Key actors for open science

Researchers

Researchers themselves have been at the forefront of efforts to promote open science. There are several motivations for researchers, ranging from the cultural values inherent in science (e.g. openness to scrutiny, willingness to engage society) to necessity, i.e., developing a technological infrastructure to allow for collaboration. Researchers also respond to incentives from funding agencies, universities and public research institutes. Tension may nevertheless exist between the competitive “publish or perish” paradigm and the interest in sharing data and collaborating.

Government

Government ministries have developed national strategies for open science, either as stand-alone strategic efforts or as part of broader open government agendas. These agendas help define national- level strategic priorities that can be translated into concrete initiatives by other innovation system actors.

Funding agencies

Research funding agencies are key actors in the promotion of open science efforts, as they are responsible for defining the mechanisms and requirements to benefit from grants and funding for research. In many countries in recent years, funding agencies have increasingly adopted rules and mechanisms to promote open science and in some cases mandate it, by including open or public access of funded research outputs as a requirement. In addition to mandatory requirements, funding agencies may promote open science through financial support to cover open access publishing charges or costs associated with the release of data and other research material.

Universities and PRIs

In a majority of OECD countries, *universities and public research institutes* have some degree of autonomy and are responsible for drawing up their own policies to support open science and implementing the policies of funding councils or agencies. In addition, universities and higher education institutions may play a role in training students and researchers to develop the skills necessary to enable open science practices – from basic skills related to the use of online repositories, to the ones needed to implement data cleaning, curation and management.

Libraries, repositories and data centers

Libraries, repositories and data centres are key actors for and fundamental enablers of open science. Libraries have adapted their role and are now active in the preservation, curation, publication and dissemination of digital scientific materials, in the form of publications, data and other research-related content. Libraries and repositories constitute the physical infrastructure that allows scientists

to share use and reuse the outcome of their work, and they have been essential in the creation of the open science movement.

Private non-profit

Private non-profit organisations and foundations may play a significant role in developing, raising awareness and encouraging an open science culture. They may not only fund open research and introduce requirements in grant agreements, but also develop and facilitate the creation of networks of stakeholders worldwide.

Private scientific publishers

Private scientific publishers offer a broad range of open access publishing (for example via the gold route or publishing in hybrid journals) and related services such as the maintenance of digital repositories and data sets or other scientific material, or the development of text and data mining (TDM**)** tools

Business sector

Businesses constitute part of the demand for open access publications and data that they use to develop new products and services. Businesses such as pharmaceutical firms also enable open science through public-private partnerships with universities or their financing of open clinical trials, for example.

Supra-national entities

Finally, *supra-national entities* play a major role in the definition of international co-ordination agreements or guidelines to address open science issues with an international and global perspective. Inter-governmental organisations (IGOs) play a critical role in promoting inter-governmental co-ordination at international level and in shaping the political agenda, through developing guidelines and principles around specific themes that are subsequently adopted and implemented by member countries and beyond. IGOs such as the OECD, UNESCO, the EU and the World Bank have been active in recent years in promoting open science efforts of member and (in some cases) non-member countries.