
Open Science at Institutional Level—Challenges and Prospects

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By

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Roadmap

- Open Science
- Open Science: Principles & Pillars
- Open Science Requirements
- Open Science across the Worldwide
- Open Science at Nigerian Institutions
- Challenges & Prospects
- Summary

What is Open Science?

- *Movement to make scientific research and its dissemination accessible to all levels of an inquiring society, amateur or professional*
 - including publications, data, physical samples, and software
 - https://en.wikipedia.org/wiki/Open_science#cite_note-1
- *Transparent and accessible knowledge that is shared and developed through collaborative networks*
 - https://en.wikipedia.org/wiki/Open_science#cite_note-2

... What is Open Science

- **Open Scholarship** considered to include research from the Arts and Humanities (Eve 2014; Knöchelmann 2019)
- Open Science a continuation of, rather than a revolution in, practices begun in the 17th century with the advent of the academic journal
 - Due to societal demand for access to scientific knowledge

Why Open Science?

1. Open access publication of research reports and data **allows for rigorous peer-review**
 - E.g., a publication by a team of NASA researchers that claimed a bacterium could metabolize arsenal
 - met criticism of the scientific community and later countered by research from University of British Columbia
 - more accurate verification of scientific results for the benefit of society.
2. Publicly funded science will be **publicly available**
 - In addition to Open Access research articles, code, data, protocols, and research proposals increasingly available a **Creative Commons Licence**

... Why Open Science?

3. Open science will make science **more reproducible and transparent**
 - Helps address "reproducibility crisis" as well as mitigate against manipulation of data
 - 60% of articles in Nature cannot be redone due to lack of data

4. Open science has **more impact**
 - Through the important pillar of public engagement

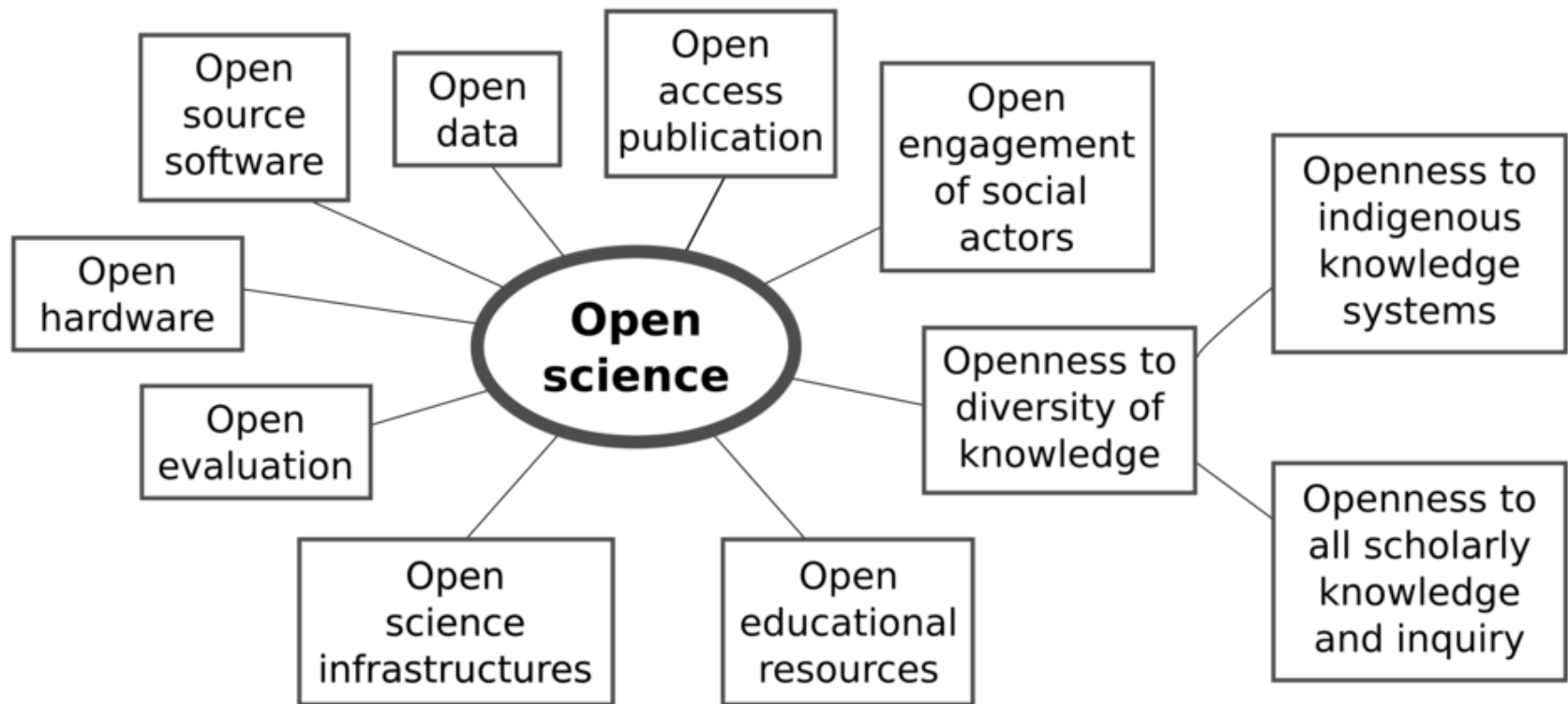
5. Open science will help **answer uniquely complex questions**
 - Complex questions, e.g., neural basis of consciousness or causes of pandemics like COVID-19, best handled by a network of open scientists

Open Science Principles

- The following principles underlie Open Science
 - Transparency
 - Accessibility
 - Authorization, and
 - Participation

- Action areas

Open Science Elements (UNESCO 2021)



Open science elements based on UNESCO presentation of 17 February 2021

Four Pillars of Open Science

1. Open access

- Goal: to have 100% free, open access to scientific information and data

2. FAIR data and software

- Data and software to be FAIR (Findable, Accessible, Interoperable, and Reusable)
- Open science allows scientists to access and share findings at the earliest stage possible so their research can be both verified and reused
- When data is FAIR, researchers can **more quickly refine and improve** upon existing methodologies
- **Technology and tools** like open-source software, codesharing, and research data management (RDM) systems help advance this cause.

... Four Pillars of Open Science

3. Public engagement

- Open Science calls for researchers to engage with the people whose lives may be directly impacted by their findings
- A win-win scenario:
 - Citizens become **more interested (and invested)** in research that's relevant to them, and
 - scientists **benefit by getting input and ideas** from outside the hallowed halls of academia

... Four Pillars of Open Science

4. Recognition and rewards

- Based on **alternative metrics** to measure the qualities and impact of research outcomes
- Make recognition and rewards focus on “real use” assessments of academic impact
 - rather than on esoteric measures like the reputation of publishers and journals
- Funders and organizing bodies are adjusting their **criteria for awarding grants** and other financial rewards
 - As the open science approach to incentives and rewards becomes more widespread across Europe

Open Science Requirements

- Open Science requires concurrent development of (LIBSENSE, 2021):
 1. Policies
 - which act as levers and incentives for researchers to practice open science
 2. Infrastructure
 - to support the implementation open science and sovereignty of national research outputs
 3. Capacity
 - people to help provide guidance, run the infrastructure, etc
- Effective implementation of these requires support of government and education stakeholders

Open Science across the World

- Open Science increasingly being practiced across the world, e.g.,:
 - Europe
 - All member states
 - USA
 - Asia
 - Japan, Singapore, India, Malaysia, etc.
 - Africa

Open Science in the European Commission

- **Policy:** EC developed its open science policy in collaboration with 2 expert groups:
 - The Open Science Policy Platform advised the Commission on how to further develop and practically implement open science policy
 - The expert group on indicators proposes indicators researchers' engagement with open science and its impacts supporting and acknowledging open knowledge practices
- **Infrastructure:** European Open Science Cloud (EOSC)
 - a trusted, virtual, **federated environment** that brings together institutional, national and European stakeholders, initiatives and infrastructures

... Open Science in the European Commission

- **Capacity:** Education and skills
 - Providing researchers with the skills and competencies they need to practise Open Science
- **Awards/Rewards:** Mutual learning exercise focuses on defining
 - **alternative metrics** to measure the qualities and impact of research outcomes, and
 - **rewards for researchers** to engage in Open Science activities
- **Funding:**
 - Fund the development of an open-access publishing platform to host Horizon Europe beneficiaries' publications

Open Science in Africa

- National OA policy:
 - Ethiopia (adopted by some universities)
 - Tunisia
- Nation OA repository:
 - Ethiopia,
 - Cote de'Ivoire,
 - Morocco,
 - Tunisia (Framework Invenio)
 - Uganda
- Institutional policies, repositories
 - South Africa, Uganda

Open Science in Nigeria: Policy

- Is there a national open science policy base for funding organizations, higher educational institutions (HEIs), etc., to feed from?
- Policy needs at various levels
 - National
 - Funding organizations—TETFund, etc
 - Higher Educational Institutions
 - Research organizations
- ABU context
 - Institutional policy

Open Science in Nigeria: Infrastructure

■ Open Science

- requires providing reliable internet connectivity and bandwidth for scientists and science-users
- depends on a global network of data repositories

■ Infrastructure need

- Network infrastructure
- Computing infrastructure
- Data centers
- Repositories: national and Institutional
- Technologies and tools for efficient data management
- Power backup

... Open Science in Nigeria: Infrastructure

■ Institutional repositories via Opendoar.org (Samuel, 2016)

- Ahmadu Bello University, Zaria (<http://kubanni.abu.edu.ng/jspui/>)
- Covenant University
- Federal University Ndufu-Alike
- Federal University of Technology, Akure, Nigeria
- Federal University, Oye Ekiti
- Landmark University
- University of Jos
- University of Lagos
- University of Ilorin
- University of Nigeria Nsukka

■ ABU context

- >70km fiber network across and within campuses
- A robust data center

Open Science in Nigeria: Capacity

- Open Science requires significant investment in capacity building, education and training
- Need for Skills and competencies
 - Researchers & research users
 - Technical developers managers of infrastructure
 - Librarians
- Are there comprehensive training systems that enable establishment of data control systems with clear roles for:
 - technical employees,
 - University Research Administrators (URAs), and
 - university library staff
 - data scientists and data curators

Open Science in Nigeria: Advocacy

- What is the level of awareness and acceptance of Open Science culture among stakeholders in Nigeria?
 - E.g., responses on OER campaign few years ago was disappointing
- Eko-Konnect initiatives
 - 2019 Users Conference “Role of Library in Open Science and Open Access”
 - eduID Workshop - Help institutions deploy academic identity infrastructure and consider policies for identity management - March 2019
 - Repository Workshop and eduID Policy Meeting – January 2020

Where Nigeria Stands—Digital Infrastructure

- Nigeria ranks 70th in Huawei's 2018 **Global Connectivity Index** of 79 countries [Huawei, GCI 2018]
 - With 2016, 2017 and 2018 GCI scores of 26%, 28% and 29%, respectively
- The GCI scores covered five core enabler technologies (measured by 40 GCI indicators)
 - Broadband, Data Center, Cloud, Big Data, IoT
- According to Pew Research Center, only 32% in Nigeria use smartphones
 - below some sub-Saharan countries like South African (51%), Ghana (35%), and Senegal (34%)
- **Broadband Penetration** Still in Need of a Leg-up, at 43% in 2021

Where Nigeria Stands—Human Capital

- Nigeria ranks 114th in World Economic Forum's 2017 **Human Capital Index** of 130 countries [WEF 2017]
 - Higher than only 8 among the 29 countries ranked in sub-Saharan Africa
- Nigeria ranks 3rd in Africa's Digitalization Maturity Report 2017 in the **Skills and Digital Literacy pillar** among 4 countries [ADMR 2017]
 - Ranks 4th in Digital Training, 2nd in Digital Tools Usage and 3rd in Skills
- Nigeria ranks 135th out of 140 countries in World Economic Forum's 2018 **Global Competitiveness Index** in terms of skillset of its school graduates [WEF 2018]

Open Science in Nigerian: Prospects

- Nigeria has great potentials for Open Science
 - Large population of researchers/researches that can be leveraged for productivity/visibility
 - Willing funders (e.g., TETFund) given requisite policy backing
- Industry experts estimate a **cloud computing market potential** of USD 1 billion in Nigeria,
 - if the broadband infrastructure hurdles are resolved
- Overcoming the identified challenges afford Open Science dividends:
 - maximise the **benefits of investment in science** and scientific infrastructure
 - maximise the **benefit of science for society** and the engagement of society with science
 - Agreement on and **benefit from Open Science frameworks** (ethics, Intelligence Openness, data formats and standards, etc.)
 - **Increased support** from governments, funders and other stakeholders

Summary

- Reviewed Open Science, its values, principles and pillars
- Listed necessities for implementation of Open Science—policy, infrastructure and capacity—and highlighted some exemplars
- Robust, localized and interoperable infrastructure necessary for realizing Open Science
- Collaboration with expert groups—e.g., Eko-Konnect—critical for successful planning and realization of Open Science
- Deliberate advocacy essential for promoting the value and culture of Open Science among stakeholders in Nigeria
- Mobilizing adequate material, human and financial resources necessary for Open Science implementation

The End

Thank You

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