Implications of Open Science (OS)

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Professor Colin J Wright
Colin.wright@wrightserver.com
Honorary Research Professor
University of the Witwatersrand
201906251120

- OS building blocks?
- Open Innovation? Citizen Science?
- Why at an Open Access meeting?
- Relevance to Library?

“Even if the open windows of science at first make us shiver ... in the end, the fresh air brings vigour, and the great spaces have a splendour of their own.”
BERTRAND RUSSELL, What I Believe
Our World...!?!?

A 19-year-old developed code for the AI portrait that sold for $432,000 at Christie’s
Reproducibility of published research?

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0068397

Business Day Editorial 20190504 EDITORIAL: Fake research in the halls of learning blight academia
Stellenbosch University's Centre for Research on Evaluation, Science and Technology (Crest) estimates the education department paid out R300m in subsidies over the 10 years to 2014 to reward academics for being published in dodgy "predatory" journals that prize quantity over quality. And as fast as government moved to raise awareness, academics figured other ways to bilk the state.
Introduction to OS

Open science: scientific research, data and dissemination accessible to all levels of inquiring society, amateur or professional. … i.e. publishing Open Research, campaigning for Open Access, practicing Open Notebook Science.

MERTONIAN NORMS 1942 (Wikipedia)

CUDOS: acronym used to denote principles that should guide good scientific research. Modified definition below is most widely used.

- **Communalism:** equal access to scientific goods (IP); sense of common ownership to promote collective collaboration.
- **Universalism:** contribute to science regardless of race, nationality, culture, or gender.
- **Disinterestedness:** act for benefit of common scientific enterprise, rather than personal gain.
- **Organized Skepticism:** scientific claims exposed to **critical scrutiny** before being accepted.

Modern Research.
The scientific (research) discovery process is increasingly:

- Global
- Collaborative
- Multidisciplinary
- Integrative
- Complex
- Data Driven.”
- Data Skills in short supply
Open Research Data
Report to the Australian National Data Service (ANDS)
November 2014

John Houghton
Victorian Institute of Strategic Economic Studies
Nicholas Gruen
Liberar Economics

Who is advancing OS?

https://libguides.wits.ac.za/openaccess_a2k_scholarly_communication/OpenResearch_OpenScience
Open Science / Research

“Open Science is the practice of science in such a way that others can collaborate and contribute, where research data, lab notes and other research processes are freely available, under terms that enable reuse, redistribution and reproduction of the research and its underlying data and methods.” – FOSTER Project, funded by the European Commission.

➢ OS defined as “scholarly research that is collaborative, transparent and reproducible and whose outputs are publicly available” (European Open Science Policy Platform, 2018).

➢ Relies upon sharing of knowledge and supporting tools, such as publications, research data, software, educational resources and infrastructures, across institutional, disciplinary and national boundaries,

➢ Promotes open access to scientific publications, research data and materials, research methodological and algorithmic methodologies, digital applications and source code, thereby re-asserting science as a global public good (International Science Council, 2018; European Commission, 2016).
Rationale:

- **Improving efficiency in science** – increase effectiveness and productivity of research system, by 1) reduce duplication and costs of creating, transferring and reusing data; 2) allow more research from same data; 3) multiply opportunities for domestic and global participation in research process.

- **Increasing transparency and quality** in research validation process, by allowing a greater extent of replication and validation of scientific results.

- **Speeding transfer of knowledge** – reduce delays in re-use of results of scientific research including articles and data sets and promote a swifter path from research to innovation.

- **Increasing knowledge spill-overs to economy** – Increasing access to results of publicly funded research can foster spill-overs and boost innovation across economy as well as increase awareness and conscious choices among consumers.

- **Addressing global challenges more effectively** – require co-ordinated international collaboration. OS, OA and OD approaches can promote collaborative efforts and faster knowledge transfer for better understanding of challenges eg climate change, ageing population, and help identify solutions.

- **Promoting citizens’ engagement** in science and research – OS and OD initiatives promote awareness and trust in science among citizens. Greater citizen engagement leads to active participation in scientific experiments and data collection.

*Source: OECD (2013a), Background paper for the TIP workshop on Open Science and Open Data, unpublished, DSTI/STP/TIP(2013)13*
Open Research Lifecycle – ‘open’ science
doi: 10.5281/zenodo.49960
Providing researchers with the skills and competencies they need to practise Open Science
Open Science Skills Working Group Report
Citizen Science:
• Train citizens researchers to use OS in an effective, constructive and democratic way…!
• Major impact: data and publications open to citizens around globe.
• Assist in bringing African cultures closer
• Role of public media
• Voice of society in national policy decisions
• Harness Citizen Science to:
  ❑ Inspire next generation of researchers;
  ❑ Gather data re exotic and threatened species, languages etc
  ❑ Observe the unexpected.

Open Innovation (OI)
• OI opportunity to reduce research costs, spread risks and bring innovations to market more quickly.
• Coined by Berkeley professor Henry Chesbrough,
• Refers to collaboration between companies, individuals and public agencies to create innovative products and services;
• Share risks and rewards.
• Premised on belief that in world of distributed knowledge, companies can’t rely only on internal research and can benefit from innovating with partners.
• Has yielded significant benefits in many fields, including healthcare, IT business models and public policy.
https://www.weforum.org/agenda/2015/02/the-benefits-of-open-innovation/

“$14.5 billion invested by the US Government in the Human Genome Project has seen a 60-fold return in investment.”
Issues to be addressed…and their impact?

- Strategy and Policies
- Open Research: open collaboration, open reviewing
  - Ethics
- Citizen Science
- Open Innovation
- **Open Educational Resources, eg Georgia Tech, MOOCs**
- **Data curation**
  - As open as possible, only as closed as is necessary
  - All research artefacts to be curated
- **Human Resources**
  - Altmetrics
  - Training of Researchers / Librarians / ICT staff at all levels
  - Data curators / analysts / engineers
  - New career paths
- **Open Research Infrastructures**: SARIR, Research Councils
- **Cyber / e-Infrastructures: T0, T1, T2, ...**
  - Role of ICT and Libraries
  - Open Cyberinfrastructure components
  - Open Trusted repositories
  - Services: DOIs, Orcid #, SAFIRE, DMP, eduroam, DMZ...
Main recommendation: OS Advisory Board (OSAB)
- independent entity,
- report directly to DST Executive or Minister,
- has coordination and monitoring functions.

Open Science Advisory Board (OSAB)

Provide ongoing foresight, advice, guidance and oversight:

a. **Policy and legislation:**
   - As “open as possible, closed as necessary” principles in policy and IP legislation;
   - Policies & practices for curating confidential information; align with international frameworks;
   - IP policies support OS consistent with FAIR, Reasonable and Non-Discriminatory (FRAND) principles;
   - Review relevant legislation pertaining to OD, OA, OI

b. **Implementation and advice to DST**
   - Support Research Infrastructures (SARIR, NICIS, Libraries)
   - HR policies and practices; metrics and career pathways to incentivise OS, OI, OD, OA;

c. **Oversight**
   - Ensure robust e-governance to support implementation; stakeholder role
   - Regular independent, objective reviews

d. **Advocacy and awareness**
   - Citizen Science

e. **Training**
   - Researchers, Research Infrastructure personnel, Management
Chapter 4: An enabling innovation environment in South Africa

• ... moving beyond R&D to broader conceptualisation of innovation, supporting a whole-of-society approach....
• ... strengthen support to business (focus on SMEs) as well as revitalize the role of SOEs in innovation.
• ... supports enabling legislative framework, eg in area of IP rights from publicly funded R&D,
• ....policy to develop local innovation ecosystems.
• To bolster innovation ... introduce policy shift including civil society in STI planning and devoting resources to supporting grassroots and other neglected innovators.

Chapter 5: Expanded capabilities to support the knowledge enterprise

• ... policy approaches to ensure open, responsive and diverse knowledge system.
  ➢ ...include adopting an open science paradigm,
  ➢ supporting a diversity of knowledge fields, and a greater focus on inter- and transdisciplinary research ...
  ➢ an enhanced focus on knowledge diffusion.
  ➢ ... research system ... supported through policy approaches to upgrade and expand research infrastructure, including cyberinfrastructure (e.g. knowledge infrastructure fund at National Treasury).
• ... realisation ambitions of this WP will in part depend on building an innovation culture in society and developing a science-literate and aware citizenry.
Librarians:
Most significant skills gaps in the following areas:
• Ability to advise on preserving research outputs;
• DMP: knowledge to advise on Data Management Plans and curation, including ingest, discovery, access, dissemination, preservation, and portability;
• Knowledge to support researchers in complying with the various mandates of funders, including open access requirements;
• Knowledge to advise on relevant data manipulation and mining tools;
• Knowledge to advocate, and advise on, the use of metadata;
• Ability to advise on the preservation of project records (e.g. correspondence);
• Knowledge of sources of research funding to assist researchers identify potential funders;
• Skills to develop metadata schema, and advise on discipline/subject standards and practices
• Ability to Support Citizen Science development and practice.