

Digitalisation of society, the role of universities and its impact on doctoral education and research

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Digitalisation provides both opportunity and challenge for universities

A key opportunity:

- Enables Open Science, supporting the fundamental goals for Open Science:
 - Public accessibility and transparency of scientific communication
 - Public availability and reusability of scientific data
 - Transparency in experimental methodology, observation and collection of data
 - Use of web-based tools/infrastructure to facilitate collaboration

Digitalisation provides both opportunity and challenge for universities

A key opportunity:

- Open Science enables
 - address the shared complex challenges that the world now faces – climate change, energy, food, health, resources
 - Enhanced sharing and collaboration → increased output (researchers, citizen science...)
 - Faster/shorter time to application and benefit (e.g. for health, adaptation to climate change etc)
 - Key for both the Paris climate agreement and the Sustainable Development Goals

Digitalisation provides both opportunity and challenge

But there are challenges:

- To have impact, Open Science must be based on
 - Accessibility
 - Transparency
 - Integrity
- Essential for trusted collaboration for research excellence
- But currently not optimal

- What are the specific challenges and how might we address them?

Open Science for Europe

- The Research, Innovation, and Science Policy Experts (RISE) Open Science High Level Group gives direct strategic support to Carlos Moedas, the European Commissioner for Research, Science and Innovation, and to the European Commission.
- Open Science subgroup: Mary Ritter (Chair), Megan Carey, Julio Celis, Marie Farge, Danius Pavalkis, Teresa Riera



Commissioner Moedas with members of RISE Open Science, Open Innovation Open to the World groups

Mallorca Declaration on Open Science

Preamble: Open Science is essential if the world is to successfully address the major challenges that it now faces. To have impact, Open Science must be based on accessibility, transparency and integrity, enabling trusted collaboration for research excellence and optimal delivery. This declaration specifically addresses the key barriers to Open Science, and builds on previous statements concerning Open Science (http://ec.europa.eu/research/science-society/document_library/pdf_06/recommendation-access-and-preservation-scientific-information_en.pdf; <http://recodeproject.eu/>; <http://www.budapestopenaccessinitiative.org/>; <http://bookshop.europe.eu/en/open-innovation-open-science-open-to-the-world-pbKID416263/>).

ACHIEVING OPEN SCIENCE

1. Remove the barriers that extreme competition for limited resources create for Open Science

True progress on Open Science will require fundamental rethinking of how research is funded and researchers are rewarded. Policies to promote Open Science should include incentives and not just mandates.

Open Science does not thrive on extreme competition. To ensure, therefore, that Open Science practice does not jeopardise careers it is essential to bring funding success rates back to a position where Europe's best researchers can reasonably expect to attract and maintain funding for their best work. Due to the proven difficulty in predicting productivity, it is also critical to support as many highly qualified, early-career researchers as possible. Accordingly, the allocation of funds should be adjusted so that all applications that meet key evaluation quality criteria should receive appropriate funding.

For career assessment and advancement, and for evaluation generally, metrics such as numbers of publications and journal impact factors should not substitute for the meaningful assessment of an individual's work. Assessment criteria should also explicitly and directly reward reagent and protocol sharing, data sharing, and open resource development.

2. Implement Open Access publishing where publication is part of the continuum of research

Monopolisation and cartelisation of the publication enterprise are not compatible with Open Science. New funding and business models need to be developed to establish a sustainable and affordable Open Access publishing system. The success of Open Science will depend on Open Access publishing having sufficient resources to implement a fair and transparent evaluation process and to ensure the quality, reproducibility and integrity of published research. Posting on recognized pre-print servers, data publishing platforms and self-archiving on shared platforms ('Green Open

Access') provide useful complementary solutions for immediate pre-publication sharing of Open Science research.

3. Establish competence and confidence in the practice of Open Data

Competence in data management and data sharing, establishing a holistic interoperable infrastructure and creating a supporting culture for openness are three core challenges for the practice of Open Data. These should be supported by the development of training programmes designed to adopt best practice for data management skills; promote an increased awareness of the many existing data repository options; and support ways to measure and reward data reuse, e.g. encouraging direct citation of data, educating grant award committees about assessment, and creating funding for explicit career tracks for data and software specialists.

4. Ensure research integrity

Research integrity and the responsible conduct of research are fundamental to ensuring that research findings are reliable, reproducible and trustworthy. Best practice in the conduct of research is, therefore, essential to the success of European science. A common European research integrity code compatible with international declarations such as the Singapore and Montreal statements should underlie all European research, and key stakeholders should be identified to work together to build an ecosystem that ensures research integrity. To support this, the culture of research integrity should be nurtured through education and training programmes specifically tailored for both early and more senior researchers. This is essential if Open Science is to flourish and earn the trust of the research community and wider society and to avoid the waste of scarce resources.

5. A cohesive European approach

European Institutions, Member States, universities, research centres, and researchers should support the fulfilment of the principles embodied in this Declaration and in the further development of relevant international laws and policies.

Realigning funding, publishing, and data sharing with the goal of Open Science practice will promote a global shift towards a scientific culture that will enhance the acceleration of discovery and innovation worldwide.

Context: For Europe, Open Science is essential to fully achieve its target knowledge- and innovation-based economy. The Research, Innovation, and Science Policy Experts (RISE) Open Science High Level Group gives direct strategic support to Carlos Moedas, the European Commissioner for Research, Science and Innovation, and to the European Commission. To interrogate key issues concerning Open Science, the RISE group came together with 12 invited external specialists at The University of Balearic Islands, 24th-25th May 2016. Work focused on how to create a culture for Open Science and Research Integrity by removing barriers and promoting incentives in research funding, career advancement and publishing. Key outcomes are brought together in this declaration. It is not a regulatory document and does not represent the official policies of the countries and organisations that participated in the workshops.

The Mallorca Declaration, January 2017

Addressing the barriers to Open Science

We identified four key barriers to Open Science

1. Research funding
2. Publishing
3. Open Data
4. Research integrity

These all impact on the role of universities:

- as institutions, senior staff, doctoral researchers
- In the context of both the research environment *per se* and education/training for doctoral researchers (and others)
- Relevant to all disciplines, but specific actions may differ

Key barriers to Open Science

1. Research funding
2. Publishing
3. Open Data
4. Research integrity

Barrier 1 – Extreme competition for limited resources is not compatible with Open Science

- For true progress in Open Science we need:
 - fundamental rethinking of how research is funded and how researchers are rewarded.
 - Policies to promote Open Science should include incentives and not just mandates.
 - Remove of perverse ‘disincentives’ for open science

Barrier 1 – Extreme competition for limited resources is not compatible with Open Science

Recommendation 1

- **For funding** we have recommended that:
 - Funding success rates should be brought back to a position where Europe's best researchers can reasonably expect to attract and maintain funding for their best work
 - Also critical to support as many highly qualified, early career researchers as possible – due to the proven difficulty in assessing potential success
 - More smaller (PI) grants - particularly important for early researchers
 - Key to the career prospects of doctoral researchers

Barrier 1 – Extreme competition for limited resources is not compatible with Open Science

Recommendation 2

- **For career assessment** and advancement, and for evaluation generally, we have recommended:
 - metrics (e.g. numbers of publications and journal impact factors) should not substitute for the meaningful assessment of the content and quality of an individual's work
 - Assessment criteria should also explicitly and directly reward:
 - reagent and protocol sharing
 - data sharing
 - open resource development

Barrier 1 – Extreme competition for limited resources is not compatible with Open Science

Potential scope for action by universities and senior staff?

- **Institutional policy and guidelines for career assessment and academic promotions**
 - Move away from focus on the number of publications and Impact Factors
 - Encourage this by, for example, asking candidates to submit what they consider to be their top 5 publications together with a research narrative
 - Read the publications!

Barrier 1 – Extreme competition for limited resources is not compatible with Open Science

Potential scope for action for universities and staff?

- **Government and Funding organisations**
 - Exert institutional influence to change policy and guidelines:
 - Funding allocation strategy
 - Assessment criteria
- **Research grant panels**
 - As panel members, senior staff can exert individual influence to change policy and guidelines for funding and assessment

Key barriers to Open Science

1. Research funding
2. **Publishing**
3. Open Data
4. Research integrity

Barrier 2: Open Access publishing is not fully working

- Monopolisation and commercialisation of publishing is not compatible with Open Science – too many papers are hidden behind pay-walls for too long
- New funding and business models are needed, to provide an affordable and sustainable Open Access publishing system

Barrier 2: Open Access publishing is not fully working

Recommendations:

- **For interim:** Green Open Access is good for immediate pre-publication sharing of Open Science research – self-archiving on shared platforms, posting on recognised pre-print servers, data publishing platforms
- **Ultimate goal** must be Open Access of the final peer-reviewed publication and underlying data
- Funding agencies can play a key role e.g.
 - NIH, acceptance of preprints
 - Gates Fdn, immediate Open Access and Open Data for final published paper for all grantees
 - ERC, WT, encouraged but not mandated

Barrier 2: Open Access publishing is not fully working

Potential scope for action by universities and senior staff?

- Support Green Open Access
 - institutional or shared repository
 - Accept preprints for assessment and career progression
- Provide students with information on policy of key journals
 - Open access, Pay-walls, Subscriptions charges and Article processing charges, Green and Gold Access
- Provide students with information on the requirements of key funding organisations
 - E.g. Gates Foundation, NIH, ERC, Wellcome Trust
- Incorporate into doctoral training programmes
- Senior researchers can lead by example in where they publish (early researchers cannot take the risk)

Key barriers to Open Science

1. Research funding
2. Publishing
3. **Open Data**
4. Research integrity

Barrier 3: there is an urgent need to establish competence and confidence in the practice of Open Data

- We identified three core challenges for the practice of Open Data:
 - Competence in data management and data sharing
 - establishing a holistic interoperable infrastructure
 - creating a supporting culture for openness

Barrier 3: there is an urgent need to establish competence and confidence in the practice of Open Data

Recommendations and potential scope for action by universities and senior staff?

- Training programmes designed to adopt best practice for data management skills
- Promoting an increased awareness of the many existing data repository options
- Supporting ways to measure and reward data reuse, e.g.
 - encouraging direct citation of data
 - assessment and career progression
 - influencing funding organisations and grant award committees about assessment
- Creating explicit career tracks for data and software specialists

key barriers to Open Science

1. Research funding
2. Publishing
3. Open Data
4. Research integrity

Barrier 4: Research integrity needs improvement

- Research integrity is fundamental to the success of open science, ensuring:
 - research findings are reliable, reproducible and trustworthy
 - money well spent
- Digitalisation and open science should increase transparency, but...
- Digitalisation also increases ability to manipulate data
 - Fabrication of data, Falsification of data, Plagiarism (FFP) may be relatively rare, but
 - Misconduct: Irresponsible/questionable research conduct is much more common

Barrier 4: Research integrity needs improvement

Recommendations and potential scope for action by universities and senior staff?

- As key stakeholders, universities can work together to build and support the ecosystem that ensures research integrity
- Recognise a shared European research integrity code to underpin all European research (e.g. new ALLEA code)
- Use shared principles to underpin policies and procedures for dealing with:
 - FFP: Fabrication of data, Falsification of data, Plagiarism
 - Misconduct: Irresponsible/questionable research conduct
- Nurture the culture of research integrity:
 - training programmes for doctoral/early researchers
 - training programmes for more senior researchers

In conclusion: Digitalisation and Open Science

To fully benefit from the opportunities offered by digitalisation, we must:

- Realign funding, publishing, data sharing and research integrity with the goal of Open Science

If we can achieve this, we can:

- promote a global shift towards a scientific culture that will enhance the acceleration of discovery and innovation in Europe and worldwide
- Enable global complex shared problems to be addressed

Universities can make a major contribution to achieve this

- Work within Universities
 - Adjust criteria for assessment, career development and promotion
 - Training for doctoral students: generic skills required for digital/open science: funding, publishing, data, research integrity
 - Training for PIs and senior staff: especially relating to research integrity
 - Foster environment/culture for research integrity
- Working with/influencing external stakeholders
 - Governments
 - Funding organisations, research grant funding committees
 - Selection panels for appointments and career progression
 - Publishing and peer reviewing of papers

And if universities work together....

- Major collaborative impact
- A key role for the EUA-CDE to support a shared European vision and implementation
- Link with on-going RISE discussions and development

RISE: next steps

- RISE meeting MEPs, June 2017 “Europe’s future: Open Innovation, Open Science, Open to the World” (jointly organised by K4I and DG R&I)
- RISE HIGH-LEVEL WORKSHOP "*Researcher careers and the European funding system: how to make Open Science a reality*", Lisbon, Portugal, June 2017
- RISE Tour d’Europe, autumn 2017 and spring 2018. The RISE group will meet with independent Think Tanks in European capitals. The reflections will focus on where EU R&I policy should be heading and their role in the future of Europe.

Thank you and
Happy 10th Birthday!