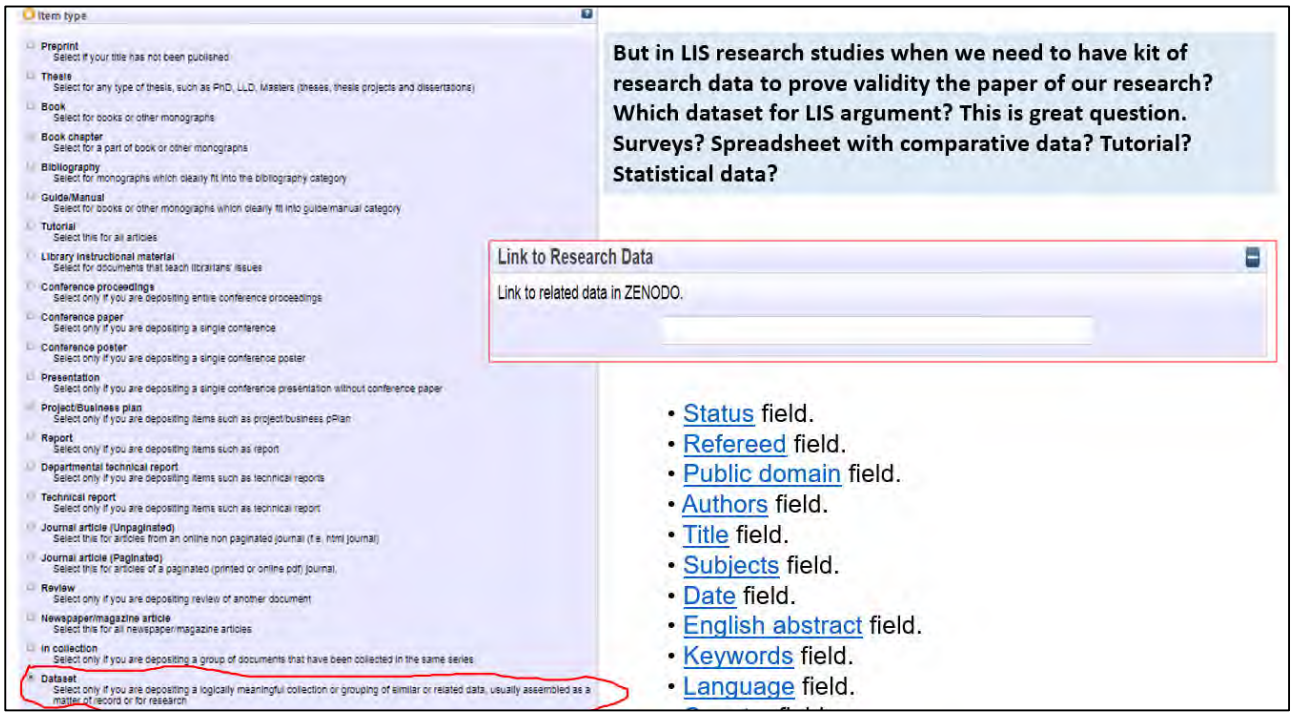

Illustration 2.

The possibility to get statistics give us the dimension of the real interest by users coming by all the world. There are over a million annual download requested by users all over the world, numerous from the United States but also from China and South America. This data means that the repository is live and well knowing not only by LIS communities, also it is a referral point for research of papers published and Grey Literature.

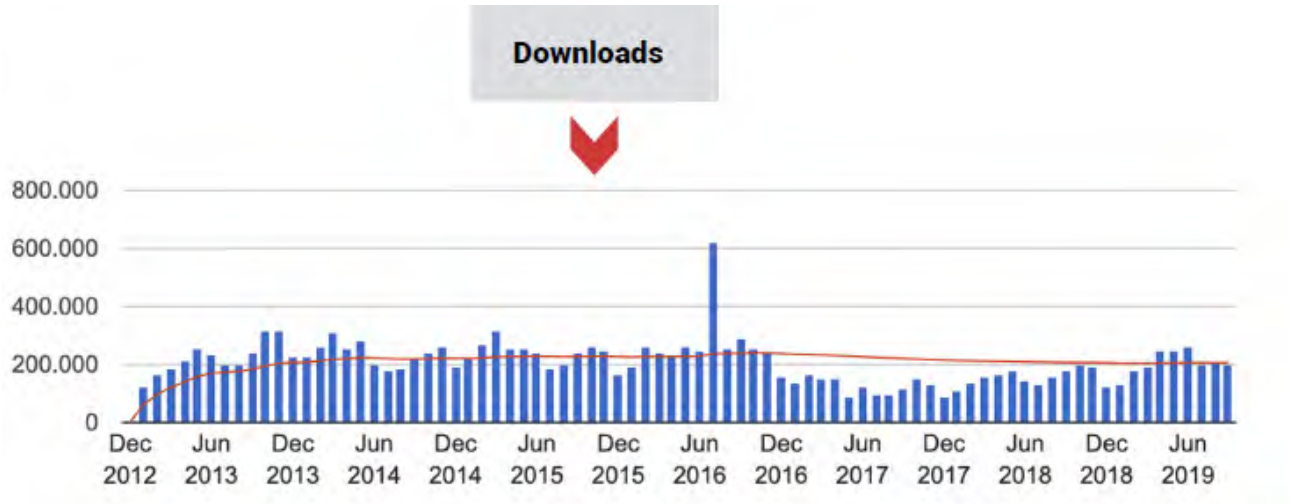

Illustration 3.

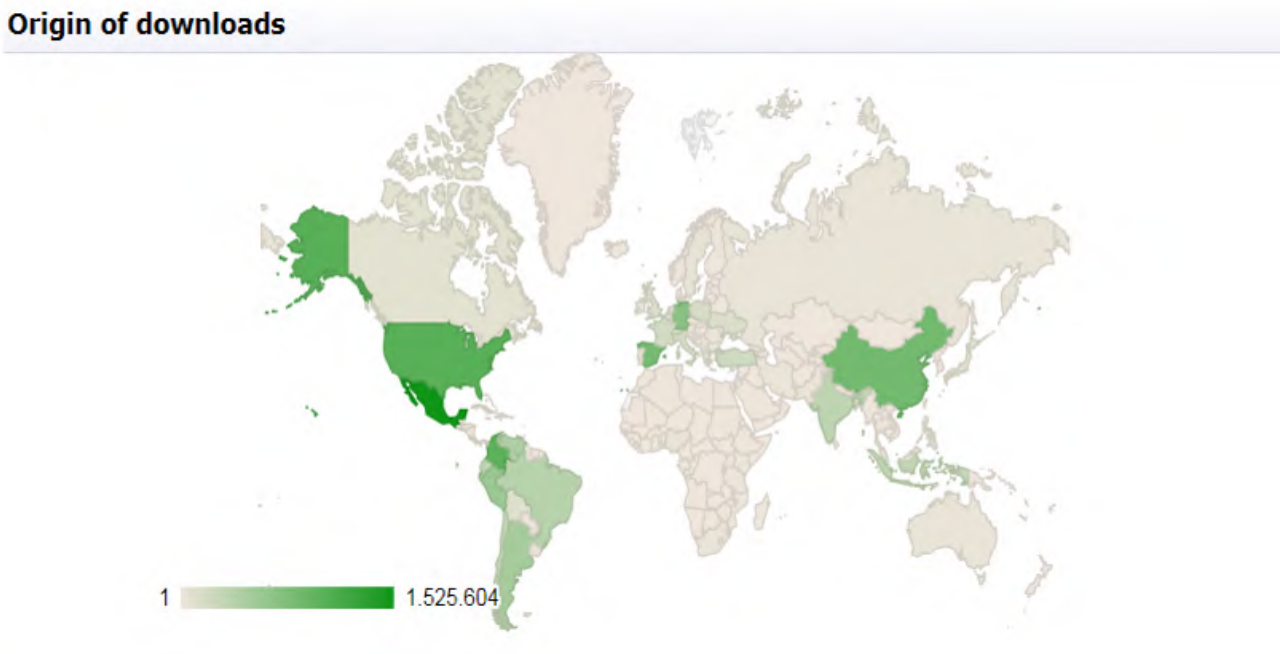

Illustration 4.

The Grey world inside E-LIS: a wide-ranged scale of grey

One of the most recent developments in the field of Library and Information Science (LIS) is the trend towards digital libraries and self-archiving. Self-archiving can be defined as the deposit of a digital document in a public, free-access repository, for example, an e-print archive. An e-print archive is a collection of digital research documents such as articles, book chapters, conference papers and data sets. E-prints are the digital texts of peer-reviewed research articles, before and after refereeing. Before refereeing and publication, the draft is called a "preprint".

Another consideration is that E-LIS accept 35 different formats of document, but the PDF is the prince format

The refereed, accepted, final draft is called a "postprint". The term e-prints include both preprints and post prints.

Documents deposited – almost 100 per months - may include preprints, postprints, conference papers, conference posters, presentations, books, book chapters, technical reports/departmental working papers, theses, and newspaper and magazine articles.

Illustration 5.

The E-LIS submission policy states that the archive accepts any scientific or technical document, published or unpublished, on librarianship, information science and technology or related activities. In this context, categories for different types of material have been created with respective sets of metadata.

In other terms E-LIS hosts documents in 22 document types (plus dataset recently added) including those belonging to the traditional gray literature world as Preprints, Thesis, Technical and dept. Reports, and those encompassing new forms of Grey Literature as Data and Datasets. These old and new forms of Grey Literature constitute 40% of the whole content of the repository: preprint 5%, thesis 4%, report 2%, another 20% concerning working papers presented to conference, congresses and different events. In addition are depositing also presentation in PPT, tutorial and learning material for almost 9%.

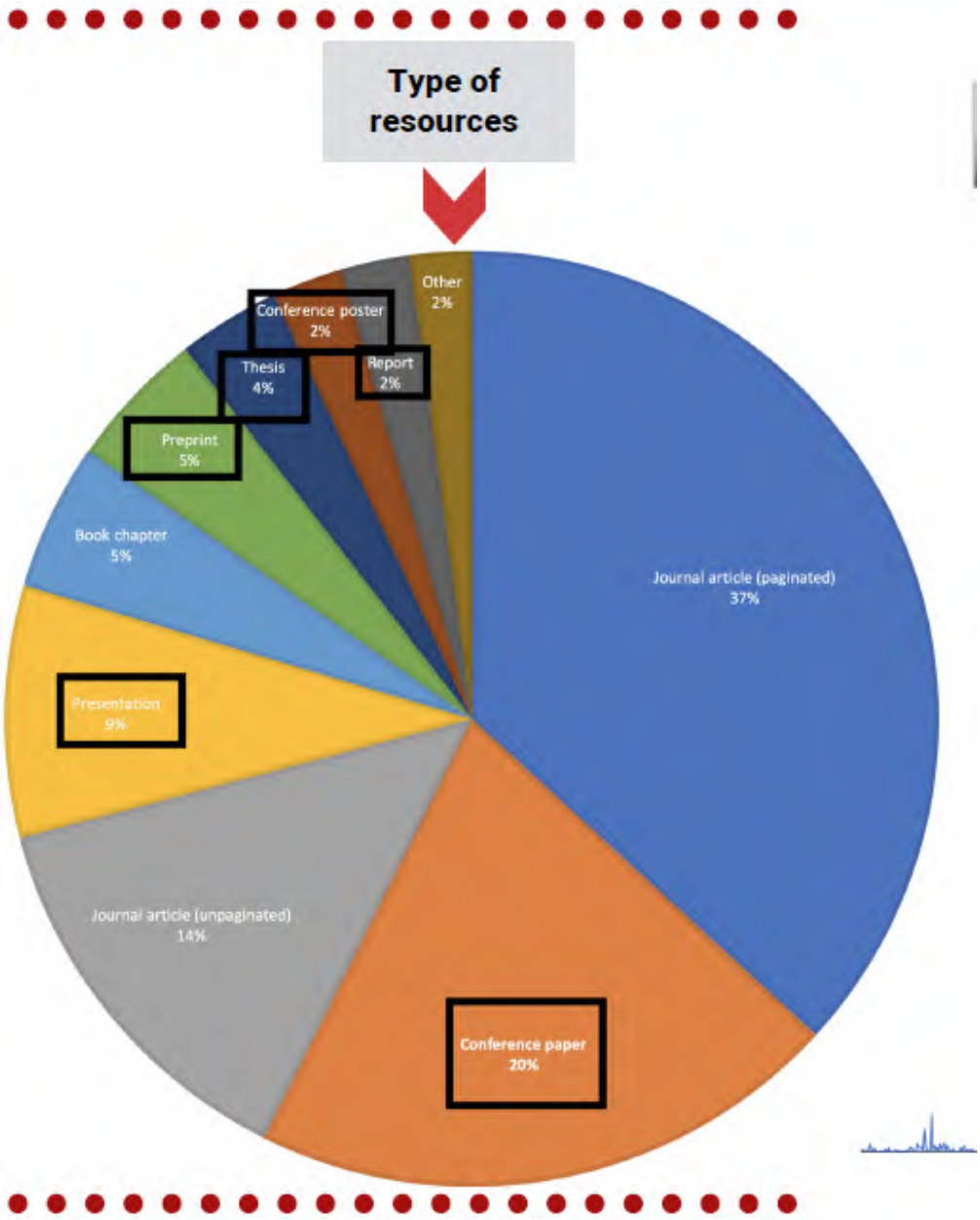

Illustration 6.

Here an example of a metadata for a preprint

Illustration 7.

E-LIS Policies and its organisational model

E-LIS is driven and directed by its policies, which determine its identity, quality and direction. Merely by putting software on a machine is not sufficient to create an archive. In the case of an archive like E-LIS; its organisational model is the sum of its policies. An archive without policies is like a library without a librarian. As example the legal framework is a main task: policies and practice for the management of intellectual property of data and the provision of open access to data and literature are needs to support the ability of the research communities to share, access, and reuse data, as well as to integrate data from diverse sources for research, education and other purposes. High-level recommendations will help research funders, infrastructure managers, research and cultural institutions and researchers for all the disciplines in consideration in furthering the goal of open data and open access in their organization and network and establish a harmonized policy for sharing and reuse data.

Privacy, sensitive and personal data are considered by administrave staff as matter particularly delicate. We all know that from research data you might identify individuals or obtain sensitive information. That's why authors must be aware of these risks and handle all these information in a secure and law-compliant way.

All the continents are now represented, over 120, with a distribution that actively involves more than 60 different countries, where there is available an editor for such Country. In ELIS it is possible to browse by country. This gives a truly international aspect to the archive and is particularly aligned with the organisation of the editorial board whereby work is channelled through international staff on an individual country basis.

- AFRICA (150)
  - Algeria (1)
  - Angola (1)
  - Botswana (3)
  - Cameroon (2)
  - Central African Republic (1)
  - Egypt (5)
  - Ethiopia (5)
  - Ghana (3)
  - Kenya (15)
  - Lesotho (1)
  - Madagascar (1)
  - Malawi (1)
  - Morocco (14)
  - Namibia (2)
  - Nigeria (29)
  - Senegal (2)
  - Seychelles (1)
  - South Africa (62)
  - Sudan (1)
  - Swaziland (1)
  - Tanzania (5)
  - Tunisia (2)
  - Uganda (6)
  - Zambia (5)
  - Zimbabwe (11)
- OCEANIA (155)
  - Australia (112)
  - Melanesia (2)
    - Fiji (1)
    - Solomon Islands (1)
  - New Zealand (44)
- AMERICA: North and Central America (3188)
  - Antigua and Barbuda (2)
  - Canada (491)
  - Costa Rica (180)
  - Cuba (789)
  - Dominican Republic (9)
  - El Salvador (6)
  - Guatemala (6)
  - Honduras (2)
  - Jamaica (1)
  - Mexico (803)
  - Nicaragua (7)
  - Panama (1)
  - Puerto Rico (29)
  - Trinidad and Tobago (13)
  - United States (914)
- AMERICA: South America (3645)
  - Argentina (1296)
  - Bolivia (32)
  - Brazil (1008)
  - Chile (263)
  - Colombia (647)
  - Ecuador (38)
  - French Guiana (2)
  - Guyana (1)
  - Paraguay (7)
  - Peru (228)
  - Suriname (1)
  - Uruguay (90)
  - Venezuela (122)
- ANTARCTICA (2)
- ASIA (1937)
  - Azerbaijan (1)
  - Bahrain (1)
  - Bangladesh (51)
  - China, People's Republic of (176)
  - Hong Kong (2)
  - India (1090)
  - Indonesia (136)
  - Iran (205)
  - Iraq (2)
  - Israel (6)
  - Japan (9)
  - Kuwait (5)
  - Kyrgyzstan (1)
  - Lebanon (11)
  - Malaysia (88)
  - Nepal (16)
  - North Korea (1)
  - Oman (1)
  - Pakistan (81)
  - Philippines (24)
  - Saudi Arabia (14)
  - Singapore (1)
  - South Korea (3)
  - Sri Lanka (24)
  - Syria (2)
  - Taiwan (15)
  - Thailand (12)
  - United Arab Emirates (1)
  - Vietnam (3)
- EUROPE (12127)
  - Austria (944)
  - Belarus (6)
  - Belgium (98)
  - Bosnia Herzegovina (10)
  - Bulgaria (124)
  - Croatia (118)
  - Cyprus (48)
  - Czech Republic (158)
  - Denmark (19)
  - Estonia (8)
  - Finland (17)
  - France (157)
  - Germany (690)
  - Greece (530)
  - Hungary (2)
  - Ireland (11)
  - Italy (1701)
  - Latvia (3)
  - Lithuania (42)
  - Luxembourg (1)
  - Macedonia, Republic of (2)
  - Moldova (1)
  - Norway (15)
  - Poland (483)
  - Portugal (269)
  - Romania (32)
  - Russia (14)
  - Serbia (22)
  - Serbia and Montenegro (243)
  - Slovakia (2)
  - Slovenia (31)
  - Spain (5069)
  - Sweden (30)
  - Switzerland (136)
  - Turkey (509)
  - Ukraine (245)
  - United Kingdom (594)
  - the Netherlands (86)

120 Countries present, 27 different languages

Illustration 8.

The collaboration with countries ignored for years by the librarianship tradition is what has made E-LIS particularly innovative on issues previously poorly represented or considered on the margins. Topics that reflect a "different" cultural approach in E-LIS finds space, generating an intellectual growth with respect to the comparison between identity and otherness, in particular respects to the presence of Grey Literature. The studies on the bibliometrics of Indian colleagues, the collaboration with Cuban librarians at the time of the US embargo, the request to include the Maori language by New Zealand colleagues, the emergence of contents from the East of the world, the ferment of the South American jobs for Open Access are just some of the inclusiveness traits of the multicultural character of E-LIS, one of the reasons for its success. Its organizational structure of international scope makes it a model for the construction of open digital libraries, exportable to other communities.

Korea Institute of Science and Technology Information (KISTI)

English version - http://en.kisti.re.kr/

*** Vision**

World-class information research institute creating values for customers

*** Main functions**

*** Management and service of Korean R&D reports**

KISTI exclusively manages, preserves, and serves Korean R&D reports for citizens and government officials. It provides Korean R&D reports and their information with National science & Technology Information Service (NTIS) and National Discovery for Science Leaders (NDSL).

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Open Access in the Academy: Developing a Library Program for Campus Engagement

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Abstract

The Open Access (OA) movement continues to gain traction. The recent breakdown of negotiations between Elsevier and the University of California system has brought renewed attention to OA issues to academic faculty, students, librarians, administrators, and governance bodies. The library is a natural hub for OA activities within the academy, and librarians can serve as advocates, facilitators, and agents for OA. The OA movement began with a focus on journals, articles, and similar vehicles for dissemination of research. The movement has now advanced and evolved to include a wide range of formats, material types, and other material. These include monographs, audiovisual materials, monographs, research data, Open Education Resources (OER), and the many varieties of grey literature.

The library and its personnel have the expertise to serve as the central point for OA issues within academe. Librarians are knowledgeable about the issues surrounding OA, and usually have existing partnerships and lines of communication with the stakeholders necessary to support OA initiatives within their institutions. The academic library has a role in explaining OA issues, advocating for OA, and of course for supporting and managing OA resources, including institutional repositories, OA journal subscriptions, OER, open research data, and other OA materials such as grey literature.

This paper offers a model for the creation and implementation of an OA program within their own institutions. This model will identify the necessary elements for a successful OA program, as well as offer advice for identifying relevant existing resources. Elements of the model will include advocacy resources to make the case for OA; advice on developing and promoting programs and services to inform, support, and manage OA activities; and how to develop an effective communications plan that both reaches all stakeholders and offers them a space to make their voices heard. In addition, the model will also present its audience with a comprehensive set of OA resources to employ when planning and implementing a suite of OA programs and services.

Open Access in the Academy: Developing a Library Program for Campus Engagement

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Because of their mission to identify and provide access to information, libraries are natural hubs for OA advocacy. For this reason, many libraries are currently investigating how best to implement OA programs. When developing a program to promote and support OA, libraries should begin by identifying the elements of such a program, and how they can best employ resources to support these endeavors. Libraries can classify programmatic elements into a

few main areas: advocacy and instruction about OA in general, consulting about OA issues, and facilitating OA activities. These areas require different levels of commitment and resources. At many institutions, personnel may already be involved in some or all of these activities. An inventory of existing OA functions could reveal that the primary need is systematic, programmatic, centralized organization and coordination.

The first area of activity, and the one that requires the most modest investment of resources, is instruction about, and advocacy for, OA in general. Libraries can develop and implement an educational program about OA targeted at institutional faculty, students, researchers, administrators, and librarians. At this level of engagement, libraries' primary investment would be the time of library personnel to educate themselves on OA issues, and then create an implement an action plan for implementing the program. Many free resources to support such a program exist on the Web (see below). The action plan at this stage could be as simple as creating an institutional web page with information about OA issues, including authors' rights, sources for OA funding, OA publications and distribution venues, and compliance with funders' OA requirements. Next steps in such a program could include training library personnel such as subject librarians who serve as liaisons to academic programs in OA issues so they can discuss and advocate as they meet with the departmental faculty and students they serve. Designing and delivering workshops about OA issues is another element at this programmatic level. These could even be targeted toward specific audiences such as authors, administrators, and researchers applying for grants.

For libraries seeking to participate in OA activities beyond mere advocacy and information sharing, the next step in creating an OA program is to engage in consulting. This requires additional commitment on the part of the library, including training personnel so they can offer consultation services for OA issues. Consultation can also cover a wide range of activities and can focus on the issues relevant to specific audiences. For example, the library could institute a program to provide consulting on issues such as authors' rights; identifying OA journals, repositories and other appropriate OA venues for publication; platforms for hosting OA content; and identifying funding sources to cover article processing charges (APC) and other OA fees. Subject specialist librarians often have the domain knowledge to some be familiar with at least some of the major OA publication venues for their disciplines, as well as subject-specific resources for APCs. An OA program could also include providing consultation services for data plans and other mandatory compliance issues. Most governmental and institutional agencies that provide funding for research now have requirements for curating data, making data and other information freely available, and other compliance requirements. The library may have personnel who already work in these areas and who could provide such consulting services to the faculty, students, and other researchers whom they serve. This paper offers a list of resources and examples useful for planning an OA consulting program below.

For libraries seeking a yet higher level of engagement with their constituencies in OA activities, the final step is facilitating OA initiatives. Moving beyond consultation and advice, in the facilitation stage the library becomes an active participant in OA activities in partnership with the constituencies it serves. This could include a wide range of collaborative activities. For example, some libraries support OA activities by providing APC funds to qualified authors. Many libraries also engage actively in developing and providing access to open educational resources (OERs). Library personnel may have the resources and expertise to move beyond consultation in the area of data curation and management, and can actively support curation, migration, discovery, and other support of research data. Likewise, the library may be able to develop data management plans, host OA repository, streaming media, or publishing platforms, and otherwise engage in active management of research assets with the scholars it serves.

There are, then, a wide variety of ways in which the library can support OA activities among the communities it serves. These can range from advocacy through consultation to

active participation in OA endeavors. In many cases, the library may be done some or all of these undertakings already. It is important, therefore, that the institution make an inventory of existing programs and services relevant to OA, identify personnel with the expertise to engage with users in OA activities, determine the resources it has available to dedicate to OA support, and create a programmatic approach to OA initiatives. Effective planning to create and implement an OA program requires that the library identify relevant stakeholders, resources, and services.

It is perhaps most effective to start planning an OA program by identifying the pertinent stakeholders. These stakeholders fall into various categories, including the users and creators of OA content supported by the library, as well as the library personnel who will participate in the program either through direct involvement or through behind-the-scenes support. The primary stakeholders are the users and creators of research content who would be the primary audience for the library's OA programs and operations. Content creators and users might include students, faculty, other researchers, and library personnel who are actively engaged in research and content creation. Library stakeholders might include subject specialists and other librarians whose primary assignments already include engagement and outreach. This stakeholder group would be involved in content creation, advocacy and communication, and training about OA issues. Other library stakeholders include technical personnel who might be necessary to support specific types of work such as hosting streaming media, curating and migrating data, creating and serving digital assets used in the development of OERs, and similar technical activities. One final category of stakeholder comprises the administrators, managers, legal, and policy consultants who are responsible for institutional compliance. This group of stakeholders should include the supervisors of personnel involved in OA activities, the administrators who are responsible for identifying funding and allocating resources to support operations and programs, and legal counsel to ensure compliance with institutional, local, national, and international legal and policy requirements. Since any new program should also include an assessment component, planning for OA should include identifying the personnel who will develop effective assessment and evaluation tools.

In the next step of designing an OA program, the library must undertake a serious, accurate, and thoughtful inventory of resources at its disposal, and determine what resources it can commit to the OA initiative. These include not only the fiscal and personnel resources necessary to create and implement an effective program, but also the technology and facilities required for success. Fiscal resources include not only direct costs such as APC funds and development of promotional material, but also indirect costs such as personnel salaries and benefits. Human resources include personnel involved in the program, not forgetting the importance of identifying a project manager, coordinator or point person. Other personnel resources include technical, administrative and legal counsel support. The category of technology and facilities include both existing resources as well as any that the library may wish and can afford to develop. Resources in this area include institutional repositories; journal, monograph, or media platforms; laboratories for the creation, management, and curation of research data and other digital assets; and spaces for consultation and advising. This is the most flexible area of program development, and the one in which the library will find itself most restrained by its existing needs and resources.

Once the library has identified stakeholders and resources, it can turn its attention to creating the actual OA program. In this stage, the library will develop the OA services that it plans to offer is users. As discussed earlier, these services can be tailored to the individual institution's needs and level of commitment. Advocacy and promotion of OA initiatives can be an efficient way to get started in OA programming. This can lead to more engaged consulting about OA activities. Consultation can take many forms, including advising students and faculty about how to search for OA content in institutional and disciplinary repositories and OA journals as well as how to identify appropriate OA publication venues

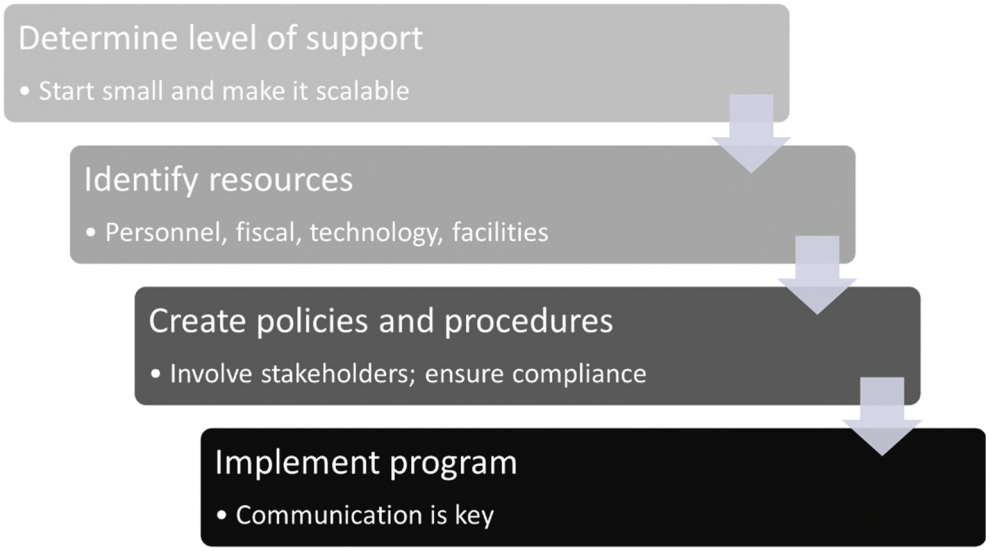
for disseminating research. An OA consultation program can also include instruction about grant agencies' research data policies and authors' rights issues. One effective and relatively easy way to step into OA programming is to develop an institutional OA web page, with content about and links to relevant information, including whom to contact for more assistance.

For libraries with the resources to do more in support of OA, the next step in program development is active facilitation and participation in OA initiatives. At this stage, the library is limited primarily by the resources that it is able to commit to the OA program. Dependent on sufficient funding, personnel with the necessary skill sets, and the required technology and facilities, the program could include activities such as creating and maintaining repositories, journal, monograph, and media platforms; offering APC funds to qualified authors; managing and curating research data; developing OERs and other digital assets; and designing and delivering workshops and presentations about OA issues. This stage requires both the heaviest investment as well as the strongest commitment on behalf of the library.

As with any successful program, a new OA initiative should include resources for addressing the necessary legal, ethical, and policy issues. This might include developing a formal institutional OA policy such as that authored by the University of California system (see below for link). These issues include authors' and researchers' rights; proper handling of Health Insurance Portability and Accountability Act (HIPAA), Family Educational Rights and Privacy Act (FERPA), and other personally identifiable information (PII); library or larger organizational retention schedules for archival material and data retention; copyright and fair use; and issues surrounding academic integrity and plagiarism. Compliance with ethical, legal, and policy requirements varies greatly between organizations, and is highly dependent on institutional policies, local and national law, international standards, and a range of ethical considerations. Consultation with legal counsel, administrators, and other policy makers is a necessity.

Creating a model for OA engagement, then, has a set of clear steps. First, the library should determine its level of support for OA activities. Support should be both sustainable and scalable. Institutions can start small, with advocacy and promotion activities, and expand these to facilitation and participation in the future, depending on need, demand, and availability of resources. The next step lies in identifying all resources, personnel, funds, technology, and facilities, that the library can commit to the program. An important part of this step is identifying activities, programs, and services that already exist, and coordinating these as part of the new program. The third step consists of creating policies and procedures to govern operation of the OA program. During this step, the library should consult with all stakeholders and ensure compliance with all relevant laws and regulations. The final step is implementation of the OA program. In this step, especially, communication is key. The library should make use of any relevant communication venues at its disposal, including websites, publications, and social media. Gaining support beyond the library is vital for both communication and engagement. Buy-in from institutional administration and governance bodies at all levels is vital. OA resolutions from groups such as faculty senates and student government can both demonstrate commitment and also educate others about OA issues.

Model for OA program development



When planning and implementing an OA program, a few key points are worth repeating:

- Make it scalable and extensible.
- Start small, gain buy-in, and expand with demand.
- Use existing resources: web pages, YouTube channels, social media, legal/policy templates
- Get buy-in from all stakeholders.

Selected resources

SPARC: https://sparcopen.org . Start here! Lots of information and resources for OA, copyright, and authors' rights including template agreements.

Directory of OA funds: http://oad.simmons.edu/oadwiki/OA_publication_funds . Searchable database of funding opportunities.

OA fund @ UMD: https://www.lib.umd.edu/oa/openaccessfund . The University of Maryland's program offering APC funds to institutional authors. (Hint: double your funding by requiring matching funds from authors' home departments).

Creating Data Management Plans @ UMD: https://www.lib.umd.edu/data/dmp . A model for creating a data management plan for compliance with grantor mandates.

DRUM @UMD: https://drum.lib.umd.edu . The University of Maryland's institutional repository.

Directory of Open Access Journals: https://doaj.org. An excellent source for identifying OA journals for both authors and researchers.

Directory of Open Access Books: https://www.doabooks.org. One of the few resources for identifying OA monographs online.

MIT Framework for Publisher Contracts: https://libraries.mit.edu/scholarly/publishing/framework/ . MIT Libraries' policy regarding conditions for licensing content from publishers; includes OA components.

Plan S: https://www.coalition-s.org . Science Europe's OA initiative.

PLOS ONE List of Data Repositories: http://journals.plos.org/plosone/s/data-availability#loc-recommended-repositories. Large list of repositories for research data.

Registry of OA Repositories: http://roar.eprints.org. Searchable database of institutional and disciplinary repositories.

University of California system policy on OA: https://osc.universityofcalifornia.edu/open-access-at-uc/open-access-policy/ is an excellent example of an institutional policy.

Open Educational Resources and Library & Information Science: towards a common framework for methodological approaches and technical solutions

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Abstract
Openness, flexibility, innovative approaches, digital dimension, liquidity and high granularity characterize Open Educational Resources (OERs), which therefore are grey literature par excellence.
OERs possess these features to a much greater extent than does the Open Science (OS) galaxy, because the manifold constellation of education is broader and much more multifaceted and transversal than the scientific and scholarly community, that is still, for the most part, Polanyi's and Merton's autonomous Republic of Science.
Indeed, the peculiarities of Library and Information Science (LIS) sector and of its latest developments contribute to increase complexity of scenarios. In fact, Library Science and Documentation, with their influential legacy, and Information Sciences through digital revolution have radically evolved, moving towards extreme scientific specialization and growing professionalization.
LIS competences on one side have become transversal and essential skills in the current knowledge societies; on the other side, they have widely spread out over all the scientific-disciplinary sectors, merging with various knowledge and specific domains and fertilizing their different segments. This unprecedented hybridization process has entailed a partial loss of LIS identity, stressing fluidity and versatility inherent in OERs; hence it has highlighted the need for guaranteeing quality, integrity, authenticity, consistency and traceability of OERs in the LIS field, in the same way as for the OS within the scholarly information and communication system.
In this paper we propose a comprehensive framework, which provides methodological, organizational, strategic, technical and technological indications in order to address the problems and new challenges described above.
The model suggests criteria, methods and tools to analyze the specific context and to identify solutions able to manage appropriately information resources and the related processes and to increase their value: processes regarding both resource lifecycle management and framework configuration control. Technical and technological solutions are also examined, in order to manage more efficiently considerable heterogeneous sets of OERs in the LIS field.
With regard to technological systems and tools, special attention is paid to the opportunity to develop validated and certified platforms, for providing quality levels in shared contexts, and persistent identification systems, for guaranteeing resources integrity, traceability, etc.
In our view, the suggested framework and tools can contribute to the development of systems more equipped to support and enhance the management of OERs in the LIS domain.

1. OERs and Science landscape: a fruitful correlation

The galaxy of Open Educational Resources (OERs), although strongly connected to Open Science (OS), is characterized by a more conspicuous polycentric nature, by an even more experimental vocation and by a greater dynamism. Their disorderly richness and complexity, their preference for crossing approaches and blended products, and their particular sensitivity to the ever changing global trends contribute to sharpening their variety and liquidity.
OERs refer to technology-mediated learning related both to Education and Training, aimed at widening access beyond the formal constraints and boundaries of the official systems and at promoting inclusion and participation in the current knowledge society. They are heterogeneous didactic objects, sometimes structured, more frequently versatile, so that, thanks to increasingly advanced technologies, they allow to build linear sequences, both logical and chronological, new products and original paths, or to create and/or to use and re-use the smallest units. In these objects differences among the product types have lessened;

furthermore, purposes, methods, practices and manners in which they are used have become more and more polyvalent and flexible, so that they are grey literature *par excellence.*

Their main features, which can explain their strong versatility and high granularity, are the following:

- *Openness*, an essential characteristic although sometimes implicit, referring to a socio cultural milieu that includes an aspiration towards a global, open, pluralistic and inclusive society, based on universal access, equity, *education for all*[1], empowerment and emancipation of individuals and communities;
- *Digital dimension,* which involves the unstoppable integration between humans and technology, the expansion of the Network, participatory technologies and social media, and the strengthening of digital convergence; it allows to create and circulate, at different processing levels, a diverse range of resources, contents and products, which have been built and modified without interruption by teachers, trainers, and learners, in various mutual combinations;
- *Innovative approaches,* which are fostered by dominant constructivist and socio-constructivist paradigms, that unanimously favour, among teaching-learning methodologies, scientific methods, inquiry-based, project-based and experimental learning, problem solving approach and active, significant and cooperative learning, entirely focused on the learner, who is the real protagonist of any educational process.

In this perspective, *e-learning* has prevailed, because it provides widespread access, interactivity, plural didactics, many very diverse methods, techniques, practices, languages, tools and services; and OERs are close to *flexible learning,* thanks to some common characteristics: distributed access, ease and adaptability, broader opportunities for study, by overcoming space and time constraints, and for peer collaboration and sharing, and a considerable cost reduction and effectiveness, compared to more traditional systems.

Producers and users, teachers and learners, experts and non-experts take part in the creation process of OERs equally: author and user roles are often blended and even multiple, and boundaries amongst formal, non-formal, informal and lifelong learning have faded, leading to the development of hybrid, intermediate and partial solutions.

Lifelong learning and e-learning predominance has released education and training from traditional space and time constraints – which concentrated and isolated them in plainly distinguishable institutional contexts and in clear-cut human life stages – so that they are now split and spread out over the entire course of life, as a permanent and fundamental attribute of human beings.

As compared with scientific and scholarly world, still today grounded in the traditional model, within the manifold constellation of education and training the opportunities offered by the digital revolution[2], the growing integration of formal, informal and non-formal learning, the rise of lifelong learning and the enhancement of informal, non-formal and cross-discipline learning have increased the genuine multiplicity and the vitality of these sectors, encouraging active and proactive participation of many actors outside formalized contexts and continuously expanding learning approaches and environments.

With this regard, deepening the comparison between science and learning scenarios, it is noted that the new technologies irruption significantly changed both traditional systems of science and scholarly communication, breaking boundaries between science and scientists on one side and broader society on the other side, in the pursuit of closer cooperation among scientists, greater participation of citizens, transparency and disintermediation. It challenged and shook independence, self-sufficiency and self-regulation of the scientific community, radically transforming, at the same time, scholarly information and communication, thanks to the accelerating growth of grey literature and data sharing, to the rising of new content creation modes, to the renewal of scientific research language.

[1]The UNESCO's programme on "Education for All" (EFA) was launched in 1990 and later reaffirmed by the Dakar Framework for Action (2000) [1].

[2] through increasing networking, participatory media, ubiquitous computing, e-learning techniques and applications etc.

ICTs have allowed scientists to share and make available, through their virtual networks, a huge variety of contents and products which accompany, support and report scientific work and results, in real time, while carrying out their research activities: they lack completeness and standardization and show a high degree of fluidity and granularity.
Thus, together with traditional types of research products, new types – i.e. contents, products, research data and results at different processing levels – continue to increase; in the scholarly information cycle, it has caused the growing liquidity of research phases, processes, and products.
Data and information explosion and related information environments heterogeneity made difficult their control, validation and certification. Today it is a key task for information specialists, that updated and renewed their roles, skills and expertise, in order to achieve it.
As is known, the science exemplary model, attributable to Robert K. Merton' *Republic of Sciences*[3] and to Michael Polanyi's *Independent Republic of Science* [3], was based on three pivotal elements:

- essential autonomy and self-sufficiency of science;
- fundamental self-referentiality of scholarly communication system;
- firmness of knowledge core, which allowed to outline disciplinary fields with reliability and trustworthiness.

Conversely, the scholarly information and communication traditional model – in which information specialists played a key role together with scientists – permanently ensured research quality, the recognition of intellectual authorship and the reputation of scientists and research institutions.
Despite the last profound changes, the traditional model is still active and essential today both as a concrete system for controlling, validating and organizing important parts of the scholarly information and communication system and as a deep schema able to influence and shape approaches, attitudes, cognitive and communication styles, and behaviours of the R&D system's actors – individuals, communities, institutions…
Today, in this field, the role of research libraries and information specialists is particularly crucial due to the ongoing revolution: in fact, they are the only ones able to control and certify the quality of research products and results, thanks to their broad spectrum of competences and skills related to knowledge and knowledge organization – i.e. the influential core legacy of library, documentation and information sciences, more complex and sophisticated disciplinary competences and expertise, and digital and web knowledge and skills, cross-discipline and close to computer science [4], [5], [6].

2. Seeking for a new LIS identity between tradition and contemporary challenges

As specifically regards LIS fields, the rise of the science of clouds and of the complexity epistemology – both dominated by non-linearity, problematicity, uncertainty, and unpredictability – the boosting of inter- and trans-disciplinary research produced two significant effects: fragmentation and decline of any hierarchical all-encompassing framework and of any systematic approach to knowledge organization[4] typical of these domains.
The dissolution of traditional models for knowledge organization – both epistemological and pragmatic – has considerably contributed to the exceptional increase of LIS specialization: LIS knowledge and competences have become specific, precise and highly fragmented, radically renewing and closing themselves to specialised knowledge clusters, and to niches of extreme professionalization. Aspects, knowledge, expertise and skills which are currently most required – i.e. digital competences and web skills – are emphasized, because they are considered the most useful and important [5], [7], [8].
Simultaneously, LIS competences – those related to an aware and critical use of information and scientific and methodological ones – have lost awareness of their original identity, so to speak, and they have widely spread out over all the scientific-disciplinary sectors as

[3] based on "the normative structure of science" and intended for "the development of codified certified knowledge" [2].
[4] aimed at systematizing science and its results and inherent not only in bibliographical classifications, but also in the Otlet's utopia.

foundation of every research activity, merging with various knowledge and specific domains and fertilizing their different segments [9].

In fact, in many educational institutions, especially within the Higher Education sector, they merged into a composite area, called in different ways, that is a cornerstone and often a crucial preliminary step for higher education programs: *study skills, learning skills, research skills, research methods, research method skills, academic skills, science literacy, scientific literacy, scientific skills, scientific inquiry skills*… [10].

More generally, especially with regard to the critical use of information, LIS competences have become core transversal skills in the contemporary age: information literacy, information skills, information competences have become key pillars of the most advanced societies.

Barack Obama declared October 2009 as National Information Literacy Awareness month in the USA. The Presidential proclamation "highlights the need for all Americans to be adept in the skills necessary to effectively navigate the Information Age". It is pointed out that "Rather than merely possessing data, we must also learn the skills necessary to acquire, collate, and evaluate information for any situation. This new type of literacy also requires competency with communication technologies, including computers and mobile devices that can help in our day-to-day decision making". Thus *information* and *digital component* are stressed as critical issues for the present and future world.

It is also stressed that information literacy is the new essential literacy, in order to exercise real citizenship, active and democratic: "An informed and educated citizenry is essential to the functioning of our modern democratic society, and I encourage educational and community institutions across the country to help Americans find and evaluate the information they seek, in all its forms" [11].

At the European level, in the global knowledge society perspective, the Recommendation of the European Parliament and of the Council of 18 December 2006 underscored eight key competences for lifelong learning, defined as "Europe's main asset" and "a key measure in Europe's response to globalisation and the shift to knowledge-based economies".

Some cardinal LIS competences were clearly identified within the *digital competence*: *digital* component ("basic skills in ICT") was predictably at the forefront, focusing "the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet"; then the emphasis shifted toward *information*, its relevance, validity and reliability, and toward its skillful use, complying with ethical principles; finally, *critical and reflective* dimension was stressed, through critical thinking and "a critical and reflective attitude towards available information and a responsible use of the interactive media."

Other LIS competences – more methodology-oriented and less characterised by discipline-specific subjects and approaches – can be found within *learning to learn* which encompasses – together with autonomous learning and problem-solving attitude – the ability "to access, gain, process and assimilate new knowledge and skills" [12].

More recently, the Council Recommendation of 22 May 2018 on key competences for lifelong learning has redefined and updated "the set of key competences needed for personal fulfilment, health, employability and social inclusion". In particular, in the *Annex - Key Competences for Lifelong Learning. A European Reference Framework,* amongst the eight key competences set out, *digital competence* now "includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking". The focus is again on the masterful use of technologies – which is connected with active citizenship and social inclusion –and then on information and information skills; the main stress is put on critical, reflective and scientific methodological aspects, which disappeared from *personal, social and learning to learn competence*[5] and have been incorporated in this area too [13].

[5] more focused on personal growth, self-awareness, resilience capacities, self-learning, communication and relational skills.

The two knowledge and competence areas previously identified, currently most widespread and most successful – the first, aimed at science education and at acquiring methods, study and scientific methods skills, and the second, including transversal competences centred on information use and digital dimension – don't explicitly show their common LIS ancestry.
Rather, such loss of identity seems an indisputable and irreversible fact, commonly accepted in LIS domains too.
However, contemporary science has posed new challenges, to which only a LIS community very aware, stable and solid from the identity point of view could successfully respond. In fact, science has recovered a broad epistemological and methodological perspective, unitary and overall, thanks to the 'ecosystem' notion, the constructive exploitation of Prigogine's dissipative structures theory and of inter- and trans-disciplinary approaches, as well as thanks to an extended, diverse and inclusive community of experts, able to establish and maintain an open dialogue.
Therefore, current science needs a worthy scholarly information and communication system, able to fulfil its ambitious expectations: research libraries and information specialists can play a strategic role, capitalising both traditional and new knowledge, skills and expertise; and they can also regain a strong common identity, no longer through a top-down approach – today unworkable in a such dispersed and fragmented scientific-disciplinary area – but through a largely bottom-up process, thanks to the gradual confident accession of increasing LIS segments.

3. The Open Education political strategic perspective and its implementation in Europe

We provide a short description of problems related to the state-of-art open education (OE) initiatives, with special regard to the European framework for policies, strategies and programmes and to their implementation in the different Member States, in order to better contextualize the issue focused in the next paragraph.
We extracted some elements from recent studies ordered by the European policy makers, with the main goal to analyse and to evaluate the financial support opportunities for OE initiatives and, at the same time, to define strategies and actions for their development.
Most studies have deeply analysed national educational and organisational contexts, infrastructures and services, in order to measure their innovation degree from both didactic-pedagogical and technological perspectives. They also provide political and strategic recommendations and concrete proposals aimed at solving complex problems inherent in the OE initiatives [14], [15], [16], [17].
From the analysis carried out, it emerged that the state-of-the-art OE initiatives show significant differences from country to country.
In the most EU countries – among which Italy too – the OE potential is not yet fully exploited. Only a few countries – that have achieved a good level of development – are the exception to the rule. The lack of support from central government, i.e. the lack of national plans for structural and implementation interventions at systemic level, is the main gap.
Moreover, there are often critical factors related to single national and local institutions. Among them, an insufficient spread of management and organizational culture applied to educational contexts and, more generally, a limited inclination towards innovation stand out [18].
In a report published in 2007 the OECD - Organization for Economic Co-operation and Development highlighted that the rapid growth of OE initiatives in Europe and across the world could frustrate innovative potentialities of open didactical resources, if it was not adequately supported at the political and institutional level.
There is still today a considerable need for international, European and national actions centrally coordinated, to enhance and strengthen the management capacities of institutions, which operate in various ways in the OE sector.
In fact, several problems, emerged from a more accurate analysis of national contexts, all together have negatively influenced at national level the following governance macro-processes of OE initiatives: the planning of economic and financial initiatives and interventions; the development of strategies and implementing guidelines; the implementation of operational programmes; the management of interactions among different public actors.

Identifying and structuring all the problems is definitely not a simple matter and analysing multiple cause-effect relationships among them is even more complex. Moreover, these relationships are only rarely linear; in most cases, they are simultaneously vertical, horizontal, transversal and circular.
Therefore, in order to formulate effective intervention plans it is essential to identify the problems, which constitute the *core causes* of the critical situation outlined above. It is not by chance that the European institutions and the other bodies supporting their policies and strategies in recent years have headed towards that right direction adopting a systems approach [14] [19] [20] [21] [22] [23].
Nevertheless, it is hard to encourage and achieve the same level of *real change* within the different national systems, because the *capacity to manage OE initiatives* corresponds to the *actual capacity to innovate*, which shows many differences among countries.

4. Project management, an opportunity for the LIS world

At this point, it seems appropriate and necessary to limit the scope of the topics covered in this paper in order to provide a more concrete contribution, although essentially consisting of methodological recommendations.

It is useful to first define "the scope of intervention" of this contribution:
- *Subject*: OERs in the LIS field;
- *Context*: Research & Development – academic and research institutions in the EU member States;
- *Aim*: to carry out collaborative (inter-institutional) OER initiatives, aimed at contributing to the training and development of new professional profiles to be employed in innovative library and information services supporting R&D processes;
- *Key actors* (in charge of content creation development and management and of service delivery): Librarians and Information Specialists;
- *Beneficiaries:* librarians and information professionals engaged in the scholarly information and communication sector; personnel charged with digital resources management in science and technology fields; ICT workers; researchers; institutions;
- *High-profile policy and strategy responsibilities*: policy makers; directors of the governance of academic and research institutions;
- *Policy*: formal laws, regulations, rules, and guidelines;
- *E-infrastructures:* a combination of digital technologies (hardware and software), resources (data, tools and services), communications (protocols, access rights and networks), people and organizational structures needed to manage them.

We consider some general *purposes*:
- To enhance spread and quality of LIS methods, practices, and tools within training initiatives addressed to the development of new careers and professional figures for innovative library and information services in the R&D sector [23];
- To ensure the effective cooperation of the institutions operating in Library & Information Sciences, Information & Communication Technology, Information & Knowledge Management sectors;
- To contribute to guaranteeing the quality of services and products and the transparency of governance and management processes of OE initiatives, through the shared adoption of inter-institutional policies, procedures and standards, and effective and, at the same time, flexible business models;
- To strengthen the potential and peculiarities of the individual participating institutions and, simultaneously, to trigger virtuous paths in order to create and consolidate proactive synergies (capacity building);
- To contribute to improving interoperability between IT systems dedicated to the management of repositories and application services, also in order to ensure their sustainability.

We continue with the analysis of the main advantages and problems that most commonly characterize OE initiatives in R&D contexts.

The advantages:
- teaching innovation and internationalization;
- visibility and enhancement of the teachers' and institutions' skills and knowledge;
- cost reduction;
- greater flexibility of the didactic proposal and better usability of contents and services;
- improvement of interactions between the different competences in the LIS context, and a consequent increase in the overall volume of knowledge;
- improvement of consulting services to support researchers' activities, especially in the context of project initiatives that involve research data and information management;
- increase and diversification of learners and the opening towards other learning communities different from the traditional ones;
- growth of interactions and exchanges with other teaching communities (other institutions, companies, professionals, etc.);
- …

The problems:
- insufficient integration of the policies aimed at developing multi-level governance systems to support OE initiatives, with consequent shortcomings in:
  - effective and flexible business models capable of ensuring the sustainability of OE initiatives;
  - analysis of the educational needs of the R&D community and, more generally, of any other beneficiaries;
  - executive level planning and management;
  - support and training for teachers;
  - incentive and recognition systems for individuals and groups;
  - unique guidelines and shared quality criteria;
  - transparency and quality of OERs creation, delivery, use, integration / enrichment and reuse processes;
  - political and organizational measures to encourage OERs reuse and sharing;
  - transparent monitoring and cost-benefit assessment systems of the initiatives' overall impact;
  - integration of technological platforms dedicated to managing OE initiatives;
  - …

References to the strategic context: due to the chosen field of intervention, it is essential to consider not only the strategies, recommendations and programmatic measures defined by the European institutions in the field of Open Education, but also the strategic and programmatic framework defined by the same institutions in the field of Open Science [24], [25], [26], [27].
In fact, both European frameworks constitute the "ontological" and "conceptual" framework to which to refer, and, at the same time, the strategic direction framework towards which to guide OE initiatives, anchoring them concretely in the R&D context.

Methodological and management references: keeping in mind these high-profile references, let's try to think of an OE initiative in the LIS field - managed through an institutional partnership - as a complex set of activities organized to achieve a single, non-repetitive goal. This set includes the planning of the initiative, the development and control of the individual activities that make it up, the constraints (human resources, costs, time, quality), the intermediate results and the final results. All of this corresponds to a definition of "project" typical of the Project Management (PM)[6] theories and methodologies.
It is interesting to note that the latest PM theories link the concepts of "change" and "networking" to the term "project".

[6] Among the many definitions of "project", we cite: "A project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates that a project has a definite beginning and end". (PMBOK® Guide, 5th Edition, Chapter 1, Section 1.2, p. 3). "The systemic management of a complex, single and fixed-term company aimed at achieving a clear and predefined objective through a continuous process of differentiated planning and control and interdependent cost-time-quality constraints" (Russell D. Archibald, Managing High-Technology Programs and Projects, 2003). "A unique set of processes consisting of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective" (ISO 21500).

Also in the selected intervention area, *designing* implies "innovation" and "inter-institutional, inter-disciplinary, inter-functional collaboration", with a marked focus on coordination and on aspects such as: sharing, communicating and motivating the key actors and the organizations which they belong to.
Among other things, the approach to networking is necessary to support the medium- / long-term innovation trends in research libraries [23].

What PM methods could be concretely applicable to the design of OE initiatives on LIS topic in the context of academic and research institutions?
In complex environments, as most public ones, for the most part PM problems derive from an outdated vision based on the assumption that the expected results can be adequately determined already at the beginning of the work and subsequently achieved, following exactly what was planned (Theories of Control, Organization Theories). This approach to project management only works for a very limited number of projects, usually small and of very short duration.
A project, like those considered here, cannot be assimilated to a "system", especially if it is medium-sized or large scale and involves different actors. Consequently, PM methodologies - based on a systemic vision of the project, which above all uses the control systems - do not seem suitable to support the management of many current projects, relying on their own efforts. In fact, most of them can be more easily described as *a complex set of adaptive actions and interactions*: a project should be able to adapt and change itself according to the specific context of reference, the experience gained and the changes that gradually occur during its execution.
Therefore, it would be necessary to make use of the support of knowledge and skills capable of "rethinking" the project (analysis of problems / constraints / conditionings) and able to choose methods and tools that best meet its specific needs, drawing on a great variety of methodologies and solution tools (*adaptive pluralistic approach*).
To effectively manage a project and, above all, to better manage the problems that usually arise more visibly in the operational phase, it is necessary to refer to a *model*.
The most complex work consists of the construction of a model conceived according to the specificities of the individual project because, as already mentioned, each project is a *unicum*.
The model is the idea of *how the project should take place.* It is the output of the "Analysis and definition of requirements" phase (architectural phase) and constitutes the basis for the generation of the "Project Plan", which defines its operational translation. The "Project Plan" defines a coherent set of governance and execution processes that allow the achievement of continuity objectives, as well as specific ones, taking into account the constraints that act on the project itself.
The quality of the project model highly depends on the number of variables analysed to define its architecture.
The project operational phase should start only when the model has reached a satisfactory degree of reliability and stability.
In many contexts, the importance of the "Analysis" phase is often underestimated. Thus in the face of the effort to ensure a more rapid departure, there is often a series of "setbacks" and strenuous "restarts" of the project, linked to continuous "recycles" in the execution phase.
The awareness of the problems that can arise from the context of constraints and conditionings of various kinds, and at different levels, allows not only to assess the actual feasibility of the project, but also to foresee possible solutions and the related operational application methods.

How to ensure the quality of a project?
A highly accredited method is the following: key actors should "control" the project - in all phases of its life cycle - through a continuous debate with the final beneficiaries.
In the case examined here, satisfaction of the beneficiaries' training needs depends on different factors: the success of OE initiatives, the quality of processes and contents made

accessible, the possibilities for enriching and re-using contents and technical-technological tools.
In the variegated scenario of Open strategies and initiatives, the concept of "ownership" has been the focus of a very interesting international debate for several years, which also involves Open Education stakeholders.
Many PM methods and techniques are available to support those who intend to design and effectively manage OE initiatives within the R&D institutions. These methods and techniques, appropriately adapted to specific contexts, allow processes to be governed more easily, constantly checking the activities progress, reviewing and updating the planning, evaluating the phase and final results.

Since the 1990s, the programming of many EU Directorates-General has been inspired - and is still inspired - by concepts such as partnership, negotiation, mixed approach (top-down and bottom-up) and, above all, participation of a plurality of subjects.
The tools must necessarily be collaborative in order to manage "program governance" complexity (consider, for example, the different tools of negotiated programming). In this case, the main difficulties consist of ensuring effective collaboration among different subjects, both institutional and private, that must converge towards a common development goal.
To meet this need and, at the same time, to improve overall management, program and project mechanisms, ad hoc methodologies and project management tools have been introduced as, for example, *Project Cycle Management* (PCM), *Logical Framework Approach* (LFA), *Goal Oriented Project Planning* (GOPP) [28].
For example, the GOPP method envisages the figure of a moderator who assists the stakeholders (key actors and beneficiaries) to identify the project proposal, using special interpersonal communication and visualization techniques.

Among the widely used methods, Total Quality Systems (TQS) are also mentioned.
Today the approach to Quality is correctly defined as a set of actions that can and must be defined according to what customers (beneficiaries, in our case) expect.
Quality indeed has a significant impact on organizational efficiency, on beneficiaries' satisfaction and on organisations' visibility / competitiveness.
According to TQS principles and methods, the key actors who design OE initiatives should be in charge of defining explicit and implicit requirements for contents and services to be made available.
The methods used by the Total Quality systems include qualitative techniques (brainstorming, questionnaires, expert judgment, flow diagrams, process mapping and cause / effect diagrams); data analysis; statistical analysis.

Among the most widely used PM models, both at national and international level, there are the Project Management Body of Knowledge guide (PMBOK) and the PRojects IN Controlled Environments method, version 2 of 2009 (PRINCE2-2009). These methodologies are rather complex, nevertheless they can be appropriately used, at least in part, to plan and adequately manage different project types, including those on OE.

The references just mentioned give only a small sample of the many PM models available today.
However, none of them is totally applicable to any design context because, in general, there is not always a unique method to solve every problem. Therefore, it is essential to select the best methods (or part of them) among those compatible with the specific problem and customize them appropriately.
In fact, the models represent only a part of reality, usually related to the problematic situation in which you want to intervene. Therefore, it is always useful to analyse previously in depth the problems to be faced, in order to distinguish problems that can be solved by applying a model (or part of it) and problems that are not solvable, in whole or in part, through this approach.

Finally, we believe that it could be helpful to promote OE initiatives aimed at providing LIS key actors with a fair amount of knowledge on PM principles, methods and techniques.
It could favour the use of a common language to discuss crosscutting topics in all the OE core processes within the R&D system, improving the dialogue among library experts, computer technicians, researchers and between all these actors and the institutions.
The widespread application of PM methods and techniques would allow to effectively link high-level strategies to planning and operational planning of OE initiatives.

Methodologies, IT tools and service levels

As a final note, we would like to discuss some rules of thumb to apply when choosing a methodology (or a set of methodologies) for a specific project.
As previously stated, each project is a *unicum* and requires a different approach. In our opinion, a flexible one is to pick from each methodology the elements that best suit the features, goals and constraints that characterize the project in question. We thus prefer tailoring and merging methodologies over choosing a single one. Some aspects of the project that could influence the choice are complexity, lifespan, heterogeneity of the stakeholders and deliverable types. For instance, agile methods are more suitable for simple and short-lived projects, whereas more structured and standardized methods are required for long-term complex projects.
A recurring problem in the current scenario, especially for long term projects, is the rapidly changing environment that could modify both the goals and the assets that can help achieving them. In those cases detailed planning should initially be done only for the first period (e.g. year 1) whereas for the following ones it may be sufficient to define the milestones and a general outline of the activities. Plans are by nature in constant evolution and can be updated and enriched with more details as the project proceeds.
It can also be useful in a dynamic environment to organize the activities in short iterations that produce results that can be objectively tested by the stakeholders. This dramatically increases the common understanding of the goals and helps building a common language among the stakeholders. This also helps in timely identifying the problems and modifying the strategies.

As for other types of projects, appropriate tools should be leveraged to support project planning/monitoring/accounting and OER access and preservation (GANTT production and updating; deliverable verification and approval; human, financial and material resource allocation; e-learning platforms).

Service quality should not be overlooked in OER initiatives and should be planned since the early phases. In this case the concept of quality regards both contents and infrastructure performance. While the former can be increased mostly by establishing processes for quality control and by deploying tools supporting those processes, the latter is mainly achieved by defining (and complying to) service levels that can be easily monitored.
As for all the initiatives that manage digital contents, persistent identification of all the resources and adoption of standard digital preservation criteria help ensuring integrity, traceability and long term access to OERs.

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Georgetown University	United States
GeoScienceWorld.org	United States
German National Library of Science and Technology, TIB	Germany
Göttingen State and University Library	Germany
GreyNet International, Grey Literature Network Service	Netherlands
Institute of Information Science and Technologies, ISTI-CNR	Italy
Irvine Valley College	United States
Korea Institute of Science & Technology Information, KISTI	South Korea
Leibniz Information Centre for Science and Technology	Germany
Library of Zeeland	Netherlands
National Institute of Informatics	Japan
National Library of Technology, NTK	Czech Republic
National Research Council of Italy, CNR Central Library	Italy
NeMIS Research Laboratory, ISTI-CNR	Italy
Network and Informative Systems Office, CNR	Italy
Nuclear Information Section; International Atomic Energy Agency, NIS-IAEA	United Nations
Polytechnic University of Valencia	Spain
PricewaterhouseCoopers, PwC	Netherlands
Reiner Lemoine Institut gGmbH	Germany
Research Institute of Geodesy, Topography and Cartography	Czech Republic
Saint Petersburg State University	Russia
Sandia National Laboratories	United States
Slovak Centre of Scientific and Technical Information, CVTISR	Slovak Republic
Swedish University of Agricultural Sciences	Sweden
TextRelease, Program and Conference Bureau	Netherlands
U.S. Government Accountability Office, GAO	United States
University of Amsterdam	Netherlands
University of Bonn	Germany
University of California, Irvine Libraries	United States
University of Florida; George A. Smathers Libraries	United States
University of King's College	Canada
University of Lille	France
University of Ljubljana	Slovenia
University of Maryland; University Libraries	United States
University of Padova	Italy
University of Veterinary Medicine Hannover	Germany
University of Wisconsin, Milwaukee	United States
WorldWideScience Alliance	United States

Pre-Conference Announcement

Twenty-Second International Conference on Grey Literature

'Applications of Grey Literature for Science and Society'

Italian National Research Council

Rome, Italy ● November 19-20, 2020

Biblioteca Centrale
National Research Council of Italy

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 closing on March 31, 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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