United Kingdom - Open science country note

Open science and the national context

The UK Government's commitment to open access (OA) was stated in its Innovation and Research Strategy for Growth (December 2011), as a key part of the contribution of BIS (Department for Business, Innovation and Skills) to the UK Government's Transparency Agenda.

The UK policy position is a strong preference for gold OA and an acceptance of green OA. Gold is preferred because of its advantages in terms of what it provides freely to the user: immediate access to the final peer-reviewed published article; compatibility with data mining; and unrestricted access and reuse.

The focus of open access in the United Kingdom is very much on expanding the use of scientific outputs outside the academic community, i.e. encouraging greater business, entrepreneurial and citizen use. It is expected that this will lead to greater innovation and impact from UK science.

Open science research and innovation actors

With a total budget of GBP 3.47 billion per annum, the seven research councils comprising Research Councils UK (RCUK) make up more than half of the UK Government's science budget. These seven are: the Arts and Humanities Research Council – AHRC; Biotechnology and Biological Sciences Research Council – BBSRC; Engineering and Physical Sciences Research Council – EPSRC; Economic and Social Research Council – ESRC; Medical Research Council – MRC; Natural Environment Research Council – NERC; and the Science and Technology Facilities Council [1] – STFC. The research councils fund specific research projects on a competitive grant basis. All research council-funded science must be made open access. (RCUK policy on open access: http://www.rcuk.ac.uk/research/openaccess/ [2])

Funding councils provide block funding for higher education institutions across the four nations of the United Kingdom: the Higher Education Funding Council of England (HEFCE), of Wales (HEFCW), the Scottish Funding Council (SFC), and the Department for Employment and Learning Northern Ireland (DELNI). This allows universities to make decisions about what research to fund. The funding councils announced their policy in March 2014. The four UK HE funding councils' policy on open access can be seen here: https://www.hefce.ac.uk/rsrch/oa/whatis/ [3])

The UK Department for Business, Innovation and Skills (BIS) provides the public funding for the Research Councils and for HEFCE.

By some margin, the two largest charitable funders in the United Kingdom are the Wellcome Trust and Cancer Research UK:

- The Wellcome Trust is a major charitable funder (around GBP 726 million per annum) of biomedical research. The trust requires that all the research it funds be made freely available as soon as possible online, and no later than six months following publication. In particular, it requires that papers be deposited on PubMed Central and Europe PMC within six months after publication. The Wellcome Trust encourages – and, where it pays an open access fee, requires – articles to be published under a CC-BY licence.
- Cancer Research UK requires the papers it funds (barring exceptional circumstances) to be made publicly available on line, and in particular made available on Europe PMC, as soon as possible, within six months.

Open science and business sector actors

The role of non-profits is covered in the preceding section.

Business Actors

- In 2012 the Cabinet Office Minister praised the private sector's use of open data provided by government. He said that "companies including SMEs and startups are using open data to improve public services and create innovative products".
- In 2013, banks and building societies began publishing mortgage-lending data broken down by postcode sector.
- Nesta (the National Endowment for Science, Technology and the Arts, an innovation charity) argues that open data in the private sector could bring sizeable benefits in terms of improving efficiency and standards, and in assisting evidence-based policy making. This is a potential area for improvement in the future.
- OpenStreetMap is a United Kingdom-based collaborative project. Several private sector organisations, academic institutions, and a community of mappers have provided funding, equipment and crowdsourced mapping information to produce an open data-based free map of the world. OpenStreetMap volunteers have even helped in crisis situations to rapidly create emergency maps of refugee camps and disaster zones for humanitarian relief agencies to use.

Policy design - Open data

The United Kingdom is in principle committed to making data emerging from publicly funded research available to all, as laid out in the Innovation and Research Strategy for Growth, December 2011. Further, the UK Government is starting to publish as much of its own data as possible, bearing in mind confidentiality and national security concerns.

Research councils' Guidance on Open Access (RCUK) 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 be made open.

Research councils and the UK Government also have a strong interest in developing effective medical and social sciences research while respecting the European General Data Protection Regulation (GDPR). The UK Government and research councils are seeking to ensure that substantial investments made to enhance UK research capacity – in medical bioinformatics and the country's contribution to public health research using longitudinal cohorts such as the UK Biobank and the imminent Life Study – are able to operate effectively under the GDPR.

UK policy on research data is still being developed in consultation with stakeholders.

The E-infrastructure Leadership Council (ELC) advises government on all aspects of e-infrastructure, including networks, data stores, computers, software and skills, as a single co-ordinating body that owns the UK e-infrastructure strategy and can advise BIS ministers on its implementation and development. It works in partnership with stakeholders across the academic community, industry, government and society. Members of the ELC come from the academic community, industry, the research and funding councils, government departments, and the charitable sector.

The Data Capability Strategy focuses on three overarching aspects to data capability. The first is human capital – a skilled workforce, and data-confident citizens. The second covers the tools and infrastructure that are available to store and analyse data. The third is data itself as an enabler – data capability is underpinned by the ability of consumers, businesses and academia to access and

share data appropriately.

Some examples of e-infrastructures and data projects being developed include:

- The Open Data Institute – This GBP 10 million project provides data from across the public sector on an open access basis to enable industrial and academic exploitation
- The Clinical Practice Research Datalink – The country's National Health Service (NHS) has very large high-quality data sets. The government has therefore decided to use and add to this resource for social and economic benefit.
- GBP 100 million investment to sequence the DNA of cancer and rare disease patients
- GBP 160 million investment in high-performance computing and networks (2011) – Investments included high-capacity networking, a national supercomputing facility, and the Hartree Centre, offering leading-edge supercomputing capabilities alongside software development expertise for industrial, academic, governmental and research organisations.
- GBP 189 million investment in big data – These investments included energy-efficient computing, establishment of the Administrative Data Research Network (ADRN), and Square Kilometre Array (SKA) platforms.

Open/increasing access to scientific publications

All research funded by the Research Councils (and the Wellcome Trust) must be made open access. The Research Councils have a preference for gold OA, but they will accept green.

Public funders of science in the United Kingdom use the stick more than the carrot by mandating open access on research they fund. However they often fund gold OA, to encourage gold as opposed to green.

The Research Councils (RCUK) insist that all research be OA, and provide some funding for their preference of gold.

The research councils (RCUK) have also launched a platform called Gateway to Research, where all research council-funded or Innovate UK-funded research can be found, with details of who has funded it, by searching simple keywords. This is a platform to find research rather than a depository in which to place it.

The funding councils for the four nations (HEFCE, HEFCW, SFC and DELNI) published their OA policy 31 March 2014. Roughly every five or six years, the funding councils allocate public funds to universities on the basis of the historical quality of their academic outputs. The funding councils' OA policy states that for the next Research Excellence Framework (REF), expected around 2020, all articles that are submitted for the purpose of getting funding for the university in the future must be deposited in an institutional or subject repository, and be freely available to read. This is therefore a highly significant incentive for universities to ensure their research is made (at least green) open access:

· The research councils (RCUK) have committed GBP 20 million per annum to the policy for the year 2013/14. They have said they are willing to commit in excess of GBP 100 million to fund APCs in the five years from 2012/13. This money is given in block grants to universities to fund article publication charges.

· The central government made a GBP 10 million investment in 2012 to help universities with the transition to the country's OA policy.

All the main UK public funders of science have an open access policy that effectively mandates OA.

Therefore it is likely that this will cover all or most publicly funded scientific research in whatever

type of institutions.

The aim of the policies is for most of UK Government-funded science to be made open access, as much of it as possible on a gold basis. It is hoped that this will lead to greater use of science and so greater innovation from scientific outputs.

Where the research councils (RCUK) fund article processing charges (APCs – gold OA), the licence must be CC-BY (fully reusable). For green open access, there can be restrictions on commercial reuse of the science.

According to the UK Publishers Association, within one year of the announcement of current RCUK policy, 70% of journals now publish gold or include a gold option.

The research councils are reviewing the effectiveness of their policy. The results of this evaluation will be made public in 2015.

For the RCUK policy, the universities receive money specifically to fund OA. Beyond that, enforcement of the policy relies on the fact that academics are unlikely to receive repeat funding from the research councils if they do not comply with the policy.

The funding councils' policy states that academic articles cannot be submitted as examples of excellent research in order to gain further funding at all in the future if they are not openly available. The policy therefore enforces itself: universities are unlikely to let articles not be published on an open access basis if they want to receive block grant public funding in future.

For the research councils, gold is preferred to green, but green is allowed. Gold (APCs) is often funded, as mentioned above. For the funding councils, only free (gratis, or green) open access is required.

Skills for open science and open data

Much of skills policy in the United Kingdom has to do with providing skills training to students in numerical subjects. These skills policies are focused more on teaching students and academics how to use the big data sets that will emerge out of open data, than on the skills necessary for open science policies *per se*. Some key initiatives include the following:

- One of the research councils, for Engineering and Physical Sciences (EPSRC), has announced a number of new Centres for Doctoral Training that focus on big data. These include the University of Nottingham, the University of Edinburgh and the University of Oxford.
- The business analytics firm SAS has launched the SAS Student Academies, which provide educational institutions with the ability to train students in real-life big data skills. There are now sixteen academies in universities across the United Kingdom.
- The Nuffield Foundation, the Economic and Social Research Council (ESRC) and the Higher Education Funding Council for England (HEFCE) have launched Q-Step, a GBP 19.5 million initiative designed to promote a step change in quantitative social science training. Over a five-year period from 2013, 15 universities across the United Kingdom are delivering specialist undergraduate programmes, including new courses, work placements and pathways to postgraduate study.

Open science and international co-operation

The United Kingdom is an active member of the e-Infrastructure Policy Forum, a forum for debate

and early exchange of information among members that aims to align national initiatives and promote enhanced co-operation among national e-infrastructures and stakeholders. It is similarly active in the e-Infrastructure Reflection Group, which recently published a white paper on a European e-infrastructure commons (www.e-irg.eu/publications/white-papers.html [4]). This paper addresses the integration of services for research communities and the interoperability and co-ordination of e-infrastructures. Follow-up aspects are open science, data management, big data, cloud computing, and legal issues that arise from the commercial use of e-infrastructures.

The United Kingdom is a partner in a number of large e-infrastructure projects funded through the European Framework 7 programme. For example, it is in the Partnership for Advanced Computing in Europe (PRACE) for high performance computing (HPC), European Grid Infrastructure for distributed computing, and European Data Infrastructure (EUDAT) for data sharing and management. Several technical work packages have been led around its e-infrastructure. The United Kingdom is involved in a large number of ESFRI (*European Strategy Forum on Research Infrastructures)* projects. For example, it hosts the headquarters hub of the ELIXIR project, tasked with building a sustainable European infrastructure for biological information. The building for the hub was funded by the UK Government and sits alongside EMBL-EBI, the European Molecular Biology Laboratory and European Bioinformatics Institute. In addition, sectoral research data initiatives are emerging to complement the country’s national and international approach, such as those being initiated by the Royal Society of Chemistry.

Links
[1] http://www.google.com/url?q=http://en.wikipedia.org/wiki/Science_and_Technology_Facilities_Council&sa=U&ei=sCfuVJi4E8idNozyg6AD&ved=0CCoQFjAD&sig2=-hb1vDDmnQ52CGkcECUYRg&usg=AFQjCNGFQiqYlLSSsBiUoSognURGzT-fHw
[2] http://www.rcuk.ac.uk/research/openaccess/
[3] https://www.hefce.ac.uk/rsrch/oa/whatis/
[4] http://www.e-irg.eu/publications/white-papers.html