POLICIES TO PROMOTE OPEN SCIENCE: EVIDENCE FROM OECD COUNTRIES

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Outline

- Defining Open Science
- An evolving scientific enterprise
- Rationales and impacts of Open Science
- The Open Science eco-system
- Policy challenges and opportunities

Main finding of OECD report on Open Science (OA + OD)

MAKING OPEN SCIENCE A REALITY

OECD

…and Country Notes on the OECD/WB Innovation Policy Platform

Open science country notes

The country notes present up-to-date information on the key actors in open science, and review recent policy trends in the areas of open access, research data, infrastructure, and skills at the national and international levels. These notes thus constitute a mapping of recent policy efforts to promote open science in OECD member and selected non-member countries. The information was gathered using a common template in the course of 2014, and is current as of Summer 2015.

Belgium	Finland	Japan	Portugal
Canada	France	Korea	Spain
Chile	Germany	Mexico	Turkey
China	Greece	Netherlands	United Kingdom
Estonia	India	Norway	United States
European Commission	Italy	Poland	

But open science is more than access to research publications and data

- *Open science is more than open access to publications or data;* *it includes many aspects and stages of research processes*. Open science is a broader concept that also includes the interoperability of scientific infrastructure, open and shared research methodologies (such as open applications and informatics code), and machine-friendly tools allowing, for example, text and data mining.

Science: an evolving scenario…

- ICTs offering new possibilities to share results
- Science is becoming increasingly data-driven

TDM-related scientific articles
1995-2014, per thousand article

Source: OECD (2014), *Measuring the Digital Economy: A New Perspective,* OECD Publishing, Paris.

Chart legend: Data mining · Big data (excluding data mining) · Text mining (excluding data mining). Y-axis ‰ from 0 to 2.5. X-axis years 1996 to 2014.
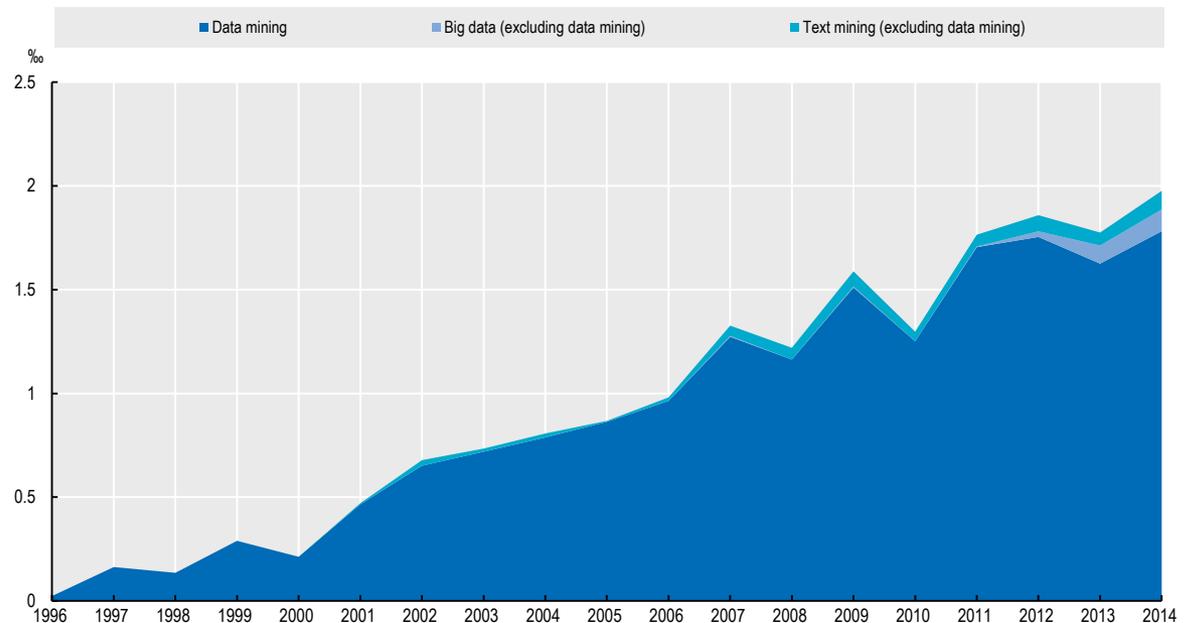
Open science: Why do we care?

- Increasing transparency and quality
- Speeding the transfer of knowledge
- Promotes competition and also collaboration on research ideas
- Increasing knowledge spillovers not only to science but also the economy and society
- Addressing global challenges more effectively
- Promoting citizens' engagement in science
- ...

OA can also contribute to innovation…but…

- PubMedCentral show that 25% of the daily unique users are from universities, **17% from companies, 40% are individual citizens** and the rest are government or other categories (UNESCO 2012)

- **48% of Danish SMEs consider research outcomes very important** for their business activities and **more than 2/3 reported difficulties** in accessing research material (Houghton, Swan and Brown 2011)

- **UK SMEs cannot easily access scientific articles** Ware (2009)

…the impacts of open science need to be fully understood

- Open science a relatively new phenomenon (at least for policy makers)
- Evidence on open access citation advantage (but quantification of this advantage is subjected to debate)
- Different behaviours in different fields (why? Over time?)
- Scientists tends to like open science in surveys (what about in reality?)
- Many estimates of the economic impact of data sharing (mostly on open gov data)
- Fewer estimates on research data sharing impact especially on innovation

Need to assess these impacts (to whom and on what?)

The open science ecosystem: a complex picture

…as a consequence

These actors do not necessarily have the same incentives, goals or expectations

A successful strategy needs to take into account this diversity, and react accordingly

Open Data is more difficult than Open Access

- Ownership & IPRs issues around datasets (and to some extent publications)
- Big diversity of datasets in research (from excel tabs to large datasets collected by machines)
- When is a dataset ready to be released?
- Confidentiality
- Security issues
- Lack of incentives in the academic community
- Missing infrastructure and skills
- Adequate and sustainable funding for Open Science (including Open Access, cost of repositories, cleaning and preserving data, …)

Three key words…

- Setting the right **incentives** for all…

- We need **skills** for Open Science

- **Sustainability** and long term preservation

The next steps

- Mandate from OECD Ministers to investigate the issue of "digitisation of science"

- GSF activity on open access to research infrastructure and business model for open data

- Further engagement with international actors

- Exploring the need to update or revise the 2007 OECD Principles on access to data from public funding

- ....

Thank you

OECD report on Open Science Policy Trends available at:

https://www.innovationpolicyplatform.org/content/open-science

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Annex

Open science policies and initiatives

Chile

The **National Policy on Management of Research Data and Scientific Information**:

- developed in order to implement the OECD Recommendations on Access to Research Data from Public Funding,

- designed in 2012 in order to optimize and rationalize the use of public resources involved in the generation and manage of knowledge; increase the access to research data and scientific information; reach international standards in the matter of access to research data, considering OECD recommendations

China

- **Scientific Data Sharing Programme** since 2001
  - To break the "data barrier" before 1990s.
  - To date, supported by the Programme, **24 platforms have been established to share scientific data from public funding,** especially the observational data and basic data.
  - > **1500 S&T projects** and engineering projects benefited from the data sharing.
  - **Data exchange** with foreign organizations and institutions.

Finland

- The **Open Science and Research Initiative** was established in 2014 by the Finnish Ministry of Education and Culture focuses also on research data

- Focus on data management plans, data storage and preservation in the long run

- *Skills are a key component of the strategy*: guidelines for data management have been developed for researchers and scientist

Germany

In the **Priority Initiative "Digital Information"** of the Alliance of the German Science Organisations has dedicated **working group** focusing on research data. In June 2010, the Alliance of German Science Organisations adopted **"Principles for the Handling of Research Data"**, to establish structures to enable the collection, archiving and subsequent reuse of primary research data in all applicable disciplines.

Focus on Skills

The major research organisations are actively contributing to strengthen OA and OD. This includes rising awareness and providing information for scientists as well as offering support and advice:

e.g. the **Helmholtz Association** has established regular training courses on managing research data with regard to Open Science.

The United Kingdom

Knowledge for everyone
The Open Data Institute

Open research data

- Research Councils' (RCUK's) Guidance on Open Access states that all research papers, if applicable, should include a statement on **how underlying research materials (such as data) can be accessed**. However, the policy does not require that the data must be made open

Focus on Skills

- Much skills policy in the UK surrounds providing skills training to students in numerical subjects. These skills policies are focused more around **teaching students and academics how to use the big data sets** that will emerge out of open data, rather than skills necessary for open science policies per se

Large scale projects:

- **The Open Data Institute:** this £10m project will provide data from across the public sector on an open access basis to enable industrial and academic exploitation

- **£160m investment in high-performance computing and networks (2011):** the investments included high capacity networking, a national supercomputing facility and for the Hartree centre, offering leading edge supercomputing capabilities alongside software development expertise for industrial, academic, governmental and research organisations.

- **£189m investment in Big Data:** these investments included energy efficient computing, establishing a network of Administrative Data Research Centres (the 'ADRN'), and the Square Kilometre Array (SKA) platforms.

The United States

- the **White House Office of Science and Technology Policy (OSTP)** memo explicitly refers to access to **digital data**

Focus on Skills

- The OSTP Memo directs federal science agencies to coordination with other agencies and the private sector to **support training, education, and workforce development related to scientific data management**, analysis, storage, preservation, and stewardship

Open data policy trends: **enablers**

Enablers are, for example, the **infrastructure** developed to share articles or data, initiatives undertaken to develop an **open science culture**, amendments to the **legal framework** to make them increasingly open-science friendly or the development of the **skills (demand and supply side)** necessary for researchers to share and re-use the research outputs produced by others.
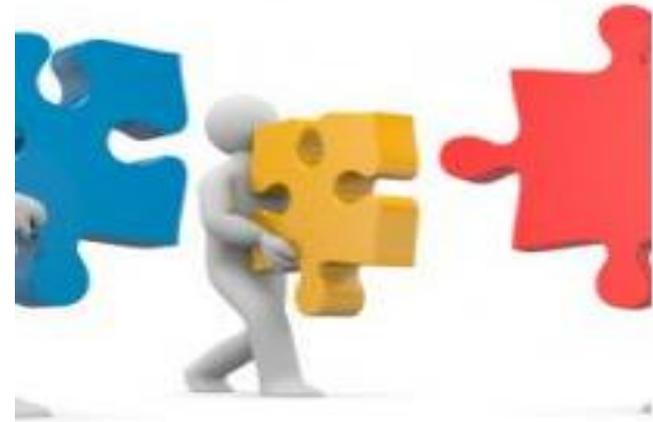
For example…

ICT Infrastructure:

- **Argentina** has developed the **SICyTAR** database with information on the CVs, publications and affiliations of researchers

- In **Spain, RECOLECTA** is the national repositories and main infrastructure that allows researchers and other stakeholders to freely archive and access research publications

- in **Mexico, CONACYT** supports the creation of institutional repositories

Skills:

- the **Finnish Ministry of Education and Culture** created a **Data Management Guide** to teach researchers to develop data management plans

- in the **UK**, the **Data Capability Strategy** focuses on human capital and skill development for data analytics as well as data accessibility and data sharing skills in consumers, business and academia. The creation of centers for doctoral training on big data has been announced in several universities and higher education institutions in the country

Legal framework:

- **Australia, Finland** are currently discussing modifications of the existing legal framework around the publication of publicly funded research results to make the copyright legislation increasingly open science friendly

- **Germany** has modified the national copyright law to grants scientists the right to upload publications on the internet even if they have transferred all exploitation rights to the publisher

- the **UK** has recently passed a series of amendments to its copyright legal framework (coming into force in 2014), which include a greater freedom of re-use of copied or recorded material for education and non-commercial research purposes

Open science policy trends: **incentives**

Incentive mechanisms may be in the form of **financial incentives** to cover open access publishing or the release of datasets.

They may also be in the form of **proper acknowledgment of open science efforts of researchers and academics**, for instance in the form of data set citations or career advancement mechanisms partly based on metrics that take into account open science or data sharing efforts.

Key remark in the OECD report

"Better incentive mechanisms to promote data-sharing practices among researchers are needed. While all public sector researchers have an interest in maximising the sharing of published research articles, the same is not true for research data sets, especially at the pre-publication stage.

In addition, *data cleaning and curation (for example, by developing metadata) is a time-consuming activity* that is rarely acknowledged in evaluation mechanisms or grant allocation procedures."

Open science policy trends: **requirements**

They are often implemented in the form of **requirements in research grant agreements** or in some cases are defined in national strategies or institutional policy frameworks.

For example…

- major funding agencies in **Australia, Denmark, Estonia, Germany, Switzerland, the United Kingdom** and **the United States, …** have mandated public access to the results of the research they fund. At EU level, **Horizon2020** is a major initiative to promote open access and data sharing.

- More countries are also considering adopting rules for mandatory open access and **data management plans**

Open science and international efforts

Science and research do not stop at borders. Co-ordinated international efforts facilitate transfer of knowledge.

Examples of international efforts to promote open science and overcome barriers include:

- **OECD principles (2007)**
- UNESCO: **Open Access Policy Guidelines** 2012; Charter for the Preservation of the Digital Heritage
- In Europe, **Horizon2020** open science requirements, as promoted by the European Commission
- LAC countries: **LA Referencia**, a federated network of national repositories of scientific documentation for 9 LAC countries, financed by Inter American Bank