The Future of Science and Science for the Future
A New Reality

Today we generate 2.5 Quintillion \((10^{18})\) bytes of data per day with 3.7 billion humans using the internet.\(^i\)

The means by which information and knowledge are acquired, stored and communicated have always been powerful drivers of human material and social progress. The world is in the throes of a Digital Revolution that is fundamentally changing the dynamics of human interactions, politics, economies, and the approach to science and its application for the benefit of humanity.

Open Science and the Digital Revolution

The reality and potential of the modern storm of digital data together with pervasive communication have profound implications for society, the economy and for science. The adaption of national intellectual infrastructures to this new reality is a fundamental challenge for Africa if it is to realise the benefits of the technology.

Open Science is a vital enabler in maintaining the rigour and reliability of science; in creatively integrating diverse data resources to address complex modern challenges; in open innovation and in engaging with other societal actors as knowledge partners in tackling shared problems. It is fundamental to the realisation of the Sustainability Development Goals (SDGs).

What is Open Science?

If science is to fully exploit its inherent potential, it must break out of its current silos where individuals and groups tend to have access only to a limited range of data that reflect their individual disciplinary focus.

We are presented with a choice: either to have access only to that data which we have individually created, or to give and receive access to a much wider range of data from multiple disciplines, which is a necessary pre-requisite if science is to address the complexities of this world.

One can either hoard a little, or access a lot. The former is an island – the latter is an ocean.

It is a transition that science must make if it is to exploit the digital revolution in supercharging scientific discovery in a data-rich era. Without this shift to a regime where researchers are able to access a wide diversity of data streams, which, when integrated, reveal deep patterns in complex phenomena, the scientific community will fail to seize opportunities for unravelling the complexity inherent in the major environmental, economic and societal challenges that humanity faces.

The Challenge for Africa

National science systems worldwide are struggling to adapt to this new paradigm. The choices are to adapt or risk the stagnation of scientific progress and the isolation from creative streams of social, cultural and economic opportunity.

Africa must make the paradigm shift as a leader and in the context of its own societally-engaged priorities. The African Open Science Platform (AOSP), aims to be a powerful lever of social, cultural and scientific vitality and of economic development on the continent.

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\(^i\) https://www.forbes.com/sites/bernardmarr/2018/05/21/how-much-data-do-we-create-every-day-the-mind-blowing-stats-everyone-should-read/#77d2a25560ba
\(^iii\) https://www.internetworldstats.com/stats1.htm
\(^iv\) www.worldbank.org/.../document/Open-Data-for-Economic-Growth.pdf
\(^vi\) PWC EU Services report ‘Cost of not having FAIR research data’.
Economically, digital platforms are examples of a general-purpose technology, with the inherent capability to continually transform itself, thus progressively penetrating new domains, boosting productivity across all sectors and industries and with an economic impact that is much greater than stand-alone technologies.

Many benefits come not simply from adopting the technology, but from adapting to it.

These technologies bring enormous long-term benefits, but by their very nature, are highly disruptive, precisely because they are so flexible and pervasive, redefining relationships between customers, workers and employers, and permeating almost everything we do, progressively overhauling all industries whilst creating new ones.

A World Bank study concludes that there is real economic potential of open data and that these conclusions apply equally to both developed and underdeveloped economies. It suggests that governments should see themselves not only as a supplier of open data but also as a leader, catalyst and user.

A study for the European Commission argued that a European open data portal would have the potential to generate a multi-billion euro bonus per year, including a cumulative efficiency benefit of 1.7 Bn euros by 2020. Another report offers a deliberately conservative estimate of the opportunity costs (benefits foregone) for the European Union of not developing an open data platform that is findable, accessible, interoperable and reusable (FAIR data) as at least 10.2 Bn and possibly as high as 26 Bn euros. These considerations form a fundamental justification for the major investment in the European Open Science Cloud.

The African Open Science Platform

The mission of the AOSP is to place African scientists at the cutting edge of contemporary, data-intensive science as a fundamental resource for a modern society.

The platform hinges on:

- Federated hardware, communications and software infrastructure, and a suite of policies and enabling practices.
- A network of excellence in open science that supports scientists & other societal actors in accumulating and using modern data resources to maximise scientific, social and economic benefit.

The preparatory pilot for the Platform was funded by the South African Government through the Department of Science and Technology (DST), using the National Research Foundation (NRF) as the implementing agent. The platform pilot has been led by the International Science Council (ISC) and its Committee on Data (CODATA); and delivered by an office hosted by the Academy of Science of South Africa (ASSAf) under direction of CODATA.

The primary objectives of the pilot phase have been to:

- To map the current landscape of data/science initiatives in Africa.
- Build a Pan-African open science community.
- To develop frameworks for policy, incentives, training and technical requirements that will help inform the operational Platform.

The AOSP is designed to contribute the strategic science priorities on the continent in two ways:

- By stimulating the African research enterprise through ready access to a common research-supporting environment that exploits the potentials of a data-intensive era; and
- By creating programmes targeted at key priorities, thus stimulating pan-African collaboration, facilitation of relevant data access, and provision of high-level technical support.

Furthermore, the promotion of deeper engagement with wider society will enhance the potential impact of socially relevant programmes as a distinctive attribute of the “open science” approach of the African Platform.
AOSP Strategy

As part of the Pilot Project, a baseline study was carried out that has mapped the current status of activities and capacities to create a live register of open data/open access/open science activities in Africa. Based on the study as well as the expression of needs, the platforms objectives have been planned in two categories i.e. enabling activities which provide and manage access to data; computational hardware, connectivity and the tools and concepts required for effective open science policies and practice; and applications activities directed towards productive scientific, societal and economic outputs and outcomes as follows:

Enabling Activities

► Strand 1: Provision of cloud computing facilities that provide networked computation, data access and analysis tools for African Science.
► Strand 2: Provision of software tools, experience-based advice on research data management and on open science policies and practice.

Application Activities

► Strand 3: Create and sustain high level, internationally competitive research capacity in data analytics and artificial intelligence in support of platform science priorities.
► Strand 4: Create priority programmes that place African scientists at the international forefront in the application of cutting edge data technologies to major research domains, and as a fundamental resource for a modern society.
► Strand 5: Create understanding, awareness and capacity in citizens and professionals in dealing with a data- and information-intensive world.
► Strand 6: Develop a community where access to data, information and scientific expertise is enabled and where scientists are engaged in cross-societal collaborations that jointly frame and jointly seek solutions to significant problems.

The long-term vision is for the Platform to have pan-African scope, however, it is anticipated that its initial growth will take place through:

► A coordinated effort between institutions across African States that are able and willing to align their scientific data-related policies and practices make a mutually beneficial contribution to the strategy;
► Collaborative agreements between existing service providers and coordination of their activities to maximise benefit to the African science community.

The African Open Science Platform will be launched at the Science Forum South Africa 2018 (12 to 14 December 2018) by the Minister of Science and Technology.

There is currently a call for expressions of support from the African Partner States and their Research Institutions and Universities.

For details refer to: The AOSP Strategy