European Commission

IPR, Technology Transfer & Open Science

Challenges and Opportunities

Thomas Crouzier, rapporteur

Edited by:
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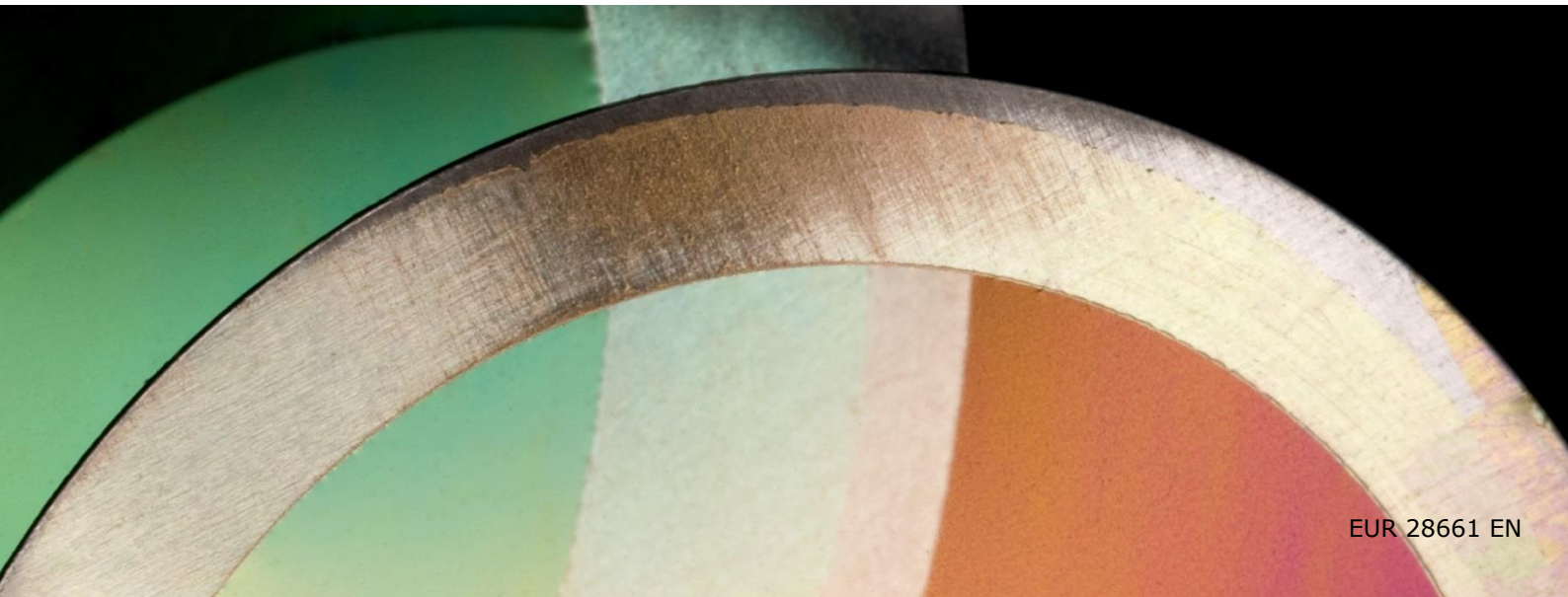

EUR 28661 EN

JRC Science Hub
https://ec.europa.eu/jrc

RTD – Open Data Policy & Science Cloud
http://ec.europa.eu/research/openscience

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Contents

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Abstract

This workshop was a one day meeting, gathering stakeholders from the research, technology transfer and innovation ecosystem, including academic researchers, academic publishers, large research organisations, representatives from technology transfer offices and experts on academic research. The workshop was made possible through collaboration between the European Commission's Joint Research Centre (JRC) and DG Research and Innovation.

The workshop aimed to bring together a wide range of expertise to answer the following questions:

- How do you strike the right balance between IPR protection and Open Science?
- How do you achieve the proper balance between the need to freely access data and the need for copyright protections?
- What is the best governance structure and copyright model for the future European Open Science Cloud to be launched in the next 18 months?

These three questions were addressed in three separate sessions:

Session 1 – The Interplay between Open Science Policy and IPR

Session 2 – The Impact of IPR on Open Data

Session 3 – The Impact of IPR and Privacy Rules on Research Data Infrastructures and

Key conclusions

The three main conclusions are:

1. There are no incompatibilities between IPR and Open Science. On the contrary the IPR framework, if correctly defined from the onset, becomes an essential tool to regulate open science and ensure that the efforts from different contributors are correctly rewarded. Their definition is depending on the objective of the research,
2. The European Commission has a role in promoting open science and its balance with IPR. This is especially important at the time when policy on copyright and definition are being redefined and the Open Science Cloud is being established. These new policies will build the framework for the leadership of Europe in Open Science.
3. Draw inspiration from existing best practices. For instance, by understanding how public research institutes with societal commitments and strong industrial partnerships are striking the right balance between IPR and open knowledge. And by using the licences offering balance right between creators and users for Open Science content.

Main findings

Other corollaries of from the workshops are the following:

4. Preserve the European Commission base principle for Open Data: "as open as possible and as closed as necessary"

5. The European Commission should aim for the highest degree of clarity concerning the policies regulating the non-disclosure of publicly funded data, for instance by creating collections of case studies.
6. Stakeholders should draw inspiration from existing IPR/Open Science balance policies.
7. The European Commission should participate in harmonizing the open science infrastructure and policies through a European Open Science Cloud that sets standards for database quality and licensing model standards.
8. Support of "bottom up" growth of Open Science and Open Data, while encouraging translation of research outputs into the commercial world.

1 Report from the Workshop sessions

1.1 Opening statement

Giovanni De Santi, Director of "Competences" at the JRC, explained in his opening remarks that because of its role as a research organization, the JRC has a natural interest in Open Science and has been involved in implementing Open Science policies. He explained that the role of the JRC in generating data for policy is increasingly important, because of the need of basing policy decisions on facts. It is also crucial because of JRC's efforts to become a force to propose policy for data management. Therefore, the questions around the accessibility of data, such as data sharing and data mining, and the legal aspects around IPR and copyrights have been essential for the JRC.

Jean-Claude Burgelman, Head of Unit for "Open Access and Foresight" at the DG Research and Innovation, mentioned the work the DG has been undertaking on open science policy to encourage the better dissemination and reuse of research outputs. He explained how the adoption of Open Science principles is necessary in order to ensure the best use and greatest impact of the investments put into research and innovation in Europe. While crafting these policies and discussing them with stakeholders, it became apparent that potential frictions between the IPR laws regulating the freedom of movement of knowledge and the Open Science principles could become a challenge. He stressed that such questions needed to be addressed at this critical time, when policy makers are setting expectations and defining the rules that will promote Open Science. Mr. Burgelman concluded with an optimistic remark, noting that although the path forward is unclear, the frictions between IPR and Open Science are not inevitable. He cited examples from open innovation where companies drop claims on their patents that are unproductive after a certain time in order to maximize the use of it.

1.1.1 Introductory remarks

The workshop started with contributions from Mary Ritter, a member of the Open Science high-level group and Elta Smith, from RAND which started an Open Science trend monitor for the EC. Mary Ritter summarized the Mallorca Declaration of Open Science of January 2016, which provides concrete suggestions to encourage open science practices among European researchers. She pointed to the many challenges that Open Science faces, including among many others, the lack of an open culture among academic researchers caused by misplaced incentives. The Open Science monitor presented by Elta Smith illustrated clear trends towards more open science and innovation ecosystems. Her presentation also revealed the difficulty in tracking the many aspects of Open Science in a quantitative manner. These introductory presentations showed that the transition towards Open Science is an ongoing effort that relies on the stakeholders of this vast ecosystem to change deeply entrenched habits. At the European level, a number of policies are already in place to support the development of Open Science, including open access guidelines and the set-up of the European Open Science Cloud. It is in this context of certain change, but also the lack of clarity about what future policies should be adopted to encourage the most productive aspects of Open Science, that this workshop was organized. The aim is to provide suggestions on how to best reconcile the free exchange and use of data, while maintaining an IPR and copyright system that has been essential to large and long term private investments in innovation.

1.1.2 About the importance of Open Science

The importance of Open Science and its direct and concrete impact on research, innovation and on society was mentioned by several participants. Panellists and members of the audience cited a number of examples to illustrate the importance of Open Science. For instance, they mentioned open collaborative projects that have created strong societal value and the rapid sharing of data that leads to new vaccines.

The following discussion of the workshop assumes that both Open Science and Intellectual Property Rights (IPR) are beneficial and necessary for the research and innovation ecosystems to flourish in Europe. Therefore, this report will emphasize the possible frictions between IPR and Open Science and not the benefits of IPR and Open Science.

1.1.3 About Open Science initiatives

Throughout the workshop, participants pointed out that, rather than IPR issues, the ability and willingness of researchers to share their research outputs determine to which extent data is made open and available. Although increasingly required by research funders, open and active dissemination of research results is not a regular academic habit. Although several reasons for this situation were mentioned, the lack of proper incentives was a common theme. The participants explained that the proper preparation and sharing of data requires a significant commitment from researchers. Therefore, clear incentives that promote the sharing of research output need to be developed.

The participants also denounced the role of journal impact factors as the dominant benchmark for the quality of scientific publications and by-proxy, of researchers. Because of the lack of relevant incentives, data curation and sharing are only perceived as burdens by researchers, eclipsing the benefits that it entails for researchers and society. Financial incentives were mentioned as a possible way forward. Another suggestion from panellists in Session 3, recommended using publications as an incentive, since they are, along with funding, the most valuable currency for researchers. Data sharing would thus be encouraged by the development of data journals that allow the data to be cited in a very similar way to published manuscripts.

1.2 Session 1 - The Interplay between Open Science Policy and IPR

The first session began with a presentation from Prof Ulf Petrusson, from Gothenburg University, which set up the context of the possible friction between IPR, and Open science and innovation. His research pointed to the multiple, and perhaps conflicting, messages (or "logics") directed at researchers from the research institutions: First, research education and utilization, which refers to the basic responsibility of making knowledge available to the public; Second, making knowledge accessible to very specific stakeholders, such as in the case of contracted research, which can lead to patent applications; Third, transmitting knowledge through innovation projects such as start-ups or other commercial or non-commercial projects. The fourth is making knowledge available through Open Science infrastructures, such as databases, massive open online courses and open software.

Professor Petrusson pointed out that these four approaches to the role of researchers are fundamentally different. They require a different set of mind-sets and skill sets. Although there are no predefined and definite incompatibilities between these various aspects, it is unreasonable to expect researchers to adopt all four logics simultaneously without proper support. For instance, universities need to provide stewardship to researchers throughout the research cycle, in order to help them conciliate the goal of mass dissemination of knowledge and the ambition to transform technologies developed in the laboratory into products with potential social and economic impact. Although support does exist, such as in the form of the local university technology transfer (TT) offices and the grant agreement templates provided by the European Commission, Open Science issues are most often excluded from the discussions.

The session then continued with a panel discussion, which sought to provide insights into the key challenges that Open Science faces with IPR. The Session 1 participants were:

- Vincent RYCKAERT, IP Business and Intelligence Director, IMEC
- Bernard DENIS, EU Relations Officer, CERN
- René Oosterlinck Technology Transfer Programme Office, European Space Agency
- Michel NEU, European Association of Research and Technology Organisations EARTO
- Dorothea KAPITZA, Helmholtz-Gemeinschaft Deutscher Forschungszentren e.V.
- Anne De Moor, Digital Europe.

The panellists were unanimous in saying that there are no incompatibilities between IPR and technology transfer, and Open Science.

1.2.1 Current approach

The current approach of the European Commission, which consists of asking researchers to make the data *as open as possible and as closed as necessary,* was thought to be a reasonable approach by most of the panellists and was not recommended to be changed. It was also stressed by a majority of the participants that the burden of proof should remain on the side of closeness and not openness. Therefore, undisclosed research outputs should be the exception rather than the rule.

This approach requires that a line is drawn to determine what can reasonably be considered as an acceptable argument for opting out of the by-default disclosure of research outputs. The uncertainty as to where to draw the line was a concern to some of the private sector representatives. Anne De Moor from Digital Europe, a sector organisation for the digital economy companies, opposed the idea of an open-by-default with no exceptions model but agreed with the *open as possible and as closed as necessary* principle. However, Ms. De Moor noted that the case-by-case treatment of exceptions through consortium agreements is often a tedious process and pointed to the need of clarifications as to how the policy will be implemented in practice.

1.2.2 Following the examples of others

The panel agreed that the context in which the scientific research is conducted is central to the issues of data disclosure and IPR, and that it, therefore, requires a case-by-case approach. For instance, interesting insights were given by two large publicly-funded research organisations that regularly collaborate with the industry in a win-win configuration. The European Organization for Nuclear Research (CERN) and the European Space Agency (ESA) have built internal organisations and internal cultures that allow both the generation of open data for the public and scientists, and a fertile ground for industrial collaborations. René Oosterlinck from the technology transfer office of the ESA gave an example of such a balance. He explained that the ESA collects data on the radiation received by the Galileo satellite positioning systems. The information about the solar radiation activities is open and valuable to scientists, while specific information about the impact of radiation on the electronics of the satellites, which has important commercial and military value, is closed for the time being.

Michel Neu, from the European Association of Research and Technology Organisations (EARTO) mentioned the system adopted in the United States as an example of how to strike a good balance between the commercial exploitation of data and the need to make data openly accessible. He mentioned that the rules that apply in the United States are clear and offer more options to close the data than those currently suggested by the European Commission.

1.2.3 Need for international standards

The representatives from the private sector expressed concerns over the uncertainties surrounding the nature and amount of proof that will be required to justify data non-disclosure. The negotiation of the consortium agreements are often tedious processes as a result of such provisions, and could place participants at a disadvantage, when compared to countries where the default policy is clearly favouring non-disclosure.

René Oosterlinck gave an anecdotal example about the ESA sharing information at a conference, without reciprocity from other participants. This illustrates how differences in disclosure policies can be, or at the very least feel, disadvantageous. What thus seems important, both for industry and academic research, is that policies take into consideration the international context and ensure that European stakeholders of the research ecosystem are at a level playing field with the rest of the world. The U.S. policies regarding open access and open data mandate full openness on the research output of its federal agencies. However, it also contains clear guidelines for possible exceptions to the by-default disclosure, and could thus serve as a benchmark for European policies.

1.2.4 A researcher's perspective

Several participants from the panel and the audience mentioned that the culture of open sharing of research results has yet to become an integral part of the academic research culture. The reasons are primarily independent of IPR issues, but are due to the long-standing habit of sharing the minimum amount of information necessary to publish original articles.

Dorothea Kapitza pointed out that universities and the European Commission have undergone large-scale campaigns to encourage researchers to engage in patenting and

technology transfer activities. For instance, the European Research Council (ERC) is operating a Proof of Concept program for its awardees and funding development studies for the most promising technologies.

Concerns were raised that the current message of Open Science communicated in recent years, could hinder these efforts, if clear guidelines on how to make the two aspects coexist were not provided. This mirrored the analysis of Prof Ulf Petrusson regarding the conflicting messages that researchers are receiving and the limited importance given to Open Science aspects when establishing consortium agreements and agreeing on disclosure policies.

1.2.5 Clearer, more flexible rules

The necessity of more precise definitions of the terms used during these debates and in legal documents, were a recurrent discussion topic during the first session. It was, for instance, unclear whether the practical implications of open science and open data were perceived in the same way by the different stakeholders. For instance, "Open Data" can imply several combinations of levels of data accessibility, access cost and data manipulation rights. In addition, there was a consensus on the fact that the guidelines for the justification of non-disclosure exceptions should be made as clear as possible in order to facilitate negotiation phases between partners.

1.3 Session 2 - The impact of IPR on Open Data

In the second session, the emphasis was placed on open data and its potential conflict with IPR. Lucie Guibault, an IPR researcher from Amsterdam University, gave an overview of European Open Science policies for both publications and data. She explained that, although encouraging researchers to submit their publications and data to repositories is important, the choice of licenses, which defines the conditions in which the data can be accessed and exploited, determines the likelihood that the information will be used. There are two possible licensing scenarios for scientific articles. The "gold" open access route, in which the authors pay the publisher for open access and for which a license, that usually authorises reuse of the publications, is applied. In the "green" route, the original work is still licensed by the publisher but after an embargo period it is made available under an open access scheme. Therefore, the conditions of reuse of the materials are unclear.

The rest of the discussion focused on "data", which refers to the underlying information that allows the generation of articles. The "data" can also refer to the information that is never exploited to its full extent and often remains unpublished. One central question that was discussed was whether data itself could be copyrighted. This question seems to stem from the undefined boundary between publications and data. The copyright protections, which cover published scientific publications, concern the text as well as the data that it contains. In fact, the copyright laws only protect original creations, which in a scientific publication is limited to the text and images. Lucie Guibault explained that data itself cannot be copyrighted, since it is not an original creation. However, some databases can involve original work, such as when innovating in the way the data is organized or in the way it can be retrieved.

The discussion continued with the analysis of a panel of experts on the management of open science and open data. The aim was to better understand how to strike the proper balance to enable researchers to take full advantage of the potential benefits of Open Data while providing the necessary protections. The participants in Session 2 were:

- Philippe Aigrain, Co-founder, La Quadrature du Net, France
- Marco Giorello, Deputy Head of Unit "Copyright", DG Communications Networks, Content and Technology
- Catriona Maccallum, PLOS Advocacy Director and Member of the Boards OASPA & OpenAire
- Inge Van Nieuwerburgh, Representative of the Open Access Belgium working group
- Elizabeth Crossick, RELX Group (a global provider of information and analytics for professional and business customers across industries)
- Susan Reilly, Association of European Research Libraries (LIBER)

1.3.1 A number of frictions

According to the analysis of several of the panel participants, there are some frictions between the mission of knowledge dissemination by academic institutions, such as libraries, and the copyright system that limits their right to disseminate data and text. Ms. Van Nieuwerburgh noted that these conflicting objectives between Open Science principles and copyright laws are maintained for 70 years after death of the author, which is excessively long considering the fast-paced needs of scientific research. According to Ms. Van Nieuwerburgh, this leads to a large amount of data being forgotten and never exploited.

The database right, which provides copyright protection for databases, regardless of their originality, was created to stimulate investments in the database industry. However, in the context of Open Science, its use was identified by the panellists as a major obstacle to the unrestricted access to data. Several participants suggested that this special protection should be repealed to promote more open access of data.

However, representatives from the commercial publishing sectors were more conservative in this matter. They did not think that there are major incompatibilities between the current IPR model and Open Science. Therefore, they recommended that little change be made to the status quo.

1.3.2 Challenges in accessing data

There was a general consensus about the necessity for researchers and many other stakeholders in society to be able to access the data generated by publicly funded research. This was illustrated by Catriona Maccallum’s comments. She explained that access to reusable data helps the reproducibility of research by enabling validation studies and follow up experiments. Caveats to this point were brought up by Philippe Aigrain, who identified trending data "fetishism", and explained that data itself has very little value. The value of data only becomes apparent, if it is FAIR (Findable, Accessible, Interoperable, and Re-usable) and if it is then exploited by data-literate scientists. These are two conditions that are currently not typically met.

Ms. Van Nieuwerburgh also explained that access to data has been limited by unclear ownership of the data. Although researchers might want to open the data, universities, for instance, could claim ownership of it and prevent that from happening. Proper guidelines and good practices dealing with data ownership could help to resolve these uncertainties.

Elizabeth Crossick then addressed the problem of infrastructure, stating that the limited access to data experienced today has very little to do with IPR issues. She made a comparison between journal articles that are curated, organised and findable, and data which are disorganised and difficult to search through, mostly because of the lack of proper infrastructure. She explains that the poor infrastructure could partially explain why up to 90% of datasets are not being reused. Marco Giorello, also agreed on the current infrastructure weaknesses, pointing to the fact that once data and text are completely open, the large volume of data transferred between repositories and research institutes will put stress on the current infrastructure. This represents a fundamental technical challenge that should be addressed along with the policies regulating data disclosure and access.

1.3.3 Specific challenges faced by text and data mining

In addition to the exploitation and access to data, many of the panel's comments revolved around text mining. In the context of Open Science, text mining is the process of feeding raw text from publications into algorithms that can recognize values, keywords and concepts. This, coupled with advanced analytics, can lead to original discoveries that create new links between the published results, or summarize a vast number of studies. Text mining is also an essential technique for many digital science companies offering innovative services to researchers. Text mining now allows smarter and better tailored article recommendations systems. In the near future, text mining could help to create new search engines that directly extract information from articles without having to refer the user to the full text.

This approach naturally considers the text contained in scientific publications as "data", and, therefore, conflicts with the principle that text is an original creation that is covered by copyright protections. Current copyright laws do not guarantee access to the full text of articles for text mining purposes. At the core of the debate during Session 2, was the limitation of certain subscription models that allow readers to access the publications, but do not allow their automated text mining.

There was a clear consensus in the discussion about the necessity of a copyright exception for text and data mining that would provide the right for research organisations to access, download and reproduce the data and text for automatic mining purposes. It was also considered to be important that this exception should be harmonized throughout Europe, since both users and databases are found in all member states.

1.4 Session 3 - The impact of IPR on Open Data

In Session 3, the conversation focused on the European Open Science Cloud (EOSC) project and the related IPR issues. Klaus Tochtermann, Director of the German National Library of Economics (ZBW), first provided an overview of what he believes the EOSC

should become: an umbrella infrastructure to unite and facilitate access and use of the numerous scientific databases maintained throughout Europe. He also gave an overview of how IPR can conflict with the various phases of the data cycle: data search, data processing and analysis and data storage and creation.

- When searching for data, the EOSC will allow users to search all datasets simultaneously. This aspect should not pose IPR conflicts, since metadata is typically open. However, if it is not, the EOSC will require the user to provide the appropriate credentials to access the database.
- The processing and analysis of the data requires the data to be accessed and manipulated. The access of the data is dependent – among other things, such as data protection restrictions – on the existing IPR models. Open datasets are freely accessible and are associated with licenses that allow their use without restrictions. Other databases can require subscriptions or be limited in access because of privacy or IPR issues. The analysis of the data is highly dependent on the associated licenses. The licenses can, for instance, define whether the data can be merged with other datasets or can be processed by supercomputer analysis.
- The storage and creation of data is also governed by the license associated with the dataset. The license defines the conditions under which the data that was generated from the original datasets can be used.

Mr. Tochtermann explained that, in his view, the IPR policies should be decided by the data centres and should not be of the responsibility of the EOSC.

The discussion was then open to a panel composed of potential stakeholders of the EOSC with the aim to reflect on the impact of IPR on the implementation of the European Open Science Cloud. The participants in Session 3 were:

- Simon Hodson, Executive Director, Committee on Data for Science and Technology (CODATA)
- Jean-Paul Triaille, Central IP Service (CIPS), Joint Research Centre (JRC)
- Christian Reimsbach-Kounatze, Information economist and policy analyst, OECD-STI
- Neville Cordell, Allen & Overy
- James Perham-Marchant, John Wiley & Sons

1.4.1 What should the EOSC become?

Several panellists discussed what the EOSC should be and for what purpose. This reflects ongoing discussions in the Commission High Level Expert Group on the European Open Science Cloud (HLEG EOSC) that define the aim and scope of the EOSC. Simon Hodson explained that, in his opinion, the EOSC is essential to break down existing barriers between research disciplines. In today's data-intensive research, multidisciplinary research could often take the form of cross-analysis of datasets from different scientific fields.

However, this can only be done if the data is FAIR (Findable, Accessible, Inter-operable and Re-usable). Christian Reimsbach-Kounatze said that for data to be reused, the database should contain more than the data itself. For instance, databases could provide access algorithms, methodologies and metadata related to the data. This would provide the set of tools necessary for the exploitation of the data.

1.4.2 Discussions around governance and reach of the EOSC

Although there was a general consensus about the utility of a European gateway for scientific data, the extent of the role of the EOSC was under debate. There were two opposing views on major governance issues: the choice of licenses and data quality control.

First, the panellists discussed the type of license that should be attached to datasets, since it would define, to a great extent, the usability of the data. For instance, Christian Reimsbach-Kounatze argued that the EOSC needs to agree on standard licensing models for the data it is connected to. This would ensure the legal interoperability of the data and could encourage the use of open licensing models by other data centres. On the other hand, Jean-Paul Triaille explained that it is not the role of the legislator to enforce standard licenses. However, he encouraged all stakeholders to engage in discussions to decide a shortlist of licences that are most appropriate for the researchers.

Second, the panellists discussed whether it should be the role of the EOSC to control the quality of its associated datasets. It was Jean-Paul Triaille's opinion that the EOSC should not go too far in making decisions about who is in and who is out of the network. He feared that this approach might discourage some from participating in the program. This could then jeopardize the community's enthusiasm in the early days of the platform. Simon Hodson, on the other hand, said that the EOSC should be more than a tube connecting data centres. He believes it is the role of the EOSC to set quality standards that will exclude some candidates, but that would also set high standards and quality assurance for the future. This is essential, since the reuse of the data is strongly dependent on its quality.

1.4.3 What licensing model for the EOSC?

From the panel discussions, it seemed that the frictions between the EOSC and IPR are mostly centred on the licensing models that EOSC-associated databases would adopt. The reason for this friction, according to Klaus Tochtermann, is that technology and computer science have overtaken law and policy. He concluded that there is urgency for action, since the legal situation is unclear and confusing for researchers. This favours the development of habits at the edge of legality. A license policy for the EOSC would define a short list of approved licenses for the databases connected to the EOSC. The licenses could be defined either by:

- a "top-down" approach, which would consist of putting in place broad exemptions that allow researchers from research organisations to freely access, download and exploit the data.
- a "bottom-up" approach, which would consist of identifying what licenses are currently being used, understand the known problems and limitations of the licenses currently used and then select those that are acclaimed as best for the common good of the stakeholders. This last option seemed to be the one

preferred by the panellists, since it was noted that a number of well-crafted licenses already exist and could be quickly adopted as EOSC standards.

The ideal data license model would be open enough to guarantee access and use of data to researchers, while being flexible enough to account for exceptions such as datasets with privacy issues. Some datasets contain sensitive information and cannot be shared without restrictions. James Perham-Marchant, representing a commercial publisher, explained that some authors want to keep the exclusivity of their data for some time after the publication of their first article. He, therefore, favoured licensing models that can guarantee the flexibility to attend to these requests. Simon Hodson added that publishers bear the responsibility to choose licenses that fit the type of data that they host and the needs of their clients. Therefore, publishers should be a major actor in the definition of the licenses.

Simon Hodson placed an emphasis on the legal interoperability of the licences, which ensures the legal compatibility of multiple databases and that different datasets can be legally combined. By linking European databases together, the EOSC can provide the infrastructure to combine datasets that have remained siloed until today. It is important that this technical infrastructure is not bottlenecked by an inappropriate legal framework.

1.5 Policy recommendations

The following policy recommendations are a result of the general consensus that appeared during the discussions of the workshop.

1. Data as open as possible and as closed as necessary

A general consensus was found on this principle during the workshop. It was deemed important that the burden of proof should be placed on the side of data non-disclosure.

2. Aim for clarity of the policies regulating the non-disclosure of publicly funded data

The guidelines regulating the disclosure or nondisclosure of publicly funded data should be made extremely clear to simplify the negotiation process in consortium agreements and to avoid further burdening of researchers. The EC should consider establishing a collection of case studies to help researchers and their local counsellors in these issues.

3. Draw inspiration from existing IPR/Open Science balance policies.

Policy makers should aim to establish guidelines for exceptions to the by-default disclosure of data that balance the free-access and the commercial exploitation of new knowledge. Policy makers should draw inspiration from the policies of other countries, such as the United States, and from European organisations working at the interface between public service and industrial collaborations such as the ESA and CERN.

4. Harmonization of infrastructure of policy.

They EC should create a European Open Science Cloud that federates data centres around a unique virtual portal, but also around database quality and licensing model

standards. It is recommended that metrics be established to encourage standardization and quality, such as a "FAIR" readiness level.

5. Provide license that ensure the openness of data and allows text mining.

The EC should gather stakeholders around the EOSC to define a short list of licenses that would meet the needs of both researchers and managers of databases. For instance, the licenses should facilitate text and data mining and ensure the legal interoperability of the data.

6. Support of "bottom up" growth of Open Science and Open Data, while encouraging translation of research outputs into the commercial world.

It is recommended to provide effective incentives and appropriate support to enable researchers to integrate both IPR and Open Science issues, side by side, from the conception of projects up to the communication of the research results. This can be accomplished by encouraging collaborations between technology transfer offices and research offices to help conciliate the multiple roles of the modern researcher.

2 Conclusions

The presentations and discussions during the workshop revealed potential frictions between IPR and Open Science. The stakeholders represented at the workshop proposed to address these frictions at different levels. At the researcher's level it would be done by providing support to help researchers tackle the different expectations put on them, at the policy level with copyright law reforms, and at the level of infrastructure with the EOSC and its potential for standardisation of open data.

Representatives of researchers and librarians strongly reaffirmed the importance of developing Open Science for the future of the research ecosystem. On the other side, representatives from companies with business models relying on the status quo, naturally proposed that little change be made. However, the discussion also made it clear that both sides will need to change in the near future. Researchers will need to embrace a more open attitude towards data sharing, while companies need to shift their business models away from copyrighted text and data, and into the services and tools that enable the exploitation of the data. Both sides are facing important cultural challenges to meet this goal.

It is important that these changes take place fast. Open Science is a bottom up movement that stems from real flaws and inefficiencies in the current public research ecosystem. Solutions that circumvent these limitations, but are doing so by defying the law, are seeing an increasing uptake by researchers. Sci-Hub for instance, is illegally serving more than 62 million full text publications to millions of researchers. The challenge for the European Commission is to build the legal and infrastructure framework to be in phase with the latest technology and the needs of researchers, while keeping conditions intact for a lively private sector that can innovate and invest in the digital science and scholarly communication industries.

List of abbreviations and definitions

CERN	Conseil Européen pour la Recherche Nucléaire
CODATA	Committee on Data for Science and Technology
EARTO	European Association of Research and Technology Organisations
EOSC	European Open Science Cloud
ERC	European Research Council
ESA	European Space agency
FAIR	Findable, Accessible, Inter-operable and Re-usable
IPR	Intellectual Property Rights
JRC	Joint Research Centre
LIBER	Association of European Research Libraries
OASPA	Open Access Scholarly Publishers Association
OECD-STI	Organisation for Economic Co-operation and Development, Directorate for Science, Technology and Innovation
RAND	Research and development corporation
TT	Technology Transfer

Annexes

Annex 1. Conference program

09.00 – 09.30	**Registration & Welcome Coffee**

Co-Chairs: and	**Giancarlo CARATTI**, Head of Unit IP and Technology Transfer, European Commission's Joint Research Centre, JRC,
	Jean-Claude BURGELMAN, Head of Unit Open Data and European Open Science Cloud, DG Research and Innovation
Moderator:	**Jacki DAVIS**, Meade Davis Communications
Rapporteur:	**Thomas CROUZIER**, KTH Royal Institute of Technology

09.30 – 09.50	**Welcome Addresses**
	Giovanni DE SANTI, Director, Directorate I – Competences, JRC
	Kurt VANDENBERGHE, Director, Directorate A – Policy Development and Coordination, DG Research and Innovation
09.50 – 10.30	**Keynote speeches**
	Open Science and EU research – **Mary RITTER,** Pro-Rector for Postgraduate Affairs, Imperial College London
	Monitoring Open Science Trends in Europe by **Elta SMITH**, Rand Europe
10.30 – 11.00	**Coffee Break**
11.00 – 12.30	**IPR and Technology Transfer in an Open Science context**
	IPR & Open Science by **Ulf PETRUSSON**, Director of the Centre for Intellectual Property and Professor of Law, University of Gothenburg Round table: **Open Science and TT: Incentives for knowledge producers, commercial exploitation, value chain** Is Open Science in general facilitating technology transfer? Is it optimizing the development of innovative products or services? In order to reap the benefits of Open Science for technology transfer activities, what does the research sector expect from the regulators and from the authorities granting research funds? How must research organisations adapt their practices? Panelists: • **Vincent RYCKAERT**, IP Business and Intelligence Director, IMEC • **Bernard DENIS**, EU Relations Officer, CERN • **René OOSTERLINCK**, Chairman of the ESA Patents Group, European Space Agency • **Michel NEU**, European Association of Research and Technology Organisations EARTO • **Dorothea KAPITZA**, Helmholtz Association • **Anne De Moor**, DIGITALEUROPE
12.30 – 13.30	**Networking Lunch**
13.30 – 15.00	**The impact of IPR on Open Data**
	The revision of IPR and Open Data – **Lucie GUIBAULT**, IPR researcher, Amsterdam University Round table: **Open data and the revision of the IPR framework (the TDM exception): how to exploit new opportunities?** Since globally networked scientists appear to advance faster towards new discoveries than those who target patents, will Open Data sharing become an alternative to patenting? Can data sharing replace IPR as a 'better practice'? Panelists: • **Philippe AIGRAIN**, Co-founder, La Quadrature du Net, France

	• **Marco GIORELLO**, Deputy Head of Unit "Copyright", DG Communications Networks, Content and Technology • **Catriona MACCALLUM**, PLOS Advocacy Director and Member of the Boards OASPA & OpenAire • **Inge VAN NIEUWERBURGH**, Representative of the Open Acces Belgium working group • **Elizabeth CROSSICK**, RELX Group • **Susan REILLY,** Association of European Research Libraries (LIBER)
15.00 – 15.30	**Coffee Break**
15.30 – 17.00	**The impact of IPR on the European Open Science Cloud and other research data infrastructures**
	The impact of IPR on the European Open Science Cloud[5] – **Klaus TOCHTERMANN**, Institute for Computer Science at Kiel University, Director of the German National Library of Economics (ZBW) – Leibniz Information Centre for Economics Round table: **How can the EOSC conciliate IP rules?** IPR are being increasingly perceived as a potential issue in relation to the future EOSC, in which massive amounts of data will become accessible from a single virtual environment. How can the EOSC thrive while at the same time ensuring that IPR are respected? Panelists: • **Simon HODSON**, Executive Director, Committee on Data for Science and Technology (CODATA) • **Jean-Paul TRIAILLE**, Central IP Service (CIPS), Joint Research Centre (JRC) • **Christian REIMSBACH-KOUNATZE**, Information economist and policy analyst, OECD-STI • **Neville CORDELL**, Allen & Overy • **James PERHAM-MARCHANT**, John Wiley & Sons
17.00 – 17.10	**Concluding remarks by Giancarlo CARATTI, JRC**

[5] For more information please refer to COM(2016) 178 final: *European Cloud Initiative - Building a competitive data and knowledge economy in Europe*.

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