Open Access to Scientific Information in Emerging Countries

Joachim Schöpfel

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Joachim Schöpfel

University of Lille

GERiiCO Laboratory

joachim.schopfel@univ-lille3.fr

ORCID iD 0000-0002-4000-807X

About the author: Joachim Schöpfel is senior lecturer in library and information sciences at the University of Lille, director of the French digitization centre for PhD theses (ANRT) and member of the GERiiCO research laboratory. He was manager of the INIST (CNRS) scientific library from 1999 to 2008 and head of the Lille department of information and documentation sciences from 2009 to 2012. He is teaching library marketing, auditing, intellectual property and information science, and he is author of more than 150 papers, communications, etc. His research interests are scientific information and communication, especially open access, grey literature and research data, copyright, library management and job development.

Abstract

Access to information plays a critical role in supporting development. Open access to scientific information is one solution. Up to now, the open access movement has been most successful in the Western hemisphere. The demand for open access is great in the developing world as it can contribute to solving problems related to access gaps. Five emerging countries, called BRICS – Brazil, Russia, India, China and South Africa – play a specific and leading role with a significant influence on regional and global affairs because of their large and fast-growing national economies, their demography and geographic situation. What are they doing in the field of open access? The paper presents some elements for a better understanding essentially based on case studies from scientists and professionals from the BRICS.

This paper is an updated and enriched synthesis of a recent work on open access in the BRICS countries published by Litwin, Sacramento CA.[1]

Open access and development

Access to information plays a critical role in supporting development[2]. 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[3]).

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

[1] Schöpfel, J. (ed.) 2015. *Learning from the BRICS. Open Access to Scientific Information in Emerging Countries*. Litwin, Sacramento CA.
[2] See IFLA's Lyon declaration launched at the 2014 World Library and Information Congress.
[3] http://www.budapestopenaccessinitiative.org/

the open repositories are hosted in Europe or North America[4], one third of the open access journals are published in six countries from the "global North", including the United States, Spain and the UK[5]. Knowledge production and exchange are part of the global inequalities, and many countries are virtually invisible on the map of global knowledge (Czerniewicz 2013). As Jingfeng Xia (2012) from Indiana University says, open access has a "disproportionate growth" especially in developing countries, because of poorer ICT infrastructures ("digital divide"), lower R&D intensity and cultural dissimilarities.

The demand for open access is great in the developing world as it can contribute to solving problems related to access gaps. Peter Suber observed that "researchers in the global south are among the most determined advocates for open access"[6]. They want it not only as readers, to have access to international research, but also as authors so that their own work can be known to colleagues elsewhere. Open access is not only access and consumption but also and above all, production and dissemination. It 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, empathically, and focused on local needs and conditions.

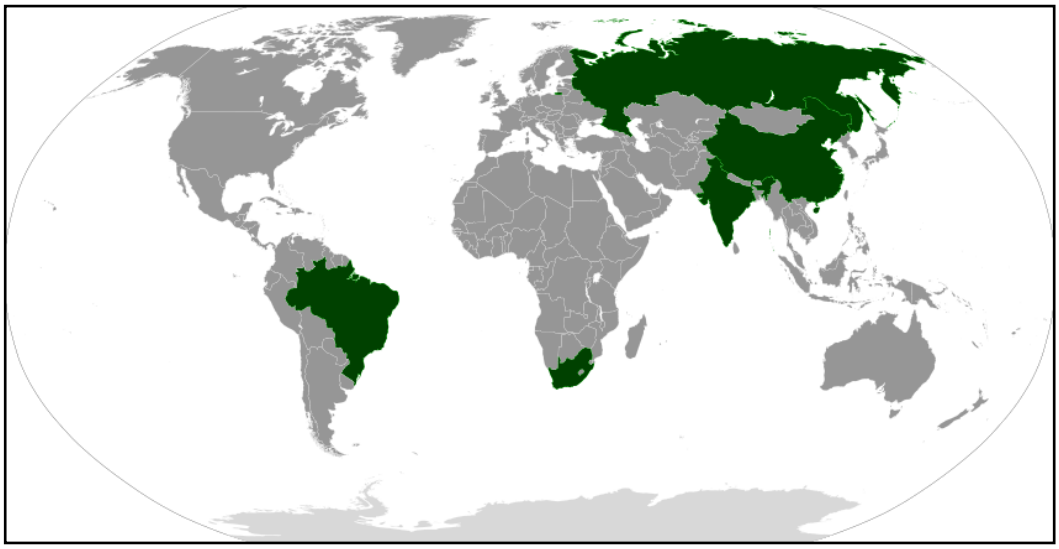

Figure 1: Global map of the BRICS countries (source: en.wikipedia.org)

Emerging countries

In our multipolar world five emerging countries, because of their large and fast-growing national economies, their demographic and geographic situation, play a specific and leading role with a significant influence on regional and global affairs. These so-called BRICS[7] countries – Brazil, Russia, India, China and South Africa – together represent in 2015 3.6 billion people, i.e. half of the world population, 22% of the world economy (gross world product) and nearly 60% of its growth[8].

Their influence on global and regional affairs is commercial and financial as well as political, ecological, military and cultural, and they also represent an increasing part of the global research and

[4] The Directory of Open Access Repositories (OpenDOAR) http://www.opendoar.org/
[5] The Directory of Open Access Journals (DOAJ) https://doaj.org/
[6] http://poynder.blogspot.co.uk
[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
[8] Sources: IMF, Estin&Co

development activities. The economic situations of the emergent countries are quite different, including their academic systems of higher education and research. Also, each country has developed different models of academic publishing for the 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. In 2015, the BRICS countries already produced 24% of the scientific documents indexed by the Scopus database, with more articles from China alone than from the UK, France and Germany cumulated. What is emerging today may become dominant tomorrow.

Today the international scientific and technical information market is largely dominated by American, British, Dutch and German publishers and models. Our hypothesis is that tomorrow, these companies and 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.

	Citable publications	**Open access journals**	**Open repositories**
source	*Scopus (Scimago)*	*DOAJ*	*OpenDOAR*
Brazil	57 033	947	91
Russia	55 500	161	28
India	113 144	320	76
China	401 945	65	39
South Africa	15 570	65	32
% BRICS	24%	16%	8%
Worldwide	**2 721 140**	**9 515**	**3 291**

Figure 2: Open repositories and open access journals (January 2017)

Some figures

The BRICS countries together produce 24% of the worldwide citable scientific publications (mostly articles), publish 16% of all open access journals but host less than 10% of the open repositories (Figure 2)[9]. The statistics show some significant differences between the BRICS countries:

- Brazil and India are at the head of the open access movement, with a significant number of open access journals and open repositories.
- Brazil, Russia and India have a high ratio of gold open access (journals), compared to the green road (repositories); this ratio is higher than in China or South Africa but also higher than in the United States, in Germany or France.
- Compared to the scientific output, Brazil produces much more open access journals (1.54) than the other BRICS countries (<0.4) and moreover, more than the most important research producing countries from the Global North (<0.6).
- Brazil and South Africa have similar ratios between open repositories and scientific output (0.16-0.21) with the countries from the Global North (United States, UK, Germany, France, Japan), significantly higher than India, China or Russia (<0.07).

Also, the development of scientific output and open access is different. Together, the BRICS countries' scientific output is 3% higher than two years ago. However, this global figure hides the fact that the situation is more or less stable in Brazil and China while the increase of citable documents is much more important in Russia, India and South Africa (10-30%).

[9] Scimago Journal & Country Rank based on the Scopus database 2015 http://www.scimagojr.com/

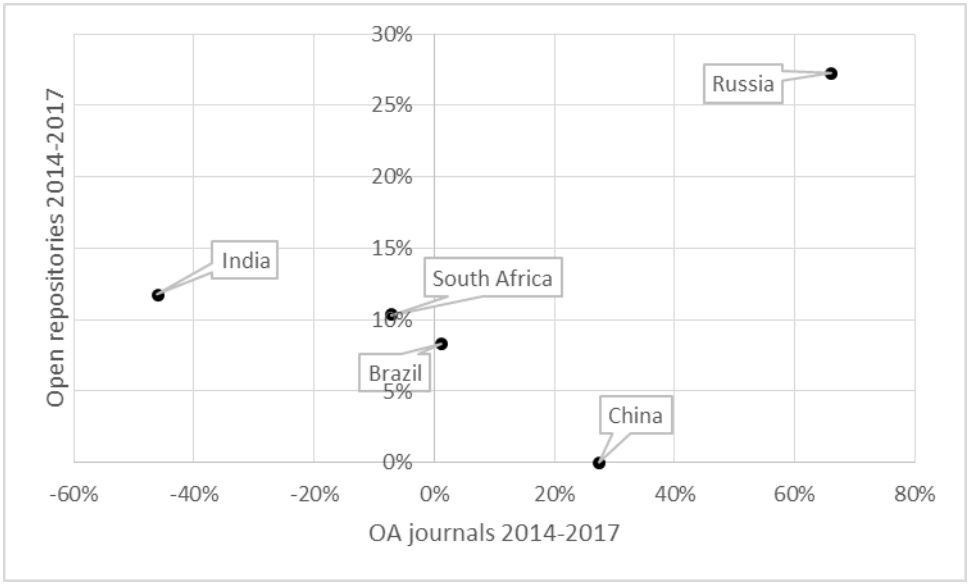

Figure 3: Development of open access journals and open repositories 2014-2017 (in %)

Figure 3 illustrates the development of open access journals and repositories. Except for China, the number of open repositories increased in all BRICS countries between 8% (Brazil) and 27% (Russia). At the same time, the number of open access journals increased in Russia and China but decreased in the other countries, especially in India.

Obviously, the BRICS are not similar; they are far from a unique model and offer different approaches and projects that may be models for other countries. But we must be careful with these figures – BRICS countries suffer from a deficient visibility in international databases and directories, and some results may also reflect methodological issues, especially for the updates and adjustments of the DOAJ. Also, these statistics represent tools and services, not content. We have no reliable information about the real amount of content – articles, dissertations, conference papers, books… - that is actually available through open access (journals and repositories); and no information about the part of the overall scientific output that this open access content represents.

Let us make some short comments on books and research data, both part of scientific output and open science. The international directory DOAB[10] contains less than 10% publishers and books from the BRICS, and nearly all of them (12 publishers, 543 books) are hosted on the SciELO platform and are from Brazil.

[10] Directory of Open Access Books http://www.doabooks.org/

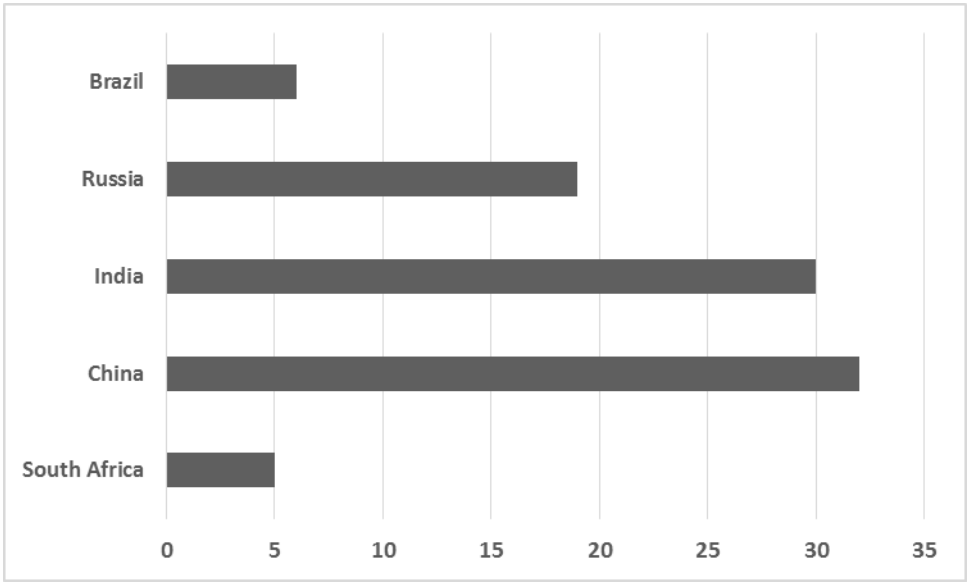

Figure 4: Data repositories in the BRICS (source: re3data, January 2017)

The international register of research data repositories re3data[11] includes 1,804 repositories. 5% are located in the BRICS countries (Figure 4). Again, this (low) figure should not be over-interpreted because up to now the re3data register was mainly focused on Western countries; also these figures do not say anything about the content, i.e. the number of archived datasets, and about their availability, if they are open or not.

In order to better understand the open access in each of the five countries we must have a closer look on specific conditions in each country, relying on information professionals and scientists from Brazil, Russia, India, China and South Africa who describe the situation in their own 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? In the following we present some characteristics and insights from different sources.

Brazil – leadership in open access publishing

Covering half of the surface of South America, Brazil is the largest country of Latin America. Ten years ago, the situation has been described as follows: a very small but growing participation of Brazilian research output on the worldwide stage; two open access journal platforms (SciELO and PKP's Open Journal Systems) but at that time little awareness of open access and few open repositories, the most successful initiative being the Digital Library of Theses and Dissertations (BDTD) with ca. 70,000 theses and dissertations available (Costa & Leite 2008).

Today, the situation has changed. Brazil became leader in scholarly publishing and open access in Latin America, with more than 1,700 journals alone on the OJS platform. According to the Scopus database, 36% of the Brazilian research output in 2015 is open access (compared to 12-14% for France, Germany, US or UK).

In Brazil, "Open Access in science has progressed along a very specific course; the research results that are published in indexed journals are disseminated, and a standard that measures the quality of the research and the impact of the public investment in the area has been established" (Peña 2015, p.19). Quality is not an issue; a recent study confirms that "the best journals in Brazil are far more likely to be open access" (Carvalho Neto 2016, p.12).

[11] Register of Research Data Repositories http://www.re3data.org/

The number of repositories is steadily increasing, reaching 91 sites in 2017; and Brazil is one of the major providers of the NDLTD portal of electronic theses and dissertations[12], with nearly 300,000 ETDs from the Brazilian Institute of Scientific and Technological Information (IBICT). However, Brazil's major contribution to the global movement towards open access is the SciELO (Scientific Electronic Library On-line) project[13]. Difficult to say what exactly SciELO is: a platform for open access publishing? A digital library? An international network? It is all of this, and more than that. First started in Brazil and, shortly afterward, in Chile, SciELO has been running for twenty years now. Initially launched as a server for journal publishing designed to improve the visibility of Brazilian journals on the Internet, it has become the most important and best known open access journal platform worldwide. Open access has allowed for more visibility, transparency, and credibility for the SciELO journals that now span over three continents with 1,250 titles from 14 countries, including Portugal, Spain and South Africa. The number of issues and articles is steadily growing, largely exceeding half a million articles in a broad range of scientific disciplines and fields (Packer et al. 2014).

According to Abel L. Packer who coordinates the SciELO program, the key factors of its success are international cooperation, institutional support and sponsorship, political lobbying and proactive communication, federation of stakeholders instead of isolation or competition, and standardization (Packer 2015). If today SciELO represents the most successful and impressive example of "gold" open access, that is, open access based on publishing rather than self-archiving, one reason is surely the fact that from the beginning, the project is valued and insists on high content quality and selectivity, on evaluation and scientometrics, and on indexing and metadata. Other reasons are the close partnership between research organizations and publishers and the search for sustainability.

What can be learned is a particularly original mixture of visionary strategy towards open access and realistic, even opportunistic goal setting, with specific dynamics and potential. More countries, like Paraguay will join the project, indexing and referencing will be improved, and the platform has started to publish books and proceedings from scientific events. More than a simple project, SciELO is today a reference and a model for other emerging and developing countries, as a specific Global South solution to open access. It seems also the world's most successful alternative to commercial open access publishing with article processing charges and as such, a political message in favour of public, not-for-profit and independent academic publishing.

Russia – the impact of history

Open access to scientific and technical information in Russia is at the very early phases of its progress. The development of the international open access movement in the late 90s and early 2000 coincides with hard times for Russian science. The negative impact of unsuccessful reforms and economic crises in Russia overrun the effect of discontent caused by the increase of journal subscription cost. Amidst other reasons one could mention the weakness of civil society responsibility, which was rather typical for Russian scholars (Zemskov & Pavlov 2015). Poor knowledge of English also plays a negative role, as this language became the main language of international scientific communication (Kiselev 2012). Only few Russian repositories are registered by the OpenDOAR directory. Another example: 2015 usage statistics from the international arXiv repository for e-prints do mention only one Russian research institution[14] (and no university) among the 200 heaviest user institutions. "There are no large centralized repositories and just minority of authors publish their papers in this way (while) the number of OA journals is insignificant and most of them are not popular among scientists" (Semyachkin et al. 2014, p.137).

However, there are some positive open access projects by the Russian government, the Academy of Sciences, by universities, information centres and engaged scientists and information professionals. The impact of history and society is obvious, perhaps more than in other countries. In the Russian

[12] Global ETD Search http://search.ndltd.org/
[13] http://www.scielo.br/
[14] Joint Institute for Nuclear Research (jinr.ru)

context, open access signifies more than Internet and scientific communication: it is public-funded free dissemination of research results to the society, in the socialist tradition of common good and public interest. Also, public institutions and authorities play a substantial role in the open access movement, prevailing on individual initiatives (Zemskov & Pavlov 2015). Some questions:

The early open access movement made a kind of amalgam between open access, open science and open society, in the American way of understanding. In other words, they linked efficient and direct scientific communication to a specific form of social and political development. Is this true for the Russian open access movement?

There is an on-going discussion in the open access movement on business models and financial aspects, beyond the terms of "free", "libre" and "gratis". Someone has to pay, but who should or will? In Russia, the dissemination of public research and access to scientific information, *a fortiori* open access, seems part of the State's responsibility and must be supported and organized by the government and regional or local authorities. Yet, "despite the fact that a lot of research is funded by government, the results remain inaccessible to most people" (Semyachkin et al. 2014, p.137). In other countries, open access is increasingly supported by the corporate sector, via funding agencies and commercial publishers. In countries like Russia where few grants are accessible, open access publishing remains a problem for the authors of papers with poor funding of research (Bjertnaes 2012). Which is the best way to assure sustainability?

Regarding law and copyright, the open access movement often opposes public v. publishers' interests, considering the scientific authors as potential allies. Here, the potential conflict is clearly elsewhere, between the authors' rights of intellectual property and the public interests and rights for information. In other words, the authors (at least those delegating their interests to commercial publishers) are considered as a potential problem on the way to open access.

Open access to scientific results is often defined as free and unrestricted access to documents and data files on the Internet. In the Russian context, the meaning appears to be larger, including free access to research tools, facilities, print documents, catalogue records and metadata, abstracts, databases and translations. Open access as a continuum of services and dissemination channels, also as a historical and societal continuum from print to digital resources - an approach finally not so far from the recent adoption of Open Science by the European research policy[15].

India – progress and barriers

Several hundreds of peer-reviewed open access journals, institutional support by important research organisations, laboratories and universities[16], a growing number of open repositories, international programs, a favourable public climate and a prolific body of research studies on open access: open access in India is a success story (Sawant 2015). As mentioned above, among the emergent countries, Brazil and India are at the head of the open access movement, with a significant number of open access journals and open repositories. More than half of Indian journals are open access, and most of them do not charge author fees (Singh 2015). "Many government institutions and universities took steps to develop repositories to disseminate their intellectual output to wider audiences (and) the Government of India (…) approved an open access policy that aims to provide online access to increase the impact of its research and foster a rich research culture" (Singh 2016, pp.18-19).

Yet, a couple of years ago "many senior scientists and directors of research laboratories and vice chancellors of universities (did) not have a clear appreciation of open access and its implications" (Arunachalam 2008, p.277), and recent surveys confirm that still only a minority of India's scholarly population of teachers, researchers and students appears to be concerned by open access. But even if

[15] *Amsterdam Call for Action on Open Science*
https://english.eu2016.nl/documents/reports/2016/04/04/amsterdam-call-for-action-on-open-science

[16] such as the Council of Scientific and Industrial Research (CSIR), the Indian Council of Agricultural Research (ICAR), the governmental Department of Science and Technology (DST) and the Indian Institutes of Technology (IIT)

"the awareness level of open access literature and initiatives among the Indian research community and scientists is low (it) is gradually increasing" (Sahu & Arya 2013, p.10). Researchers in general have positive attitudes towards open repositories, but even though they are aware of the benefits, they are reluctant to deposit their documents (Sawant 2015). Also, they are often in favour of open access journal publishing but opposed to the author payment model and article processing charges (Singh 2015). Also, "while university libraries abroad have reacted in an organized manner to counter the alarming costs of providing access to information, there is little evidence of concerted action in India" (Balaram 2013, p.403).

Another problem is the so-called predatory publishing, i.e. malpractices in open access journal publishing which has become a serious problem in India. "Many (predatory publishers) purport to be headquartered in the United States, United Kingdom, Canada or Australia but really hail from Pakistan, India or Nigeria" (Beall 2012, p.179). Is this the price to pay for the success of open access journal publishing, as a kind of collateral damage? Aware of the situation, Indian institutions started to take action, with guidelines, approved journal lists, information and education (Sawant 2015). Will this be enough? Or is the only way to reduce this malpractice promoting self-archiving and totally free open access?

The picture of open access in India looks promising as policy makers are taking a keen interest in the development of the movement (Sawant 2015). Self-archiving in repositories (green road) may be a reasonable alternative to open access journal publishing (gold road) because the infrastructure is there and because it is less expensive, because it allows faster turnaround and is compatible with publishing in conventional journals. This is an interesting prognostic in line with pro-green open access experts like Stevan Harnad, and somehow in contradiction with the lobbying by commercial publishing and open science strategies in the UK, Germany or the Netherlands. "If India sets the example, by officially adopting and implementing (a national OA self-archiving mandate for all of its research institutions and funders), India's own research access and impact will be maximised, the rest of the world will follow India's example, and research progress worldwide will be the beneficiary" (Harnad & Swan 2008). But India is a land of contrast and diversity, and one never knows when things start happening in India (Arunachalam 2008). The future will show who is right, if open access only adds another contrast to India, if there is space for both green and gold, and which one will be the particular Indian contribution to the global movement.

China – the gold road

China with the highest population worldwide and a rapidly growing economy has become a global player at all levels, be it in finance, business, diplomacy, military or environment. However, "compared to the OA situation in other countries, OA journals have developed slowly in China. As of 19 September 2012, only (…) 0.42 per cent (34/8180) originate from China, (…) thirty-one are in the natural sciences and only three are in the social sciences" (Guo et al. 2014, p.337). In 2017, the number of open access journals and open repositories seems still insignificant (see figure 2).

However, following recent surveys, the Chinese figures in the international directories are only the tip of the iceberg, while the hidden part, i.e. the real number is higher. In fact, less than 5% of the open access journals are indexed by DOAJ whereas the rest remain virtually invisible and unknown to the international research community (Hu et al. 2012, 2013). Dehua Hu from the Central South University in Changsha, conducted the first systematic and comprehensive survey of Chinese open access journals in 2013. The results provide a unique picture of the actual situation on the open access publishing market. Today, open access journals represent 20% of all Chinese journals in sciences, technology and medicine (only 10% in 2009), most of which are hosted and distributed in PDF on independent websites (Hu 2015). In social sciences and humanities, the percentage is a little bit lower. A survey on the 714 journals listed in the Chinese Social Sciences Citation Index (CSSCI) in 2012 to 2013, 14% were OA (Guo et al. 2014).

Most of the Chinese open access journals are not part of a larger aggregation, but are published independently. In a certain way, the Chinese open access journal publishing landscape made up of many different local projects and initiatives may be compared to hundreds of blooming flowers,

different from other countries with great national platforms like for instance Brazil with SciELO or France with OpenEdition. The importance of private (corporate) initiatives seems specific for Chinese open access publishing and quite different for instance from the Russian approach. Also, the journals' open access status is not stable; some journals switch from open access back to the usual subscription model (Cheng & Ren 2008).

At the same time, institutional repositories developed steadily, especially from 2009 on, when the Chinese Academy of Sciences deployed institutional repositories in its research institutes (Zhang 2014). Today, more than 760,000 research papers from 112 institutes have been deposited (75% with full-text), and these have accumulated 17 million downloads, of which 33% were from outside of China[17]. Zhang's prognostic is that in the future green open access will become the policy focus of funders, research organizations and universities. "Support for IR development will be extended, while the institutions that already have IRs will explore services with non-textual materials and more in-depth knowledge analysis" (Zhang 2014, p.48).

Like other emerging economies, open access appears not only interesting but necessary for the development of Chinese science and the visibility of its research output .In order to improve the situation and increase the part of open access publishing, Hu (2015) suggests some elements for a proactive public policy, e.g. modifying the system of accreditation and control of new scientific journals, developing networking and partnerships, fostering the quality control of papers and improving the protection of the authors' intellectual property. Yet, he insists on the equilibrium between public, publishers' and authors' interests and on the need for co-existence between print and digital journals and different dissemination models. No revolution, but a new state of stability and development.

Today, China is already the second producer of scientific articles after the USA and far ahead of other countries. For the Chinese, scientific journal publishing is critical. Their problem is impact, in terms of visibility, usage and citations. Will the open access journal publishing contribute to this impact? How will they deal with the language barrier, a crucial issue for Chinese journal publishing? Will the future be gold or green or both? In any case, one thing is certain – any development in China will have an influence well beyond the country's frontiers.

South Africa – the philosophy of *Ubuntu*

South Africa, the young "rainbow nation", is the first political and military power in Africa and the last country to join the BRICS. South Africa may not have the same global influence as China or Russia but it nonetheless plays a significant role on the African continent and in particular in the Sub-Saharan region.

South Africa was one of the early adopters of the open access movement in Africa, not only because of its relatively strong culture of research production and a strong information technology infrastructure but also because of its specific tradition of sharing and common goods. The government policy clearly puts the focus on institutional repositories (Le Roux 2015). As adopters of open access, South African researchers have been given the platform to freely share their scholarly output with the rest of the continent and the developing world. This option of freely sharing, which underpins the open access movement, translates into a wider distribution of published research thus presenting a model that allows free access (and often more liberal licensing terms) to publications.

The potential is real, and the opportunities are there. Compared to other countries, the uptake and awareness of open access, however, seems still low; open access is still seen as an experimental option (Le Roux 2015). A recent survey on open access and journal cancellations observes that South African open access initiatives are in their early stages of development and that academic librarians have not really embraced such initiatives – "very few university libraries are fully exploiting the opportunity to make knowledge more accessible by utilising OAIs. Users of South African university services therefore are not generally benefitting from the advantages of OA repositories (…)" (Hoskins 2013,

[17] http://www.irgrid.ac.cn/ (accessed 23 January 2017)

p.589). The risk has been described by Czerniewicz & Goodier (2014): "A worst case scenario for South African researchers would be a lose-lose situation in terms of both access and participation. (…) Access to southern research is likely to be even further reduced as local researchers' publishing options might be restricted by financial gatekeeping at the outset. While sweeping changes in the global north will see more northern research freely available to all online, the danger for locals is twofold: firstly, that they may be limited in their opportunities to publish (especially by expensive APCs) and, secondly, that their own research drowns in the worsening invisibility of the online discoverability sphere" (p.8).

The African philosophy of *Ubuntu*, which stands for a universal bond of sharing that connects all humanity, fosters and reinforces the obligation to share scholarly literature. Scientists and society are connected, and the distribution of scholarly literature must contribute to the growth and development of research and society. Such interconnectedness points to the fact that the research process is only complete when the end product in the form of scholarly output is read: hence the importance of its wide distribution. Open access also contributes to reverse the unidirectional information flow from the global North to the global South, as knowledge produced in the global South can now become available via open access platforms to the global North, thus improving the visibility of the former and increasing its usage and impact. At the same time, open access enhances the protection and preservation of local knowledge by having it captured and digitized and made available to the international audience (Raju et al. 2015). "There remains an ongoing tension between the local and the international, as indigenous knowledge is now being promoted at the same time as the importance of participating in global knowledge production" (Le Roux 2015, p.317).

In this context, research data sharing is a specific and important issue. A study on the Thomson Reuters Data Citation Index shows that data sharing in South Africa concentrates in the natural and applied sciences, in particular agriculture, health sciences, forestry and business economics and can be said "to be at its 'initial formation stage' in which (…) the absolute number of publications is small and the growth rate shows signs of increasing" (Onyancha 2016, p.244).

Any study about open access in South Africa is (also) political and raises some crucial questions, such as the impact on other countries and learning not from the Western hemisphere or the global North but from other emerging countries such as India (publishing industry) and Brazil (launch of SciELO-SA, see the case study by Diab 2016). Another question is about the underlying philosophy of open access. It is generally accepted that open access has to do with open society and open science, as defined by Karl Popper and promoted by Georges Soros. But does it, really? The case of Russia already showed how the open access movement could be fed by other, socialist traditions. Here, in South Africa, the roots of open access appear to be even stronger and deeper in the culture and philosophy of African humanism, because "the principles of open access resonate well with the African philosophy of *Ubuntu* (i.e.) the innate principle of sharing (and) a sense of interconnectedness with generosity being at the score" (Raju et al. 2015, p.160).

Learning from the BRICS?

Culture and history create specific environments of science, economy and law, and each country must face particular challenges and seize its own opportunities. Meeting local standards appears to be a crucial condition for the development of open access. Whereas Brazil launched a central platform for open access journal publishing that gained world-wide visibility and impact, China started to transform numerous and independent print journals into digital and freely available online products. 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. Yet, we can distinguish some common features, above all a strong commitment to open access shared by scientific and political authorities in order to increase the impact of the countries' research output and the availability of scientific information.

Increasing visibility and impact in international databases, directories and registries is one of the major challenges. Language is another challenge because of English dominating scientific communication,

but not for all countries, and not all disciplines are affected in the same way. In Latin America, Spanish and Portuguese languages are largely used to communicate on research with national focus or interest; physical and life sciences are mainly communicated in English while social sciences and humanities are done in the local language. In Russia, the language barrier is an important problem - scientific Russian is well developed and has a rich history therefore one can hardly imagine that all Russian scholars will start writing their original works in English. This may be a transitory challenge because of the development of English language skills among new generations of scientists. Yet, for publishers, "internationalization represents a most difficult barrier to overcome for journals whose scope is essentially national and/or who publish in languages other than English" (Packer 2015, p.54).

Other challenges are similar to those in Western countries, e.g. the copyright legislation, funding (sustainability), "filling up the repositories", lack of education, quality of content and products and need for supportive policy. In South Africa, "the greatest challenge is (…) the eradication of the misconception that open access is vanity publishing (…) especially among researchers themselves" (Schöpfel 2015, p.193). In the global village, one size does not fit all. What works in one part of the world may fail elsewhere. However, there are some common key factors for the success of open access, more or less similar to those of the Global North, in particular intellectual property (copyright) legislation compliant with open access, national research policies in favour of open access, and supportive academic reward systems.

For Zemskov & Pavlov (2015), the only sustainable model for the development of research and scientific communication, including open access, is different from market models. In Russia, like in Brazil, India and South Africa, the role of public policy and institutions remains crucial: "In modern Russia the state can and must be the main if not the only financial support of OA (…) as a part of Russian science funding" (p.87). However, the Chinese way seems different, with a large diversity of often local and independent initiatives. Apparently open access is not only a choice of research communities but it is also related to society and economics.

One feature of the open access movement is its international, cross-boundary nature. Conferences, networks, forums and blogs are real and virtual spaces for exchanging ideas and learning from each other. However, so far we cannot see a specific "BRICS space". While the BRICS countries started to coordinate in crucial fields such as finance, economics, energy or nuclear security, there is no open access coordination up to now. Yet, there are bilateral initiatives, and Brazil seems to take the lead, as Abel Packer from SciELO explains: "We are working with South Africa in the development of nationally published journals through SciELO Program that is led by national public research institutions and therefore it is an expression of national open access policies"[18]. Following substantial discussion between the Academy of Sciences of South Africa (ASSAf) and its Brazilian counterparts, the Academy adopted the SciELO platform for its open access journals. In May 2014, SciELO organized the first Brazil-China Bilateral Meeting on STM Publishing.[19].

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

[18] http://www.scielo.org.za/
[19] http://eventos.scielo.org/brazil-chinameeting/en/program/

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 of the 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.

Brazil, Russia, India, China and South Africa all developed their own way to open access, based on specific blends of green and gold road, public investment and private initiatives. It remains uncertain if these BRICS initiatives and projects bear the potential of an alternative model of open access. What they have in common is their commitment to research as a driver of economic and societal development and to open science as a way to enhance quality, impact and access to scientific information. Open access is not an end in itself but a means to better science and societal progress.

Perhaps there is no unique or dominant model of open access. Perhaps there never will be. Perhaps, too, there is no need for a unique model, be it green or gold. Diversity may be a better option for sustainable development. However, based on the experience of the BRICS countries we can say that even if every country has to determine its own special way to open access, they can learn from each other, and they are already doing so. Learning from each other does not only mean learning from failures, mistakes and dead-ends but more so and above all, learning from success. More than the understanding of problems and challenges, perhaps the real message is the importance of success stories. The development of open access depends on the promotion/enhancement of successful initiatives, such as SciELO in Latin America. Expect success, focus on it, and coordinate scientific and political efforts in favour of open science. The future will show how the international research community will realize and transform the tremendous potential of open access and open science. The future is open. But the BRICS countries will be a central part of it.

References

Arunachalam, S., 2008. Open access in India: Hopes and frustrations. In: *Open Scholarship - Proceedings of the 12th International Conference on Electronic Publishing, ELPUB 2008*, Toronto, Canada. 271-279. http://elpub.scix.net/data/works/att/271_elpub2008.content.pdf

Balaram, P., 2013. Open access: Tearing down barriers. *Current Science* 104 (4), 403-404. http://eprints.iisc.ernet.in/45879/1/editorial.pdf

Bartling, S., Friesike, S. (ed.), 2014. *Opening Science*. Springer, Heidelberg. http://link.springer.com/book/10.1007/978-3-319-00026-8

Beall, J., 2012. Predatory publishers are corrupting open access. *Nature* 489 (7415), 179. http://europepmc.org/abstract/MED/22972258

Bjertnaes, L., 2012. How can open access improve the possibilities to be seen? Collaborations with Northwest Russia and Balticum. In: *The 7th Munin Conference on Scientific Publishing*, 22–23 November 2012, Tromsø, Norway.

Carvalho Neto, S. et al, 2016. Measuring, rating, supporting, and strengthening open access scholarly publishing in Brazil. *Education Policy Analysis Archives* 24 (54), 1-25. http://dx.doi.org/10.14507/epaa.24.2391

Cheng, W., Ren, S., 2008. Evolution of open access publishing in Chinese scientific journals. *Learned Publishing* 21 (2), 140-152. http://dx.doi.org/10.1087/095315108x288884

Costa, S. M. S., Leite, F. C. L., 2008. Brazilian open access initiatives: Key strategies and actions. In: *Open Scholarship - Proceedings of the 12th International Conference on Electronic Publishing, ELPUB 2008*, Toronto, Canada. 288-298. http://eprints.rclis.org/11774/

Czerniewicz, L. 2013. "Inequitable power dynamics of global knowledge production and exchange must be confronted head on." London School of Economics. http://blogs.lse.ac.uk/impactofsocialsciences/2013/04/29/redrawing-the-map-from-access-to-participation

Czerniewicz, L., Goodier, S., 2014. Open access in South Africa: A case study and reflections. *South African Journal of Science* 110 (9/10), 1-9. http://dx.doi.org/10.1590/sajs.2014/20140111

Diab, R., 2016. ASSAf: Promoting scholarly activity through the SAJS. *South African Journal of Science* 112 (1/2), #a0141. http://dx.doi.org/10.17159/sajs.2016/a0141

Gómez, N. et al, 2009. Open access indicators and information society: the Latin American case. *OCLC Systems & Services: International digital library perspectives* 25 (2), 82-92. http://dx.doi.org/10.1108/10650750910961884

Guo, F. et al, 2014. Open access in China: A study of social science journals. *Journal of Scholarly Publishing* 45 (4), 336-352. http://dx.doi.org/10.3138/jsp.45.4.02

Harnad, S., Swan, A., 2008. India, open access, the law of Karma and the golden rule. *DESIDOC Journal of Library & Information Technology* 28 (1), 35-40. http://dx.doi.org/10.14429/djlit.28.1.150

Hoskins, R., 2013. The influence of open access on journal cancellations in university libraries in South Africa. *The Electronic Library* 31 (5), 574-592. http://dx.doi.org/10.1108/el-10-2011-0142

Hu, D. et al, 2012. Open access journals in China: The current situation and development strategies. *Serials Review* 38 (2), 86-92. http://dx.doi.org/10.1016/j.serrev.2012.03.001

Hu, D. et al, 2013. Open access in China and its effect on academic libraries. *The Journal of Academic Librarianship* 39 (1), 110-112. http://dx.doi.org/10.1016/j.acalib.2012.11.009

Hu, D., 2015. Open access in China: The development of open access journals. In: Schöpfel, J. (ed.), 129-151.

Kiselev, A. R., 2012. Development of open access medical journals in Russia: Encountered problems and the example of the Saratov Journal of Medical Scientific Research. *European Science Editing* 38 (4), 93-94.

Le Roux, E., 2015. Publishing South African scholarship in the global academic community. *Notes and Records: the Royal Society Journal of the History of Science* 69 (3), 301-320. http://dx.doi.org/10.1098/rsnr.2015.0033

Marcondes, C. H., Sayão, L. F., 2003. The SciELO Brazilian scientific journal gateway and open archives. *D-Lib Magazine* 9 (3). http://dlib.org/dlib/march03/marcondes/03marcondes.html

Onyancha, O., 2016. Open research data in Sub-Saharan Africa: A bibliometric study using the data citation index 32 (3), 227-246. http://dx.doi.org/10.1007/s12109-016-9463-6

Packer, A. L. et al, 2014. *SciELO - 15 Years of Open Access: an analytic study of Open Access and scholarly communication*. UNESCO, Paris. http://dx.doi.org/10.7476/9789230012373

Packer, A. L., 2015. The SciELO program and gold road open access. In: Schöpfel, J. (ed.), 27-59.

Peña, K. I. C., 2015. Comparative analysis of public policies in open access models in Latin America. Brazil and Argentina cases. *RUSC. Universities and Knowledge Society Journal* 12 (1), 15-24.

Raju, R. et al, 2015. South Africa: The role of open access in promoting local content, increasing its usage and impact and protecting it. In: Schöpfel, J. (ed.), 160-189.

Sahu, S. K., Arya, S. K., 2013. Open access practices in India. *Library Hi Tech News* 30 (4), 6-12. http://dx.doi.org/10.1108/lhtn-03-2013-0011

Sawant, S., 2015. Open access in India: Awareness and acceptance of institutional repositories and open access journals. In: Schöpfel, J. (ed.), 97-122.

Schöpfel, J. (ed.) 2015. *Learning from the BRICS. Open Access to Scientific Information in Emerging Countries*. Litwin, Sacramento CA.

Semyachkin, D. et al, 2014. CyberLeninka: Open access and CRIS trends leading to open science in Russia. *Procedia Computer Science* 33, 136-139. http://dx.doi.org/10.1016/j.procs.2014.06.022

Singh, H. P. P., 2015. Knowledge and attitude of health researchers from India towards paying to publish and open access journals. *Indian Pediatrics* 52 (3), 252-253. http://view.ncbi.nlm.nih.gov/pubmed/25849011

Singh, P., 2016. Open access repositories in India. *IFLA Journal* 42 (1), 16-24. http://dx.doi.org/10.1177/0340035215610131

Suber, P. 2012. *Open access*. The MIT Press, Cambridge MA. https://mitpress.mit.edu/books/open-access

Xia, J., 2012. Diffusionism and open access. *Journal of Documentation* 68 (1), 72-99. http://dx.doi.org/10.1108/00220411211200338

Zemskov, A. I., Pavlov, L. P., 2015. Open access in Russia: The beginning of a long way. In: Schöpfel, J. (ed.), 67-89.

Zhang, X., 2014. Development of open access in China: strategies, practices, challenges. *Insights: the UKSG journal* 27 (1), 45-50. http://dx.doi.org/10.1629/2048-7754.111

All web sites accessed in January 2017.