Introduction: Open Access to Scientific Information in Emerging Countries

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Open science…

The village of mankind is faced with global challenges. Health, transport, energy, food, climate, security, education and innovation are issues that transcend national boundaries and cannot be resolved by any one country acting alone.

Science is expected to produce helpful knowledge and to contribute to the sustainable development of open society and humanity. Yet, a better understanding of society, nature and environment requires open science, free debate of ideas and exchange of procedures and results. Discussion, readiness to learn from each other and rational criticism are conditions for scientific progress.

Three hundred years ago, in the Age of Enlightenment, European and North-American intellectuals proclaimed themselves as the "Republic of Letters", an open community of scholars, writers and philosophers corresponding through letters, papers and pamphlets on new ideas, observations and experiences. Their free floating conversation at distance, between the salons, societies and academies in London, Paris, Amsterdam and Philadelphia, created the crucial environment for the development of modern scientific research and teaching, against obscurantism and ignorance.

Yesterday, in the Gutenberg era, openness and freedom of discussion was guaranteed by public correspondence and the invention of academic journals, such as the French *Journal des Sçavans* or the *Philosophical Transactions* published by the Royal Society in London. The digital revolution created a knowledge-based society ruled by new information and communication technologies, infrastructures and media. Internet changed research, collaboration and academic publishing. Today, in the galaxy of Internet and virtual networks, openness of scientific communication calls for other solutions.

In the emerging information age, some people consider knowledge as a strategic weapon, as an argument in global competition. Knowledge is more than that. It is a cultural heritage and a common good, produced by society and indispensable for progress and development. Benjamin Franklin once said, "An investment in knowledge pays the best interest." Investment in knowledge means learning and also teaching, thinking and also talking, producing and also communicating. Knowledge must be shared to make sense and be useful. The best interest of knowledge in the beginning 21st century is sustainable development and survival. More than ever open society needs open science, a second scientific revolution (Bartling & Friesike 2014) where scientists share their results straight away and with a wide audience.

… and open access

Access to information plays a critical role in supporting development[1]. Open access to scientific information is one solution. The basic idea is simple: "Make research literature available online without price barriers and without most permission barriers" (Suber 2012, p.8). Free availability on the public internet and in particular on the easily accessible World Wide Web, includes the permission "for any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself" (Budapest Declaration).

In 1999 a meeting in Santa Fe, New Mexico, laid the technical foundation for open access, i.e. the Open Archives Initiative (OAI) and the OAI Protocol for Metadata Harvesting (OAI-PMH). The objective was to create a global open access community, to raise awareness on open access to scientific information and to foster the development of interoperable open access platforms and infrastructures compliant with the OAI protocol. "Hopes were high", remembers Eric F. Van de Velde, technology consultant and former computer scientist at Caltech, "hopes for universal free access to scientific literature, for open access journals, lower-priced journals,

[1] See IFLA's Lyon declaration launched at the 2014 World Library and Information Congress.

access to data, and for better research infrastructures". Half a generation later, the success of open access cannot be denied. And even if not all high hopes have come true, "none of the unfulfilled dreams can detract from the many significant accomplishments of the Open Access Movement"[2].

The first international open repository "arXiv" was launched in 1991 by the High Physics community in Los Alamos. The site invited scientists to deposit their papers at the same time as when they submit them to journals. The objective was direct scientific communication, making papers available to the whole community immediately, often several months before formal publishing.

With nearly one million items, arXiv is still one of the most successful models of the so-called "green road" to open access. "Green road" means self-archiving, i.e. the practice of depositing one's own work in an open repository. The Directory of Open Access Repositories OpenDOAR contains more than 2,700 open repositories but the real number is certainly higher. Most of them are run by universities, faculties, departments, laboratories or other research institutions, for instance by the MIT, Columbia University or Harvard, while others are disciplinary, cross-institutional subject repositories. Open repositories cover all disciplines, and they contain all document types, mostly articles but also theses and dissertations, reports, conference proceedings, unpublished working papers etc. More recently, some institutions launched so-called data repositories, for the deposit and free dissemination of all kinds of research results, raw data and so on.

Along with open repositories, research communities and the publishing industry developed another mode of open access, the so-called "gold road" which means open access delivered by journals. The Directory of Open Access Journals (DOAJ) lists about 10,000 journals that do not charge readers or their institutions for access and that assign the right of users to "read, download, copy, distribute, print, search, or link to the full texts of these articles", that exercise peer-review or editorial quality control and that report primary results of research or overviews of research results to a scholarly community.

Most of them are funded by subsidies from research organizations, governments or learned societies while about 30% charge Article Processing Charges (APC) in order to cover publishing costs and generate revenues. APC mean that authors or their institutions have to pay a publication fee for each accepted paper that may range from less than hundred to four thousand US dollars or more.

Nobody can say exactly how many scientific papers are available in open access and which part of all scientific output they represent. The Bielefeld Academic Search Engine indexes nearly 65 million scientific open access web resources[3]. A recent study on open access claims a percentage of 50% articles even if 20% seems more realistic. What is sure is that this figure differs among disciplines and varies because of institutional decisions, national policies and infrastructures. In some scientific fields such as physics and mathematics, open access has more success than in humanities or chemistry. Some institutions decided on a mandatory approach that commits their scientists to deposit publications in institutional repositories. In the same way, some governments and funding bodies invested in open access infrastructures and/or decided to link research funding to open access dissemination of results, to facilitate uptake and accelerate the transition to open science.

From global thinking…

Open access to scientific information and research data is a global concept, with a universal approach to human knowledge and society. "How knowledge circulates", stated John Willinsky from the MIT, "has always been vital to the life of the mind (and) to the well-being of humanity" (2012, p.207). This "access principle" was developed to solve some concrete problems, like the serials crisis, restricted access and delayed communication but is strongly supported by scientific values and ethics. Yet, and despite its success, there are limits.

As a matter of fact open access does not solve all the problems of scientific and technical information, and it may even create others. Harnad et al. (2004) say that open repositories (the green road) may well contribute to the access/impact problem insofar as they increase the availability and potential impact (citations) of scientific output. But Harnad is rather skeptical about the "gold road", i.e. open access journals, as a sustainable solution for the affordability problem and predicts that this option rather than reduce the financial burden, shifts the problem from library budget to publishing charges. Especially as predatory publishing is a growing concern[4].

Moreover, we must be careful with generalizations of what is open and what is not. Diversity is the rule, not homogeneity. Access to scientific information is a multivariate concept with different shades of openness, ranking across a continuum from "open access" to "restricted access". A document may be open with regards to

[2] Eric Van de Velde on his blog http://scitechsociety.blogspot.com/
[3] http://www.base-search.net
[4] http://www.nature.com/news/predatory-publishers-are-corrupting-open-access-1.11385

reader rights but more or less closed for reuse.[5] An institutional repository may fulfill different functions, such as long-term preservation, scientific impact or research evaluation whereas free and unrestricted access to all resources will not always be the priority. Absolute figures on repositories, journals and resources may be good indicators for the development of open access. But more insight is needed into successful models, best practices, degrees of openness, acceptance, usage and policies for a realistic understanding and evaluation of the open access movement.

Yet, this book shifts the focus to another point. Up to now, the open access movement has been most successful in the Western hemisphere. The three essential reference papers on open access, i.e. the Budapest, Berlin and Bethesda declarations were mainly prepared and supported by Western institutions, organizations and communities. Two-thirds of the repositories are hosted in Europe or North America, one third of the open access journals are published in six countries from the "global North", including the United States, Spain and the UK. As Jingfeng Xia (2012) from Indiana University says, open access has a "disproportionate growth" especially in developing countries, because of ICT infrastructures ("digital divide"), R&D intensity and, even more important, cultural dissimilarities, and meeting local standards appears to be a crucial condition for the development of open access.

…to local action

Knowledge production and exchange are part of the global inequalities, and many countries are virtually invisible on the map of global knowledge (Czerniewicz 2013). But what is adequate circulation of knowledge? How can technology help the spread of education and the growth of research capacities in a multipolar world? John Willinsky asserts that "innovations in open access publishing are taking place against the chilling historical backdrop of earlier efforts at instilling universal education and knowledge systems" (2006, p. 109-110).

To become sustainable, open access must adjust to local conditions and even more, be assimilated into local political and scientific culture, as a local initiative supported by local communities. In the global village, one size does not fit all. Each country, each region has its own history and tradition, with institutions, communities and economies that shape the way of future development. What works in one part of the world may fail elsewhere, especially if promoted or enforced as a new "unique model".

Open access is more than a "unique model" of how to circulate knowledge. More than a prescription of how to do things, open access is a principle, a framework for initiatives and projects aiming at fastening scientific communication and increasing online availability of research literature, freely and as reusable as possible. This is a challenge not only for technology and infrastructure, but also for politics, business and laws.

Also, even if open access to scientific information involves in the first place the academic communities, scientists, scholars, students and librarians, it is relevant to other groups, in particular those working in areas of health, welfare, education and justice, and affects other sectors, such as publishing industry, information services, international cooperation and ICT start-ups.

The demand for open access is great in the developing world as it can contribute to solve problems of access gaps - the more rights are assigned to the reader, for instance through Creative Commons Attribution licensing (CC-BY) and "libre" open access, the better it is for usage at the limit or beyond fair use. Peter Suber, Open Access Project Director at Public Knowledge, Washington, observed that "researchers in the global south are among the most determined advocates for open access" [6]. They want it as readers, to have access to international research, and they want it as authors, so that their own work can be known to colleagues elsewhere. This last point is particularly important: open access is different from existing programs such as HINARI because it gives a perspective of participation and integration. Open access is not only access and consumption but also and above all, production and dissemination.

Open access is expected to facilitate the full participation of the global academic community in research and scholarship, sustained by international collaborative strategies. Thus, open access has the potential to contribute and foster local research and development. But to realize this potential and to make open access sustainable, we have to learn from each other, carefully, empathic, and focused on local needs and conditions.

Learning from emerging countries

In our multipolar world, five emerging countries, because of their large and fast-growing national economies, their demography and geographic situation, play a specific and leading role with a significant

[5] SPARC, PLOS, & OASPA (2012). *How Open Is It? Open Access Spectrum*. http://www.plos.org/
[6] http://poynder.blogspot.co.uk

influence on regional and global affairs. These so-called BRICS[7] countries – Brazil, Russia, India, China and South Africa – represent together nearly three billion people, i.e. 40% of the world population, and 18% of the world economy.

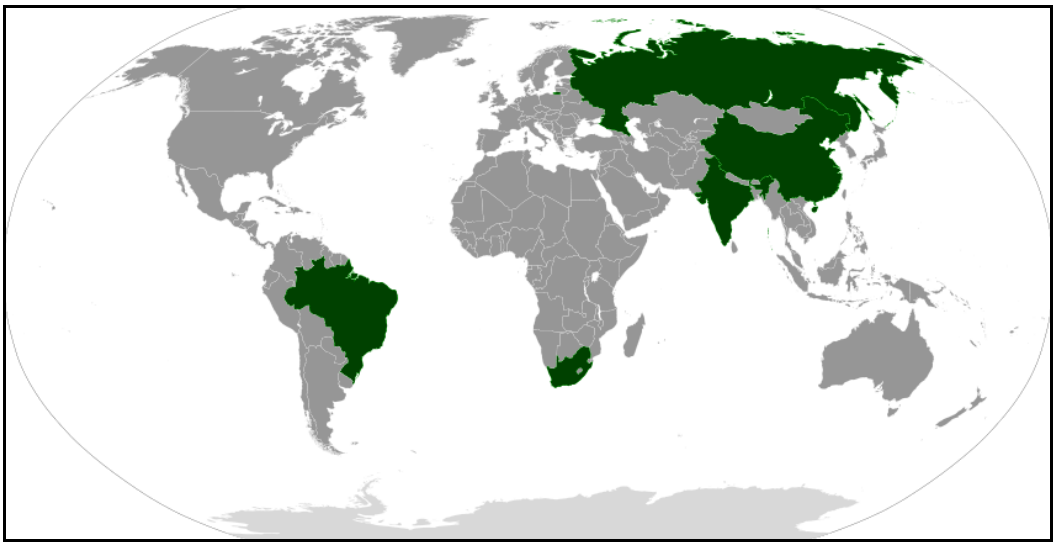

Figure 1: Global map of the BRICS countries (source: en.wikipedia.org)

Their influence on global and regional affairs is commercial and financial as well as political, ecological, military and cultural, and they also stand for an increasing part of the global research and development activities. In 2013, they produced 22% of the scientific documents indexed by the international SCOPUS database, with more Chinese articles than the UK, France and Germany cumulated. Emerging today may become dominant tomorrow.

Regarding open access, they are part of the movement but their ranking is contrasted. Following the international directories for open access repositories and journals, the BRICS countries publish 17% of all open access journals (mainly Brazil and India) but host less than 10% of the open repositories. However, these figures are not exhaustive, especially for Chinese journals, and the real number of repositories and journals in the BRICS is surely higher.

There is no specific "BRICS approach to open access". Each country developed its own policy and infrastructure of open access. Each development is very different from the others. For instance, whereas Brazil launched a central platform for open access journal publishing that gained world-wide visibility and impact, China started to transform their numerous and independent print journals into digital and freely available online products. Also, while some countries focus on regional collaborations, such as Brazil and South Africa, others (China, Russia, India) appear to seek global impact, in competition with Western countries. Yet, there are examples of collaboration and partnership, especially between Brazil, India and South Africa. They work together, and they learn from each other.

The BRICS are not similar; they are far from a unique model but they offer different approaches and projects that may be models for other countries. Each local solution is a potential opportunity for tomorrow's scientific communication. Will future openness set optimal incentives for the creation of knowledge? "Many wrong paths could be picked and may result in dead-ends. It is important that stakeholders are flexible and honest enough to be able to leave dead-end streets" (Bartling & Friesike 2014, p.12). Diversity is not a problem but a chance, and it will support the sustainable development of open access. Diversity, richness of projects and mutual learning are necessary on the way to open science.

Overview

The economic situations of the emergent countries are quite different, as well as their academic system of higher education and research. Also, each country has developed different models of academic publishing for the

[7] The acronym BRICS was introduced by Jim O'Neill from Goldman Sachs in 2001
http://www.goldmansachs.com/our-thinking/archive/building-better.html

dissemination of its research results. These models, even if partly integrated into the international market of scientific and technical information, reflect specific situations and strategies often not well known in the Western world. The value proposal of our book is to provide this information and to close a gap in scientific literature on academic publishing. The reason is twofold: not only to share with these countries a growing part of the international scientific and technical information market but also to allow them to provide interesting and alternative options for this market too. Today this market is largely dominated by American, British, Dutch and German publishers and models. Our hypothesis is that tomorrow, these models will have to share their dominant position with the emerging countries including their cultural, linguistic, scientific and economic diversity and richness. Also, these countries may be better positioned to provide sustainable models for other regions such as the Maghreb, sub-Saharan Africa or Latin America.

Our objective is to provide the reader – librarian, scientist, publisher, student or citizen interested in open science – with valuable and recent information on the open access in each of the five countries so that he/she can make up his/her mind. Therefore we asked experts, information professionals and scientists from Brazil, Russia, India, China and South Africa to describe the open access situation in their different countries for an international readership, with an empirical approach and focusing on country-specific characteristics and challenges. How are they doing, and why? Where are the bottlenecks? What can be learned? Each chapter has its particular topic and perspective:

Brazil: The first chapter presents the open access journal platform ScieELO, the most important open access server for scientific journals worldwide, with an impact well beyond Brazil.

Russia: Chapter two provides a general overview on institutional initiatives for free dissemination of public research on the Internet, especially in the field of grey literature, in a society with strong traditions of public interest prevailing on private intellectual property.

India: Along with a detailed description of the open access movement in India, the third chapter informs about awareness and acceptance of institutional repositories and open access journals among the Indian scientific communities.

China: The author presents the results of a recent survey on the development of open access journals in China. This is interesting insofar as only very few titles are known and indexed outside of China.

South Africa: The last chapter shows how open access can increase its impact and also protect local content, and how it can build on African cultural traditions and values of *Ubuntu*, i.e. relatedness, sharing and generosity.

Each chapter is introduced by "Facts & Figures", a section with some basic data about each country, on its economic performance, research and development, scientific output and open access publishing. These data collected between March and September 2014, come from several sources (UNESCO Institute of Statistics, Battelle-*R&D Magazine*, ProQuest UlrichsWeb, OpenDOAR, DOAJ, Wikipedia, Worldometers.info) and have been cross validated whenever possible. The maps have been adapted from the United Nations Office for the Coordination of Humanitarian Affairs OCHA website[8]. Moreover, this section provides a summary of the following chapter and introduces the author(s).

Each chapter tells a story, and each story is different. How can we conclude such a book? Instead of a synthesis, we asked Pierre Mounier, a historian from the School for Advanced Studies in Social Sciences in Paris, and Deputy Director of the French OpenEdition publishing house, to conduct a virtual roundtable with our authors in order to find out what is common, what is different, what can be learned and what are the threats and opportunities for the future development of open access - a real challenge but also a way to emphasize shared values and engagement in the international community of open access and open science, and to finish the book with an open debate and new perspectives.

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[8] http://www.unocha.org

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