

Research Article

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Algeria, Morocco and Tunisia's presence in The Directory of Open Access Repositories (DOAR) and The Registry of Open Access Repositories (ROAR): A comparative study of their ratio of open access material

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Abstract: Open access has seen a great many developments since its inception some twenty five years ago. From an individual initiative it evolved into an institutional then a governmental action that gave it more weight. These initiatives that took place in the last decade of the twentieth century, and are still going on, have coincided with a revolution that has impacted our daily lives and more precisely our lives as researchers: the Internet which changed our ways of doing scientific research and whose influence could be seen live under our own eyes. While open access in the developed world has thrived, in the developing world to which Algeria, Morocco and Tunisia belong it seems to lag behind. As an example of this, the three countries have together only fifteen and thirteen open repositories in The Directory of Open Access Repositories (DOAR) and The Registry of Open Access Repositories (ROAR) respectively. Beside this quantitative weakness, these open repositories do not seem to implement a clear open access policy as most of them do restrict access to registered users with an account and a password which contravenes the most primary open access philosophy allowing access to scientific literature pending only an Internet connection. Additionally, previous studies have shown that the most basic open access concepts seem to be misconstrued by those in charge for a national open access policy. In consequence, this has impacted negatively on the performance of these open repositories and the ratio of its open access literature. It is suggested that bigger importance and means be given to the question by the people in charge. Cooperative projects such as *ISTeMAG* should be encouraged and should be the basis of a sound open access policy and allow these countries to attain the much coveted title of The Information Society.

Keywords: Open access, open repositories, Algeria, Morocco, Tunisia

1 Introduction

Open access has accomplished since its inception a great many developments that have made it one of the most talked subjects in the scientific literature. Having started in the developed world, it has achieved great strides and developments in a medium promising freer and more access to information. On the other hand, the developing countries lag far behind and have not, so far, taken advantage of this new manner of undertaking science. In light of all this, our study will try to answer the following question: What developments have

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Algeria, Morocco and Tunisia achieved in open access and more specifically in the “green road”, which is self archiving one’s publication in a freely accessible repository. This question is important to answer as access to information is becoming more and more important for developing countries struggling to overcome an incapacitating digital divide, in addition to economic hardship. Benromdane (2016) analyzed the open access repositories at the Arab level and concluded that these repositories have tended to multiply but the institutional policies are unknown and undeclared, and the volume of contributions remains quite feeble. At the Arab level, Gdoura (2009) investigated the practice and opinions of Arab researchers and publishers in Arab universities by means of a questionnaire sent to researchers from Tunisia, Oman, Morocco and United Arab Emirates, and a study of scientific publishers’ attitude towards open access. He concluded that the Arab academic publishers tend to accept open access principles while researchers hesitate to self-archive, being ignorant of the most basic concepts of the movement. In a comparative analysis between Algeria and Tunisia, Zeghmouri, Benromdane and Abdi (2008), have concluded that there is an acute ignorance of the most basic concepts by researchers, an almost complete lack of a national policy and a feeble technical backbone (Internet) all compounded by a weakness in publishing activity at the international level. At a national level, Hachani (2014) undertook to explore the state of art of open access in Algeria and came out with the conclusion that Algeria has not taken advantage of opportunities that were present. His study analyzed different programs and achievements such as Webreview and concluded that more needed to be done. On an African level, Hachani (2015) studied the ranking of African repositories in the Ranking World of Repositories (RWR) and compared them to those in The Directory of Open Access Repositories and Registry of Open Access Repository. The study was designed to help understand the discrepancy between the encouraging rankings of African repositories in the RWR and those held by the same repositories in DOAR and ROAR. The study concluded that the differences in rankings were due to the criteria used (more sophisticated in RWR using: Size, Visibility, Rich Files, Scholar) while DOAR and ROAR relied on data given by the institution ranked.

2 Research methodology

Based on all this and in regard to the importance open access has for the developing world, our goal is to study the situation of open repositories in DOAR and ROAR from the three countries making up the Maghreb (Algeria, Morocco and Tunisia), compare their standings, statistics and policies, and see what the three countries have in common, what they differ in, what are the impediments to a clear open access policy, and propose what could be done. We hope this would, modestly, demonstrate to different parties (researchers and management) the importance that open access, and more especially open archives, have in developing countries’ (and particularly Maghrebi countries’) economies. Open access allows countries to improve their research development capacities as information has become a more important asset than the natural resources they have been relying on. The situation in these countries being quite similar, we insist on the inescapability of cooperative programs that are up to now quite absent and the fact that these programs may not only mutualize resources but also launch and implement new ones.

3 Material and methods

Besides analyzing data pertaining to the three countries regarding their open repositories in both DOAR and ROAR through the open access ratio, numerical statistics, and their contents, the study will analyze the Internet situation in the country (bandwidth, penetration rate, number of Internet users, etc.). The UNESCO’s Global Open Access Portal (GOAP) will also be used as it represents an official reference pertaining to open access internationally. The two sites studied will be analyzed to see the different statistics the three countries hold. The whole set of data will be compared to see which country has achieved the bigger and more tangible advances in open access in general and in open repositories in particular.

3.1 The Global Open Access Portal (GOAP)

The Global Open Access Portal lists by regions (Africa, Arab States, Asia and the Pacific, Europe and North America and Latin America and the Caribbean) and inside each region the countries belonging to it. Algeria, Tunisia and Morocco are all listed both in Africa and in Arab States. The Portal contains the following sections for each country: Enabling environment, Potential barriers, Major projects/initiatives, Details of key organizations, Past and future open access related activities and List of publications. These six sections present the countries policies in open access and analyze the data.

3.1.1 Algeria

Though a recent development, open access is seen positively by different actors. There are 12 open access repositories and six open access journal in DOAJ. It seems that the government (in a very centralized system) is gearing toward making affordable access to Information and Communication Technology. But the Internet penetration rate is only 45.2 % which ranks it 09th in Africa. Among the major open access projects are Maghreb Virtual Science Library, Portail National de Signalement des Theses, Biblio Univ Algérie (Le Portail des Bibliothèques Universitaires Algériennes) and Webreview.

3.1.2 Morocco

The country seems to have embarked on an ambitious program to catch up and fight the digital divide. DOAJ lists nine titles and DOAR lists two open repositories. The Internet on the other hand has achieved a penetration rate of 57.3% which ranks it 4th in Africa. Key projects and initiatives are e-Omed project, Majaliss, Maghreb Virtual Science Library ,Toubk@l, Le Catalogue National des Thèses et Mémoires (The National Catalog of Theses and Dissertations) and Maroc Numéric 2013.

3.1.3 Tunisia

Despite being the smallest of the three Maghrebi countries, Tunisia has achieved substantial advances in open access. It is home to nine titles in DOAJ and two titles in AJOL (African Journal On Line) and one open repository. Despite a good Internet penetration rate of 50.5%, which ranks it in 6th position in Africa, and an advanced education system, Tunisian researchers still lack the awareness to fully take advantage of open access. Major projects are The Tunisian National Library, eBooks Project in Tunisia and The Maghreb Virtual Science Library. A number of open access related activities have been undertaken such as Study Day on Open Access JELA 2015, I.C.O.A. 2014 and 2106 (International Conference on Open Access), GrandIR: EIFL Workshop on Open Archives, Atelier sur les Archives Ouvertes and The Tunis Agenda for the Information Society.

It seems that the situation in the three countries is quite identical and could be summarized in a movement that is still in its first steps and there is a need to make its different actors more aware of its benefits. The only tangible difference seems to be the Internet penetration rate that is in Algeria's case quite low compared to the two other countries, especially since the country is – supposedly – better off financially compared to the two other countries.

3.2 The Internet

The importance of the Internet in open access is obvious. If open access philosophy is to give back authors and institutions control over their output, the Internet is the vehicle that sustains it. So much has been said about the Internet and the way it has changed our way of life, this study will focus on its development and its influence on scholarly communication in the three countries. We will take the site Internetworldstats as an example and basis for this work. The site is quite complete and gives statistics about the different continents and countries as shown below :

Table 1. World Internet usage and population statistics

World regions	Population (2017 est.)	Population % of World	Internet 31 March 2017	Penetration rate (% Pop.)	Growth 2000-2017	Users % table
Africa	1 246 504 865	16.6 %	353 121 578	27.7 %	7 557.2%	09.3%
Asia	4 148 177 672	55.2 %	1 873 856 654	45.2 %	1539.4 %	50.2 %
Europe	822 710 362	10.9 %	636 971 824	77.4 %	506.1 %	17.1 %
Latin America / Caribbean	647 604 645	08.6 %	385 919 382	59.6 %	2035.8 %	10.3 %
Middle East	250 327 574	03.3 %	141 931 765	56.7 %	4220.9 %	03.8 %
North America	363 224 006	04.8 %	320 068 243	88.1 %	196.1%	08.6 %
Ocacia/Australia	40 479 846	0.5 %	27 549 054	68.1 %	261.5 %	0.7 %
World Total	7 519 028 970	100 %	3 731 973 423	49.6 %	933.8 %	100 %

March 25th 2017 (www.internetworldstats.com)

Some of the general observations about this table are: the extreme imbalance in the distribution of Internet users, the big jump forward of the Internet that is progressively becoming more democratic and, last but not least, the significant growth in Internet use in Africa (more than 75 fold) and the Middle East (more than 42 fold) between 2000 and 2017. The penetration rate, on the other hand, shows a large disparity between Africa and North America, for example, where the latter has a penetration rate that is more than threefold that of Africa. We will see what the statistics for the three Maghrebi countries are.

3.2.1 Algeria

Despite its significant capacities, Algeria lags well behind in Internet statistics. The most important ratio is that of the penetration rate in which the country is 9th in Africa out of 57 African countries with 45.2%. The only seeming bright spot is the 371-fold increase (from 50 000 to 18 580 000) of the number of people having access to the Internet in during the 15 years between 2000 and 2015, a fact that makes the Internet in Algeria a rather booming business despite some shortcomings.

3.2.2 Morocco

Morocco fares much better in Internet statistics than Algeria. For example its penetration rate is 4th in Africa with 57.3%. Its growth is also quite impressive with a 202 folds (from 100 000 to 20 207 154) increase in a 15 year span (2000-2015).

3.2.3 Tunisia

Tunisia's penetration rate is also respectable with 50.5% which places it 6th in Africa. Its growth between 2000 and 2015 is much less impressive than that of Algeria or Morocco, with a 58-fold increase.

3.3 Bandwidth

If Internet statistics are important to demonstrate the increase in usage, bandwidth statistics are also very important because they show the speed at which information is conveyed from point A to point B or from B to A. Among the many sites that calculate bandwidth, testmy.net shows the average upload and download speeds for 235 countries. The Internet statistics for the three countries seem to confirm the numbers and data seen in the previous section, and more specifically penetration rate where both Morocco and Tunisia had better numbers compared to Algeria. Algeria's statistics are even more problematic regarding bandwidth. It is 1.3 Mbps for download and 784 Kbps for upload while Tunisia's are 4.4 Mbps for download and 2.2 Mbps for upload, and Morocco's are 7.3 Mbps for download and 1.1 Mbps for upload. These statistics put Algeria at the 179th rank out of 235 countries for download speed and at the 158th rank for upload speed. Tunisia is ranked 129th for download speed and 98th for upload speed, and Morocco is ranked 77th for download speed and 101st for upload speed. These numbers seem to confirm the better Internet condition of Tunisia and Morocco compared to Algeria in penetration rate or bandwidth. These seemingly illogical statistics (Algeria being richer due to its oil revenues) do have their origin in political and structural rather than technical or financial reasons because of the tendency the Algerian centralized system which tries to censor information. This could be explained by the fact that, although Algeria has seen the last twenty five years a notable democratization, it still is not a beacon of freedom and the authorities in charge tend control information which explains the dismal Internet statistics.

3.4 ROAR and DOAR: two reference sites for open repositories

If open access in its two variants (green and gold roads) has achieved great strides and has become a fact in the lives of researchers, open repositories or self archiving (green) seems to be the most affordable way to disseminate information for developing countries. In fact, the gold road, though more instantly rewarding, is subject to the availability of funds to publish especially in the medical and sciences fields. The A.P.C. (Author Paying Charges) scheme that allows research to be instantly available comes with a hefty price that could go as high as \$5000 for Elsevier or \$624 *per page* for Lancet (Hachani, 2016). That makes open repositories (the green road) more affordable and technically easier to implement than publishing in open access journals (the gold road). Chan, Kirsop and Arunachalam (2005) demonstrate that open repositories increase the world literature contribution of some countries. For example, countries with transitional economies such as Brazil, China, India and South Korea have seen their share of the world literature increase as a result of setting up open repositories. China's scientific publications rose from 69 000 to 115 000 articles from 1993 to 1997 and 1997 to 2001. Likewise, Brazil increased its share of the world's scientific publications from 0.84% to 1.21% in the same period. The number of papers from India rose from 17 501 in 2000 to 23 336 in 2004. Meanwhile, South Korea's share of global chemistry papers grew from 0.3% in 1982 to 1.4% in 1993 then to 2.4% in 2004. From a purely developing country point of view, Papin-Ramcharan and Dawe (2006) analyzed the problems encountered by The University of the West Indies (St. Augustine Campus in Trinidad and Tobago) specific to a small institution whose capacities are far from those of a developed country. They summarize the problems encountered by the researchers as: researchers' lack of awareness of open access publishing options and poor ICT infrastructure and Internet connectivity. These problems do hinder the benefits that a developing country's research institutions could get from open access. The Open Access Scholarly Sourcebook (OASIS) is a site that "..... aims to provide an authoritative 'sourcebook' on

Open Access, covering the concept, principles, advantages, approaches and means to achieve it. The site highlights developments and initiatives from around the world, with links to diverse additional resources and case studies.” (OASIS homepage) As such it is a source to understand the different developments open access is going through. In an article titled ” Open access and developing countries”, OASIS came to the following conclusions: “Institutional Repositories are highly appropriate for the support of research in developing countries. They: publicize an institute’s research strengths, provide maximum return on research investment; increase impact and usage of institute’s research, use free software and benefit from free technical support for installation and use; have low installation and maintenance costs; are quick to set up and gain benefits; provide usage statistics showing global interest and value of institutional research; are interoperable with all IRs, and form a global research facility.” Regarding set-up costs, one organization in India calculated that the set-up and running cost for a year amounted to \$6055, including the cost of a PC and a year’s management costs, while some other figures have indicated much less than that. In light of all of these data, it is of the utmost importance to see, from our own point of view, what is the situation regarding open repositories in the three countries making up The Maghreb. This will be done by examining the statistics of the three countries in the two reference sites that are DOAR and ROAR.

3.4.1 The Directory of Open Access Repositories (DOAR)

As of August 09th, 2017, The Directory of Open Access Repositories holds 3377 repositories, (increased from 128 on December 1st 2005). Of these 3,377 repositories, Europe (1533), Asia (680) and North America (607) make up over 83% of the total. If one adds South America (294), the imbalance is even bigger with a little over 92% of the repositories in these regions. On the other hand, Africa holds 150 repositories (4% of the world total) of which six countries : South Africa (33 repositories), Kenya (26), Nigeria (20), Algeria (13), Tanzania (11) and Zimbabwe (10) make up 75% of the African total which means there is also an intra-African imbalance between these six countries and the other countries (with a number of countries not even having a single repositories such as Burkina Faso, Mauritania, Chad, Gabon etc.).The three countries that are the subject of this research hold a total of 16 repositories (13 for Algeria, 2 for Morocco and 1 for Tunisia). These totals represent 11% of Africa’s total and Algeria represents 81% of the total of Maghrebi’s repositories. What do these statistics represents in terms of open access policies for the three countries? How do these data translate in the different domains of open access for the three countries? Is the seemingly superiority of Algeria in quantitative terms reflected in qualitative terms? We will try to answer some of these questions in what follows.

3.4.1.1 Algeria

There are 13 Algerian repositories in DOAR. They are:

3.4.1.1.1 Archives ouvertes de l’Université M’hamed Bougara Boumerdes

The site could be searched in two manners: Production scientifique (Scientific output) and Browsing (Communities and collections, Issue Date, Author, Title and Subject). Production scientifique includes the following sub-communities: conferences, monographs, end of studies projects, masters and PhD theses, scientific publications and journals. As of August 09th, 2017, 2017, the Archives held 3378 items generally made up of work from the university’s faculty and graduate students. Most of the work is not open access but some recent articles with high impact factor are open access. The subjects covered include Chemistry and Chemical Technology, Earth and Planetary Sciences, Ecology and Environment, Mathematics and Statistics, Technology General, Civil Engineering, Computers and IT, Mechanical Engineering and Materials, Language and Literature, Business and Economics. It does not seem that the site implements a clear open access policy as Open DOAR signals a total absence of an open access policy. The languages used on the site are Arabic, French and English.

3.4.1.1.2 Bibliothèque Centrale Université Hadj Lakhdar – Batna

The Open Archive of the University of Batna holds the work of the staff and students. As of August 09th, 2017, it held 1, 261 items. It is a multidisciplinary repository. It seems that the site does not implement a clear open access policy as Open DOAR signals a total absence of an open access policy. There is an “open archives” heading that lists different open archives nationally (among which the one at Batna, Boumerdes and Tlemcen) and internationally (HAL from France and Deutsche Digitale Bibliothek from Germany) and at the Maghrebi level with ISTeMAG Algérie. An interesting feature is the “biblio numerique” heading that leads to a number of open access sources: *Open Access to Scholarly Communication*, *Open Books Publishers*, *Sage Open*, *Springer Open* and *Wiley Open Access*. These references are supposed to be completely open access while only *Sage Open* and *Springer Open* do practice gold open access while *Open Books Publishers* charge an amount of money for access and *Wiley Open Access* practices A.P.C. (Article Processing Charge) *Open Access to Scholarly Communication* lists and explains open access links. An interesting feature under the heading “Publications” details the articles and books produced by the University staff. For books (of which there are 5 listed), they are mainly theses published by *Editions Universitaires Européennes* (a company known to contact academics just after their thesis defense to publish their thesis). The articles subheading is, on the other hand, more profuse: it spans the years 1990-1999 and then 2000-2017 for publications in foreign languages and 2004-2015 for publications in the Arabic language. The open access ratio of these publications is as follow: out of 149 publications in foreign languages, 14 are open access (09%) and out of 210 publications in the Arabic language, 8 are open access (04%) which gives us a feeble combined 06.5% under the “Publications” heading. Furthermore, the open access option is implemented with no clear policy from year to year.

3.4.1.1.3 Bibliothèque Virtuelle de l’Université d’Alger

It is the first and most endowed of the open repositories sites in Algeria. It is also the oldest as it was founded in 2002. It held as of August 09th, 2017, 12 513 items. Its homepage contains different sections among which the most important and related to open access are: Communities & Collections, Issue date, Author, Title and Subject. Beyond these sections that are very rich from the stand point of quantity (Browsing by issue date yields 12 103 items, by author 13 191 items, by Title 12 103 items and by subject 8 718 while Communities and Collections gives access to old theses, articles, abstracts, books, journals, theses in French language and theses in Arabic language), the site offers a wealth of items that are unique from the standpoint of quality. The Algiers University Library being one of the oldest in the Arab World contains some of the most valued and rare books that have been digitized and made fully accessible through the site. As an example, the 1936 digitized thesis of philosopher Albert Camus is open access and one could see even the handwritten corrections the author made to his work. The library holds even an incunabulum dating back to 1483 by Thascius Caecilius Cyprianus, its full title being *Divi Caecilii Cypriani viri Fanctiffimi et elo quetissimi epistolas exactiffime rocogoni tasivcasl*. The library offers on its site an opportunity to view these and other precious and unique items.

3.4.1.1.4 Bibliothèque Virtuelle des Energies Renouvelables - Centre de Développement des Energies Renouvelables

The Center for Development of Renewable Energies virtual library is a repository of some of the center’s scientific output. It held as of August 9th, 2017, 1 839 items. The most important and interesting feature is the collection that lists “The Journal of Renewable Energies”, “The Bulletin of Renewable Energies”, “Theses Collection”, “Publications and Conferences”, “Research Projects”, “Map Collection”, and “Scientific Journals”. These features give access to a respectable number of open access publications such as all 848 articles appearing in the center’s journal *The Journal of Renewable Energies*, and the entire 570 short contributions from the Center’s researchers in the Bulletin. The Theses Collection are works related to renewable energies defended in Algerian universities; there are 430 theses of which only 10 are open

access. Publications and Conferences present the conferences attended by the center's researchers (393) and articles published (217). None of these are open access. The map collection lists a number of maps made by researchers and the center's research laboratories. They relate to solar, geothermic and Aeolian deposit. They are all open access. The center does not seem to implement a clear open access policy, and although its own journal is open access, none of the conferences or articles published by the center's researcher is open access. In addition, the open access ratio for these is very feeble (2%).

3.4.1.1.5 Bouira University Digital Space

The site had 3 007 items as of August 9th 2017. Most of the open access material could be retrieved through the "New documents" button. The site gives access to a number of references in full text. One could also access the other material through the different communities (Law and Political Sciences, Human and Social Sciences, Life Sciences, etc.), "Publications of Bouira University" or "The UAMOB Digital Library". The latter seems to be the section that is most complete in terms of numbers and open access. Not only does it provide the latest documents but also statistics about authors, subjects and date of issue. The *Revue Maarif* is the university journal. It holds 178 articles all open access. *Lettre de l'Université de Bouira* is the university's internal bulletin; all 20 issues are open access. All together, the different sections present a good percentage of open access material although it is also quite irregular in its offer of open access material.

3.4.1.1.6 Center of Academic Publications University of Souk Ahras

The Center of Academic Publications University of Souk Ahras contains scientific materials (Theses, Journals, Book chapters and Conference papers) published by members of the University. There were 290 items as of August 9th, 2017. The number of open access publications seems to be higher than the non-open access publications especially in the "Recent publication" section. One could also search by year since the inception of the University (2000) or by type of documents (Journals, Conferences, Theses, Scientific Books and Book Chapters) where all 44 theses are open access. There is a journal titled *Journal Of Youth and Social Problems* that seems to be the University's. It started in 2013 and has issued 2 volumes and 2 issues. While the first issue in 2013 was open access, from 2014 all the issues presented only abstracts. The proceedings of the 1st National Conference on Health and Bio-Surveillance of Aquatic Ecosystems, organized by the University in 2014 are all open access. Despite these encouraging trends, it seems that open access option does not conform to predefined criteria and open access is simply implemented on a whim.

3.4.1.1.7 CERIST Digital Library

The Digital Library presents itself as the institutional repository of the CERIST (Research Center On Studies of the Scientific and Technical Information). It listed 733 items as of August 9th 2017. The site could be searched by Communities and collections, date of publication, authors, titles, key words and structures. These sections only offer open access to CERIST email holders (or through a service in which the user must answer a number of questions related to his or her institutional affiliation). The only accessible references are those in the "audiovisual output" and "related output" sections (respectively 7 and 22 references) which are a number of films, course materials and recorded conferences. The most important section "Academic and scientific output", which contains papers and articles presented and published in international and national conferences and journals, books and chapters of books, and graduate theses, which lists 722 references, is not open access. The wealth of these references not being open access makes CERIST DL a project that is far from answering the need of Algerian researchers, especially considering the importance and weight CERIST has in the Algerian IT scene.

3.4.1.1.8 CSC Digital Library Centre de Recherche Scientifique et Technique en Soudage et Contrôle - CSC

The Centre de Recherche en Technologies Industrielles' site (CRTI) formerly known as the Centre de Soudage et de Contrôle (CSC) is quite rich in content. It holds, as of August 9th, 2017 1 102 items. Beside the homepage and other features, the "Documentation and events" section details the center's researchers' scientific output. The section is divided in four main subsections which are: Thesis, End of study reports, Publications and Papers (a patent subsection lists the three patents the center's researchers have authored). These four main sections yield the following ratios of open access materials: In the Theses section, there are 123 PhD dissertations, of which only 13 are open access, which gives us a feeble 10.56%. The End of studies reports show, on the other hand, a much better ratio of 97.84% with only 3 end of study report non open access. Publications list the papers the center's researchers have authored; of 210 papers only 39 are open access which gives us a rather feeble 18.57%. The last subsection is Papers which lists the center's researchers output in conferences and scientific events. Out of the 842 papers presented at national and international conferences 423 (50.23%) are open access. The CRTI seems to have a rich scientific output but its various sections have a very uneven ratio of open access material. For example, the PhD dissertations are at a 10% ratio while the end of reports are at almost 98%. This imbalance is detrimental to a center that otherwise presents quite good open access percentages and a varied scientific production for a developing country.

3.4.1.1.9 Dspace CREAD

Dspace CREAD is The Research Center for Economy Implemented on Development institutional repository. It is quite recent and holds, as of August 9th, 2017, 285 items. The site could be searched by: communities, collections, publication date, authors, titles and subjects. Besides these traditional research outputs, the site offers also a wealth of open access publications:

- *Les Cahiers du CREAD* is the center's quarterly journal. It publishes articles pertaining to the center's mission. The issues offered are: n° 79 (2007) – n° 110 (2014). There are 158 articles, all open access.
- Theses: there are 6 theses, all open access.
- Books are sorted by author, subject and date issued. They do not seem to be books but rather book chapters. There are 61 sorted by issue date, author and title and 100 sorted by subject. They are all open access.
- Of Working Papers there is only one. It is open access.

Despite being of recent inception, the CREAD institutional repository presents a respectable number of items in open access. The CREAD is in Algeria a landmark academic institution, and offering its output openly for the scientific community could be considered a notable addition to the open access movement.

3.4.1.1.10 Dspace@UABT, Université Abou Bekr Belkaid Tlemcen

The Dspace @UABT repository lists 9082 items as of August 9th, 2017. The UABT's Dspace site could be searched through different sections but the most important one is "Communities and collections", which holds the output of the university's different departments.. Beside the Maghnia Annex section, "UABT's Research Articles" lists a respectable number of open access references. It could be searched by author, subject and date published. There are national and international articles and papers, and also patents. The following statistics are available: 605 international articles, 116 local articles, 1 patent, 181 international conference proceedings and 58 national conference proceedings. The 34 departments also offer open access to bachelors, masters and doctorate theses. This makes the Dspace @UABT repository the most open access by the number of sources it offers among the Algerian sites in DOAR. It should be noted that Dspace@ UABT is ranked 711th worldwide in the Ranking Web of Repositories (RWR) out of 2 197 the site ranks.

3.4.1.1.11 Université Hassiba Benbouali Chlef - Algérie Bibliothèque Centrale de L'Université Hassiba Benbouali

This repository holds 1 075 items as of August 9th, 2017. Its main heading are: conferences, seminars and colloquium, laboratories, courses, academic journals, PhDs and masters. It is generally made up of theses and research articles. It also lists the papers given at the 6th International Symposium on Building in Seismic Zones organized by the university (the area is known for its strong seismic activity). The research by the 17 departments yields a respectable number of theses (masters and doctorates), all open access. There are also 8 academic journals (connected to the university's faculties) offering full open access. It seems that the repository is quite new and not in full gear but the rate of open access material and its origin is encouraging.

3.4.1.1.12 University of Biskra repository University of Biskra, Algeria

The repository had 8905 items as of August 9th, 2017. The most important references are in the "Communities and collections" section. The repository lists papers given at international and national conferences and offers full text. There are also a number of academic journals (17) that offer open access to all their contents. Besides that, a number of conferences organized by the university and its laboratories are listed open access. The site lists also master's and doctorate theses from 23 departments in five faculties that are in most cases open access. The University of Biskra repository could be considered a good example of what an institutional repository in a developing country ought to be. It achieves open access both in quality and quantity of material.

3.4.1.1.13 University of Biskra Theses Repository

The repository had 2 535 items as of August 9th, 2017. It is a repository listing the entire master's and doctorate theses defended at the University of Biskra. The site could be searched by year, subject, division and author. Most of the references are open access and downloadable. The browse button displays in the number of theses by year, the subjects and their breakdown and also the author's name alphabetically (both in Arabic and Latin alphabet) followed by the number of occurrences. Far from being just an addition to the University of Biskra repository, the University of Biskra Theses Repository adds to the output of the institution by singling out very important material in an academic institution: its doctorate and master theses. In addition, the site is easy to search and well designed and relates only to the research undertaken at the University of Biskra.

3.4.1.2 Tunisia

There is only one open repository in Tunisia and that is the Université Virtuelle de Tunis' UVT e-doc (UVT e-doc). It holds as of August 9th, 2017, 724 items. The repository could be browsed by author (alphabetical in Latin script), year (from 2011 to 2016) and subject (articles, conferences, courses, training, books, seminars, technical reports and theses). All items are open access and freely downloadable. The site is rich with many documents when one browses it. Despite its small number of items, the UVT e-doc implements a clear practice of open access and showcases the academic output of the Université of Tunis and also of other Tunisian academic institutions.

3.4.1.3 Morocco

There are two open repositories in Morocco. They are Dépôt institutionnel de l'Université Hassan II Casablanca and Université Mohammed V Rabat The Institutional Repository.

3.4.1.3.1 Dépôt Institutionnel de l'Université Hassan II Casablanca

The site is powered by Dspace Version 1.4.1 which makes it very dynamic and user friendly. It holds as of August 9th 2017, 2220 items. The site could be browsed by Issue date, Author, Title and Subject. It could also be searched by Communities of Research and Teaching which are Schools and Faculties or Institutes. The homepage also presents a “Discover” button that lists Author, Subject and Date issued along with the number of items in each list. We were able to open and download a considerable number of scientific materials making Depot Institutionnel de l'Université Hassan II Casablanca a well-designed repository that offers many items in open access. Its different sections are well designed and rich.

3.4.1.3.2 Université Mohammed V Rabat The Institutional Repository

The Université Mohammed V Rabat The Institutional Repository site is of equal quality with the Depot Institutionnel de l'Université Hassan II Casablanca. It holds as of August 9th 2017, 3330 items. The two sites' design is quite similar and the repository seems to have a large number of items in open access. The homepage announces the repository's contents which are theses and research articles from the university's staff. This explains the high ratio of open access material in the repository. In addition, the browsing button gives the number of items in each section (date of publication 2 595 items, authors 2 751, titles 2 595 and subject 6 773) which is very helpful in performing research. Like the other Moroccan repository, the Université Mohammed V Rabat The Institutional Repository is a very well designed, rich repository. Its open access ratio is very high because it holds research originating from the Institution, which compels its researchers to deposit their scientific output in their institution's open repository.

The Maghrebi presence in DOAR could be considered quite feeble compared to the world standards as it represents a very weak ratio in terms of number of repositories. Algeria with 13 out of the 16 Maghrebi repositories, holds the most of the repositories although its different repositories do not seem (in a centralized public system) to implement a unified open access policy. There seems to be, among institutions' heads, a race to launch open repositories but with no clear or coordinated policy. This makes the numerical advantage held by Algeria quite disappointing in the Maghrebi context. Tunisia with one repository is not well ranked despite the fact that its lone repository implements a clear open access policy. Morocco on the other hand, with only two repositories is second to Algeria but its repositories are, by far, better designed, and implement a clear and frank open access policy. They should be taken as an example at the Arab and African level.

3.4.2 The Registry of Open Access Repositories (ROAR)

The Registry of Open Access Repositories is another reference open access directory. It listed as of August 9th, 2017 a total of 4 508 sites. Out of these repositories, 2 111 or 47% are held by 8 countries (United States of America 806, United Kingdom 258, Germany 244, Japan 227, Spain 178, Brazil 158, Poland 120 and India 120). The Arab world seems to lag behind as only Egypt (11 repositories), Saudi Arabia (9 repositories) and Algeria (8 repositories) seem to have embarked on a policy promoting open repositories. The African continent is also far behind as only South Africa (49 repositories), Kenya (19), Nigeria (16) and Egypt (11) have somewhat encouraging statistics. The same picture emerges as with DOAR for Maghrebi repositories but with Algeria (8 repositories) less dominant compared to DOAR and with Morocco (3 repositories) and Tunisia (2 repositories) having better statistics. One notices, for all practical purposes, that the repositories the three countries have in DOAR are in ROAR with slight differences for each country.

3.4.2.1 Algeria


There are 8 Algerian repositories listed in ROAR which are: Bouira University Digital Space, Theses et Memoires Université de Biskra, Dspace Université de Biskra, CERIST DL, DSpace@UABT:Accueil University

of Tlemcen, Archives Ouvertes de l'Université M'hamed Bougara-Boumerdes and Depot Numerique de l'Universite d'Alger. These sites are also listed in DOAR, along with five others that are absent from ROAR. As seen before, and said in many different occasions (Hachani 2013, 2014, GOAP), open access in Algeria suffers from a lack of awareness on the part of the people in charge, who seem to misconstrue the basic principles of open access, and also the total absence of a clear national policy regarding open access. As an example for this, a thesis defended in a public university (Université des Sciences et Technologies Houari Boumediene) in 2015 is not open access nor available in paper until 2020 because its author has not deemed it appropriate to make it available for the scientific community. This kind of behavior is reflected in the results open access has achieved in a country that could boast solid human and financial health but unfortunately not fully exploited.

3.4.2.2 Morocco

There are three Moroccan open repositories in ROAR. They are Depot institutionnel de l'Université Hassan II Casablanca, Université Mohammed V Rabat the Institutional Repository and Rissalaty. The two former are also listed in DOAR and could be considered as a good example of open access repositories because of the high ratio of open access they have.

3.4.2.2.1 Rissalaty

Rissalaty is an open repository that gives access to the doctoral theses (in Medicine, Pharmacy and Dental Medicine) defended at the Université Hassan II - Casablanca. There are two kind of access: one for the researchers that have signed an authorization to have their thesis online and a second that allows only members of Université Hassan II - Casablanca through their "Digital Work Space". The site lists the 15 communities that the university encompasses. One notices that out of 3 630 theses, 3 030 are from the faculties of Medicine and Pharmacy (2 416) and Dental Medicine (617) which makes it a preponderantly medical university. The rest are theses from other faculties (Faculty of Social and Human Sciences, Faculty of Law and Economics, Faculty of Sciences and Ecole Nationale Supérieure d'Electricité et Mécanique). There are a number of other faculties that do not have any open access theses listed. The site could also be searched by Communities and collections (3 630), defense date (3 528), authors (3 519), titles (3 528) and subjects (7 854). It does not seem that the site implements a clear policy of open access as some theses are fully available, some have only the title page and table of contents available and some are not available at all; these are identified by the sign  (a white padlock on a blue background) and the request for an email and a password. We tried to send an email but the address listed was invalid.

3.4.3 Tunisia

There are two Tunisian open repositories in ROAR. They are Université Virtuelle de Tunis' UVT e-doc and OceanDocs: Institut National des Sciences et Technologies de la Mer. The first one is already in DOAR and the second only in ROAR.

3.4.3.1 OceanDocs: Institut National des Sciences et Technologies de la Mer

The Ocean Docs: Repository of Ocean Publications is a very rich repository that houses a great number of open access materials. "It is supported by the Intergovernmental Oceanographic Commission (IOC) to collect, preserve and facilitates discovery and access to all research output from members of the ocean research and observation community and specifically their Ocean Data and Information Networks (ODINS)." (OceanDocs homepage). It is divided up into a number of communities and collections: HOSTING External partners of IOC/IODE, International Coastal Atlas Network, ICG/IOTWS-Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System, International Oceanographic Data

and Information Exchange, OceanDocs Steering Group, Region - Africa, Region - Central and Eastern Europe, Region - Latin America, Region - Western Pacific and Repositories – OceanDocs Network. These different collections contain a great number of open access documents. The site contains material that could be browsed by publication date (7 046 items), authors (9 496 items), titles (7 046 items) and subjects (6 063 items). It seems that the entire site is open access as most of the documents have a PDF logo allowing readers to download the document.

The ROAR site lists the same institutions for Algeria as DOAR, but for Morocco and Tunisia two institutions that are not in DOAR: Rissalaty and OceanDocs: Institut National des Sciences et Technologies de la Mer. While Rissalaty does not offer a high ratio of open access documents and restricts access to some documents to registered readers, OceanDocs gives access to the whole site (as far we have been able to see) and allows download of its documents. This may be because the site is sponsored by an international organization working of marine and oceans sciences but the fact is the site offers full open access to all its documents and represents a good example of what could be achieved with open access from a developing countries perspective.

4 Results

The comparative analysis of the open repositories the three Maghrebi countries hold in both DOAR and ROAR yields interesting results. It shows the similarity between the three countries with some differences. The similarity lies in the weakness and simply the ignorance of the concepts of the open access movement as the GOAP and studies (Hachani 2014) have demonstrated. The differences could be summarized in the Internet statistics (penetration rate and bandwidth) that are much better for Tunisia and Morocco compared to those of Algeria. The directory sites DOAR and ROAR show a clear quantitative dominance of Algeria in availability of open access resources with 13 (DOAR) and 08 (ROAR) repositories while Morocco has respectively two and three, and Tunisia one and two. This quantitative domination of Algeria does not indicate qualitatively better sites or better access to information. As an example, Tunisia, which quantitatively is the last of the three countries, has the best site in terms of access and that is OceanDocs: Institut National des Sciences et Technologies de la Mer which is fully open access and has a wealth of items numbering in the thousands. This site, supported by the Intergovernmental Oceanographic Commission, practices an open access policy that allows marine researchers access to information without any impediment. Conversely, Rissalaty, a site for theses defended at the Université Hassan II – Casablanca, practices a limited open access policy. This limits its impact on the Moroccan, Maghrebi and Arab scene as open repositories are supposed to be accessible to anybody with an Internet connection especially that Rissalaty (which means *my thesis* in Arabic) is a site for thesis.

It seems, as previously stated (Hachani 2014, 2016), that open access is neither well understood nor valued by developing countries. Despite the obvious benefits and advantages of open access, there seems to be a disregard and a neglect for a medium that is, from our own point of view, not only necessary but also unavoidable for the economic advancement of developing countries. Open repositories have been proven to be easier to manage and implement than electronic journals for developing countries. This study of three countries demonstrates that open access and open repositories in particular are not taken seriously as an option for development in the Maghreb. As an example for this discrepancy, a site like Rissalaty which lists theses does not implement a frank open access policy and allows access only to authorized users. This is unfortunate because thesis and research output from a University belong to the institution and *should be mandated* to be open access as the institution has financed the research. It has been proven (Gargouri, Harnad and Larivière 2013) that, when a clear institutional mandate is imposed as in the case of The University of Minho in 2004 and 2011, the rate of deposit is higher and deposit delays decrease. This experience shows the success an imposed mandate deposit policy yields on open access ratio

5 Conclusion

Open access has achieved, in its short life spanning the last decade of the 20th century and the fifteen years of this century, a great number of advances that have changed the way science is published and even performed. The Internet has made information available and affordable at the click of a computer mouse. The first developments were initiated in the West but progressively the whole world has become dependent on the Internet for information. The developing world has also jumped on the bandwagon but the results are, so far, not encouraging. This is due mainly to an acute economic hardship as compared to the developed world, but one also has to recognize the responsibility of these countries to implement open access and especially open repositories. There seems to be an ignorance of the movement and its benefits by those who are supposed to know, ignorance that has led to the statistics indicated in this study. Furthermore, there does not seem to be cooperation between the three countries as each one implements open access in its own way. The only cooperative project, ISTE_{MAG}, does not seem to have an updated Internet site. This is the kind of cooperative project that the Maghrebi countries should implement and, more than that, follow up. It is only in this manner that the benefits of open access could be attained. Again, let's bear in mind the following “...*Many developing countries remain poor largely because they let the Industrial Revolution pass them by. They can ill afford to miss the Information Technology Revolution.*” (Swaminathan cited by Palamakumbura 2008). It is only by shifting attention to more vital criteria such as promoting access to information, implementing a clear and mandatory national open access policy, lowering the cost of and democratizing Internet access, privatizing the Internet providers and the telecommunication sector, etc., that developing countries could hope for a better life and empowerment of an information revolution that is taking place.

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