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DIGITAL INSTITUTIONAL REPOSITORIES AND THE OPEN ACCESS AS A TOOL FOR ACADEMIC CONTENT DIFFUSION

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— Abstract—

The purpose of this article is to analyze the current situation of digital institutional repositories in countries such as Spain, Costa Rica, the United States and Mexico, as well as the recommendations made by initiatives as Budapest, Bethesda, Berlin or Alhambra to contribute to the open access, keeping in mind the General Guidelines for the National Repository and Institutional Repositories published by the National Council of Science and Technology in Mexico (Conacyt) in 2014, which is part of the new federal government's strategy to meet the demands of having a means of consultation of the products generated in research centers, universities and public institutions financed with public resources. In addition, the results of a study that indicate the growth, development, benefits and importance of institutional digital repositories are presented, as well as the challenges that imply their implementation.

Keywords

Repositories, open access, Conacyt, Ranking web.

The diffusion of science and culture is a complex task. It involves large conceptual and linguistic dimensions. In this research project an analysis is made of the digital repositories' growth and development within higher education institutions.

After the development of ARPANET in 1969, a technological revolution began for the exchange of data between computer equipment without geographical limitations. This technological advance allowed to create what is now known as the internet.

The scientific publication in electronic media is achieved thanks to the development of ArXiv in 1991 by Ginsparg, who began to make use of information technologies and took advantage of this tool. Consequently publications in digital media have created the need for licenses that protect copyright, limit total or partial access to the results of research published by scientists, academics, technologists, students, teachers, etc., creating barriers that hinder its dissemination.

Publications in electronic media have increased considerably due to the exponential growth of Information and Communication Technologies (ICT). We now live in a time of constant changes in society's lifestyle, which in an accelerated way introduces new generations to the excessive use of electronic and/or mobile devices. For the purposes of this research we will focus on mobile devices such as the Smartphone, Tablet and Laptop.

According to Zambrano (2009), ICTs are: multiple technological tools dedicated to storing, processing and transmitting information, making it manifest in its three known forms: text, images and audio.

The purpose of publication and storage is to publicize the results of the research carried out and make them available to everyone, as well as all the academic materials that are generated by higher education institutions.

Given the growing mass production of information that is stored on the network, the task of recovering the desired information, applying filters, debugging content becomes complex and if it were not for the same tools that have been developed in parallel to the internet, it would be impossible!

Therefore to spread science you need a medium available all the time and for everyone, one which they can access without restriction. When we talk about open access, it means that it does not need a subscription, free, without requiring a license, user or password. With open access the availability of

these materials is guaranteed to everyone who has an electronic device with internet access. (Cetto, 2015)

The purpose of this research is to analyze, through a qualitative approach, the social impact of an open access digital repository, as a tool for the dissemination of academic and research content, making use of new technologies for the exchange of information over the Internet through mobile devices. As a result of this research, the state of art in Mexico's institutional repositories is described from the repository world web ranking, the criteria that are considered to belong to this ranking are explained, as well as the policies used by other repositories. This allows having a reference and knowing the benefits of having a repository developed under standards and taking into account international recommendations and especially incorporating new technologies for mobile devices.

METHODOLOGY

The present research is a qualitative documentary type in which an exploratory descriptive research is carried out, in order to unveil everything that until now other national and foreign universities have achieved through the implementation of the institutional repositories and the benefits to contribute to the open access initiative.

Non-probabilistic sampling was used intentionally or for convenience to a group of experts related to the dissemination, disclosure and creation of academic and research materials, a questionnaire was applied and the results were obtained from the Autonomous University of Chiapas, University of Sciences and Arts of Chiapas and the National Autonomous University of Mexico. In addition, a documentary study was carried out to learn about the advances that the University of Costa Rica and the University of Salamanca have achieved in terms of repositories.

The sample was integrated by teachers, researchers, administrators and directors of universities and research centers, with a total of 32 questionnaires. It is worth mentioning that the questionnaire was applied in digital and printed format. Finally, a series of recommendations is proposed for the development of an open access digital institutional repository.

DIGITAL INSTITUTIONAL REPOSITORIES

The production of academic and scientific materials from universities has been increasing and accelerating as ICTs allow access to a greater number of in-

formation sources. In addition, universities establish within their organic laws or academic projects to promote and boost academic productivity to meet the needs that society demands. When a large quantity of digital materials is generated in a wide variety of formats such as text, images, audio and video, a place to deposit them is required to preserve them and then consult them.

In general terms, a repository is a place or space where certain things are stored. According to Bongiovani (2010) a repository is, "a collection of digital objects based on the web, on material... produced by members of an institution (or several) with a defined policy...", the Mexican Network of Repositories takes up the definition given by Ernest Abadal in 2012 and mentions that a repository is: "a website that collects, preserves and disseminates the academic production of an institution, allows access to the digital objects it contains and its metadata".

On the other hand Bustos and Fernández (2009) mention that an institutional repository is, "an electronic file of an institution's scientific production, stored in a digital format, in which the search and retrieval is allowed for later national or international use.

Lynch (2003) cited in Melero (2008) refers to university institutional repositories as the "set of services offered by the University to the members of its community for the direction and distribution of digital materials created by the institution and its members. An organizational commitment to the administration of these materials is essential, including long-term preservation when necessary, as well as the organization and access or their distribution".

Finally, the Law on Science and Technology in its article 4, section XII, establishes that a repository is "the centralized digital platform that, following international standards, stores, maintains and preserves scientific, technological and innovation information, which is derived from research, educational and academic products." (DOF, 2014)

There is a variety of repositories according to their content or entity in charge of their development, implementation and maintenance. The criterion most used to distinguish repositories takes into consideration the main objective for which it was created. Abadal (2012), Redalyc and UAMex (2013) mention that there are two types of repositories:

- Institutional: Contain information of the members of an institution, be it a university or a research center. They have a multidisci-

plinary nature. Sometimes they focus exclusively on scientific content (journal articles, theses, congresses, etc.) but there are also examples of inclusion of teaching material, administrative documentation, heritage collections, etc.

- Thematic: Its contents are specialized in a specific scientific field. The creators can be academic institutions, public bodies and non-profit organizations.

Digital or virtual libraries have boomed in recent years and are an option to classify and organize materials that will later be made available to university students and the general public. However, prolific production requires platforms or more dynamic means to retrieve information without requiring prior knowledge on the cataloging of content as traditionally handled in a library.

Therefore, the purpose of an institutional digital repository is to recover all that material created by the university community and to house it in a single place where it can be made public, available all the time without limitation of the geographical area or access accounts. To achieve this, policies are required to regulate the production, distribution and preservation of said materials.

GENERAL STATUS OF DIGITAL REPOSITORIES IN THE WORLD

Digital repositories in Latin-America

The Latin American Council of Social Sciences (CLACSO) is an international non-governmental institution, created in 1967 that maintains formal relations of consultation with UNESCO. Its objectives are the promotion and development of research and teaching of the Social Sciences; the strengthening of exchange and cooperation between institutions and researchers within and outside the region; the proper dissemination of knowledge produced by social scientists among social forces and movements and civil society organizations.

The documentary repositories in Latin America and the main directories that gather the information of the existing data providers, where the same institutions have registered themselves, are the following:

- Directory of open access repositories OpenDOAR
- Registry of open access repositories ROAR
- The list of data providers of the open archives initiative
- Installed DSpace Instance Directories
- OAISTER's list of repositories

- List of Repositories of the ScientificCommons search engine
- List of ARC repositories
- OAI-PMH's registry data providers of the University of Illinois

The Sedes Sapientiae Catholic University (UCSS) of Lima Peru has developed a digital institutional repository under the concept of being "the technological platform that gathers, preserves, allows access and disseminates digital documents of the entire university community." (UCSS, 2016)

Its objectives are:

- Centralize the digital documents of the University
- Disseminate the research carried out by students, teachers and members of UCSS
- Organize the digital documents of impact on the research and culture of the University
- Facilitate the participation of the University in information exchange initiatives, worldwide
- Allow the obtaining of statistics of the digital documents, which will contribute in the analysis of the scientific and cultural production of the UCSS
- To be a means of verification of research for national and international regulatory bodies

The repository of the UCSS contemplates within its policies that the thesis files must be delivered in editable Word and PDF format. These must contain the title of the thesis and the author's name. In addition to that the disc should include the executive summary written by the author. (UCSS Policies, 2016)

Additionally, it establishes that when submitting the materials, a format must be filled out indicating the type of access that will be granted to the materials.

- Public: The authors authorize, at once, for the material to be consulted and published in the Digital Repository or other media, all research work to full text.
- Restricted: The authors authorize that only the metadata be shown, but not the full-text PDF file.

On the protection of Copyright, the Library (in charge of managing the contents) according to the current legislation of the UCSS, to make the dissemination of research content free access to information will be provided by electronic means, prior agreement and base on a commitment letter that the

library gives to undergraduate and graduate students, where the authorship of the materials is specified and the rights of the students are protected.

To remove any content from the repository of the UCSS, it is established that it can only be done under the following conditions:

- When accusations of defamation, plagiarism or violation of third party rights occur
- If it is that said work is going to be edited or published as a book
- The author is going to patent such work
- Other reasons that merit withdrawal

The University of Costa Rica also has an open access repository available to the general public: The Institutional Repository of the University of Costa Rica *Kérwá*. It was implemented since July 2010 to store, disseminate and preserve the scientific and academic production of the University of Costa Rica. "The name of the repository is inspired by the analogy between the body of institutional knowledge and *kérwá*, a cultural concept of the cabécar to name the set of stones that the *jawá* (indigenous doctor) uses in ceremonies to find answers to his questions." (Repository Kérwá, 2016)

According to the University of Costa Rica, the Kérwá Institutional Repository is "a digital archive that stores, disseminates and preserves the scientific and academic production of the University of Costa Rica (UCR). It offers open access to books, technical and working documents, articles, theses, audio and video records, research reports, among others. This repository began operating in mid-2010 and was declared an Institutional Repository in 2013." (Repositorio Kérwá, 2016)

Its objectives are:

- Offer free and full text access to the research products generated at the University of Costa Rica
- Encourage self-deposit of scientific and academic production of the University to share it with other academics and users in general
- Provide the authors of the University with an online tool to give visibility to their work

In addition, its Data Policy contemplates that:

- Kérwá is an open access repository. Anyone can download the documents for free and without registration.

- The documents deposited here can be downloaded, copied, reproduced and delivered to third parties provided it is for educational or research purposes.
- Some of the documents in this repository have different distribution licenses and permits. Please, carefully check the details of the license.
- Commercial use of any of the documents is not allowed, unless it is specified in its license. If you want to make different use than allowed by the license, please contact the owner of the property rights.
- If you wish to use the documents in the Kérwá you should always indicate the name of the author and the title of the work, as well as the other bibliographic data required for the elaboration of the references. In addition, it must include a link to the original document and guarantee the integrity of the work.
- This is an auto-deposit repository and does not count as a publisher, it works only as an online file.
- The mention of the Kérwá Repository is appreciated, but it is not mandatory.

Content policy:

- Kérwá is the Institutional Repository of the University of Costa Rica and accepts a wide variety of documents as long as they are products of academic or research activities. These can have different versions: work drafts, revision versions (of a document that was sent to peer review journals), accepted versions (the author's final version with the peer-review), and published versions (files created by the editor or final layout).
- Each document is described individually with its publication status.
- The main languages of this repository are: Spanish, English, Portuguese and French. Documents in other languages are also accepted

Digital repositories in North America

In recent years, global projects have been carried out based on the digitalization of academic and scientific contents in different formats, for their preservation, storage and dissemination in information systems. These initiatives come from content management systems, from software development proposals based on information retrieval in the network.

For example, the World Digital Library (WDL), headquartered in Washington, DC, has approximately 15004 articles from 193 countries. The WDL, "makes

available on the Internet, free of charge and in multilingual format, significant primary materials from all countries and cultures." (WDL, 2016)

Its objectives are:

- Promote international and intercultural understanding;
- Expand the amount and variety of cultural content on the Internet;
- Provide resources to educators, scholars and the general public;
- Build capacity in partner institutions to narrow the digital divide within and between countries.

About Copyright and Collections states that: "Content found on the WDL website is contributed by WDL partners. Copyright questions about partner content should be directed to that partner. When publishing or otherwise distributing materials found in a WDL partner's collections, the researcher has the obligation to determine and satisfy domestic and international copyright law or other use restrictions."(BDM, 2016)

Digital repositories in Spain

The European Library, "is a digital library that houses the contents of 48 European libraries. Various materials such as books, posters, maps, sounds, videos available in 35 different languages to open the universe of knowledge, information and cultures of the different states of the European Union. This library is the embryo of the European digital library: Europeana. This initiative of the European Commission covers not only libraries but also museums, archives and other holders of material cultural heritage." (Universia, 2015)

In Spain, the only existing policies are those of the recent calls for projects of the Community of Madrid, those of the CSIC and those of the Madrilenian Universities Carlos III and Rey Carlos I. (Abad, 2009)

Some Spanish institutions have joined the *Open Access* initiative by developing institutional policies that recommend or require, where appropriate, the deposit of the scientific material produced by the members of the institution in the institutional repository. Abad (2009) mentions that they often refer to the need for documents produced by an institution, or the result of projects financed by certain calls, to be open and available for universal access and use. To do this, authors can choose one of the two existing ways to put this into practice: Open access journals or repositories. Such is the case of:

- The University of Liège (University of Liege (*Université de Liège Institutional Mandate*)
- Polytechnic University of Catalonia

OPEN ACCESS

Open Access is a change of model in the functioning of scientific communication that, at this moment, is not free. Since licenses have to be paid for the use and, in addition, most of the contents are under rights or licenses of use. However, open access is a paradigm shift, a revolution that wants to change the science communication system from head to toe.

Open Access (OA) is a movement that was unveiled just over 10 years ago, with the signing of the first declaration in Budapest (2002), followed by that of Bethesda (2003) and Berlin (2003). The emergence of this movement in Europe and North America is mainly due to the increase in the cost of research journals (Cetto, 2015)

Peter Suber (2006), one of the main theorists on open access, mentions that the "Open-access literature is digital, online, free of charge, and free of most copyright and licensing restrictions". Mentions the two main characteristics or conditions so that the contents are open access: they must be free of charge and free of restrictions for their exploitation, that is, that users in general can copy, print, modify, distribute, etc., as long as mention is made of the author and source.

The Law of Science and Technology in Mexico in article 65 mentions that:

> *Open Access means access through a digital platform and without subscription, registration or payment requirements, to research, educational, academic, scientific, technological and innovation materials, financed with public resources or that have used public infrastructure in its realization, without prejudice to the provisions on patents, protection of intellectual or industrial property, national security and copyright, among others, as well as information that, by reason of its nature or the author's decision, is confidential or reserved*

There are 4 historical statements that contributed to the creation of national policies on Open Access:

Table 1. Statements that contribute to Open Access.

Statements	Description
Budapest (2002)	Scientists and academics interested in publishing and increasing the visibility of their research results, opt for the use of new technologies, specifically the use of the internet. It includes the electronic distribution reviewed by pairs without restrictions. Newspaper publication.
Bethesda (2003)	The objective was to agree on significant steps and to support scientific research, scientists who generate research results, editors who facilitate peer review and the distribution of research results. The author (s) will grant free and irrevocable right to copy, use, retransmit and make derivative works giving recognition to the author. The full version should be deposited in at least one repository.
Berlín (2003)	The mission of disseminating knowledge is incomplete if the information is not made available to society in an expeditious and comprehensive manner. Future web must be sustainable, interactive and transparent. The content and software tools must be freely accessible and compatible.
Alhambra (2010)	The idea of having a design of alternative and sustainable editorial models is proposed, with which a study on the current models to document the practices and economies in the academic publication will be initiated in order to support future plans and actions. Fulfil with international guidelines and standards to increase editorial quality and eliminate embargo policies. Regarding the repositories, the importance of advancing in the validation and certification of the repositories was emphasized, defining clear policies (author rights, preservation, work flows, what is deposited and by whom) and improving interoperability.

Source: Own elaboration based on data from the Budapest, Bethesda, Berlin and Alhambra declarations.

The previous table shows the importance of repositories and the need to have a tool where free academic content can be stored and distributed free of restriction and how electronic publications have to make use of new technologies to expand their horizons and achieve greater dissemination of knowledge based on international standards, editorial policies that guarantee the quality of the stored contents.

OPEN ACCESS POLICIES

Many countries and institutions that have taken the initiative of open access are implementing measures that contribute to the dissemination of knowledge, to eliminate obstacles that prevent their access to materials made with public resources and create guidelines that allow their development.

Alma Swan (2013) assures that the development of a policy is of crucial importance for the progress of open access, and having a structured process is the best way to ensure the impact of a good policy.

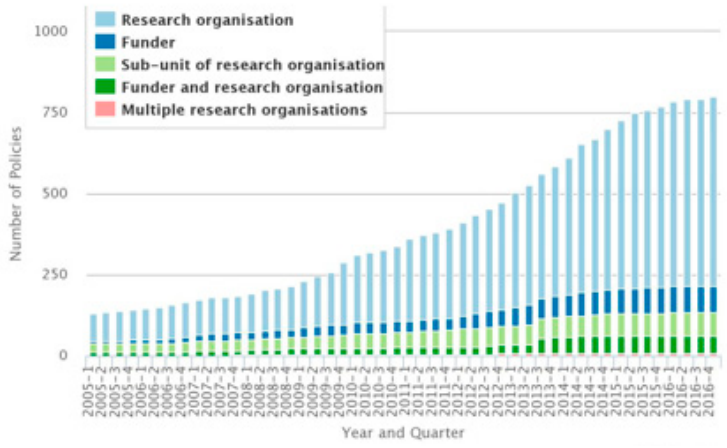
In total, there are 796 Open Access policies adopted by institutions that are in force, which are distributed as follows:

Table 2. Distribution of Open Access policies.

Researching financiers		81
Research organizations		54
Multiple organizations that conduct research		9
Higher education institutions		581
Faculties or research centers		71
	Total	796

Source: Own elaboration based on ROARMAP 2016 data

Image 1. Mandatory Open Access policies growth by quarter



Source: ROARMAP, 2016

Open Access policies are essential for the proper functioning of Open Access on both the green and golden roads. Higher education institutions

must be very specific and design policies that adapt to their needs, which allow the production and dissemination of their academic productivity. Image 1 shows the growth that these policies have had in recent years.

The Institutional Policies oblige the authors to use the institutional repositories as storages. This not only allows them to benefit, but the institution is the one who stores and preserves the contents, makes available to the entire community all the materials to be consulted without any restriction. In terms of research management, the repository is a valuable tool. (Swan, 2013).

In Mexico only 3 institutions have adopted mandatory use policies for open access in 2013 as can be seen in image 2. The institutions registered with these policies are:

1. Autonomous University of Nuevo Leon
2. Autonomous University of the State of Mexico
3. Electoral Court of the Federal Judiciary

Image 2. Mandatory use policies adopted in Mexico

Source: ROARMAP, 2016

REPOSITORIES WEB RANKING

In the present work, we obtained data from the Repository Web Ranking, with the purpose of analyzing the growth of public and private institutional repositories throughout the world. The Ranking of Repositories operates

under 4 parameters (metrics or impact factors)[1] to globally determine the location of each repository in its list.

1. Size: 10% of points are awarded to repositories that intend to provide full-text documents, bibliographic records or summaries. Mainly those that are within the *Open Access* initiative.
2. Visibility: 50% of points are awarded based on a virtual "referendum" where the opinion on the repository's content is extrapolated from external links or citations. The methodology from which this data is obtained is being adjusted, considering that many of the data sources have been or can be altered or modified to obtain a better qualification.
3. *Files Rich*: With the development of web 2.0 and technological innovations, the growing number of social platforms, the diversity of electronic devices that can connect to the Internet, the Web Ranking has considered the use of tools such as Academia, Bibsonomy, CiteUlike, CrossRef, Datadryad, Facebook, Figshare, Google+, GitHub, Instagram, LinkedIn, Pinterest, Reddit, RenRen, ResearchGate, Scribd, SlideShare, Tumblr, Twitter, Vimeo, VKontakte, Weibo, Wikipedia (all languages), Wikipedia English, Wikia, Wikimedia , YouTube and Zenodo, to grant a 10% of points needed to qualify and be within the Ranking of Repositories. Considering that repositories are repositories for archiving documents, the aforementioned platforms are needed to promote and improve the dissemination of contents in a universal and visible way thanks to web 2.0.
4. *Scholar*: 30% of the remaining points are obtained from a collaboration with Google Scholar, where repository indexed data are collected that determine the quality in the way of presenting the contents, whether in full text (preferably) or in parties (usually generate empty records and a large number of independent documents that make it difficult to recover the entire document).

1 Repositories web metrics. 2017 first edition (January data). http://repositories.webometrics.info/en/node/29 Retrieved on February 7, 2017

Table 3. Top global repositories by institution

World Rank	Portal	Country	Tamaño	Visibilidad	Files Rich	scholar
1	(1) Smithsonian/NASA Astrophysics Data System		1	1	1	1
2	NASA Technical Reports Server		126	5	2	2
3	University of California eScholarship Repository		296	2	3	9
4	CERN Document Server		2	13	6	7
5	MIT Institutional Repository		108	3	5	36
6	University of Nebraska Lincoln DigitalCommons		421	7	4	17
7	HAL Sciences de l'Homme et de la Société		89	8	14	32
8	Universidade de São Paulo Biblioteca Digital de Teses e Dissertações		111	10	30	8
9	University of Michigan Deep Blue		136	9	7	83
10	Universiteit van Amsterdam Digital Academic Repository		118	30	17	3
11	HAL Institut National de Recherche en Informatique et en Automatique Archive Ouverte		58	11	13	40
12	University of Queensland UQ eSpace		72	15	10	25
13	Universitat Autònoma de Barcelona Dipòsit Digital de Documents		41	34	24	4
14	Queensland University of Technology Institutional Repository		200	14	9	56
15	Virginia Tech University Digital Library and Archives		670	4	8	347
16	Digital CSIC		79	26	28	25
17	University of North Texas Digital Library		24	18	12	103
18	UPCommons Universitat Politécnica de Catalunya		12	36	29	19
19	Lund University Publications		40	45	36	5
20	University of Southampton Institutional Repository		18	22	22	79
21	Purdue University DigitalCommons		647	21	15	33
22	University of Illinois at Urbana Champaign Ideals		32	37	26	29
23	Repositório Digital Universidade Federal do Rio Grande do Sul LUME		8	61	51	11
24	University of Helsinki HELDA		410	20	32	52
25	University of Pennsylvania ScholarlyCommons		791	16	18	80

Source: Repositories Ranking Web, July 2016

In Table 3: It can be seen that at a global level, two NASA repositories occupy the first and second positions, followed by the University of California repository, which started operations in 2002 and manages an *Open Access* policy. It contains around 124,283 publications and has indexed 90 journals with a total of 34,924,221 visits from 2002 to February 07, 2017.

Table 4. Top institutional repositories in Mexico

ranking	World Rank	Instituto	Tamaño	Visibilidad	Files Rich	scholar
1	561	Repositorio Institucional de la Universidad Veracruzana	356	523	349	1114
2	568	Repositorio Digital Institucional Instituto Politécnico Nacional	486	819	521	348
3	651	Repositorio Academico Digital Universidad Autónoma de Nuevo León	945	944	703	258
4	833	Repositorio Institucional Universidad Autónoma del Estado de México	658	1131	636	595
5	866	Tesis Institucionales Instituto Politécnico Nacional	799	928	596	1140
6	1157	Universidad Autónoma de Querétaro Repositorio Institucional	1218	1479	1158	646
7	1473	ITESO CONACYT Documentacion en Ciencias de la Comunicacion	1649	1323	830	1803
8	1527	Repositorio Institucional Universidad Autónoma del Estado de Hidalgo	799	1765	1265	1186
9	1649	RAD Repositorio Institucional Red de Acervos Digitales UNAM	1344	1227	860	1988
10	1698	Nínive Repositorio Institucional de la Universidad Autónoma de San Luis Potosí	1480	1879	1281	1120
11	1851	Universidad Autónoma Metropolitana Unidad Iztapalapa. Tesis Electrónicas TESIUAMI	2205	1489	914	1955
12	1892	Repositorio Institucional de acceso abierto del Tecnológico de Monterrey	1272	1938	1327	1183
13	2245	Tesis Digitales El Colegio de México	2213	1932	1487	2014

Source: Repositories Ranking Web, July 2016

In table 4, of the repositories in Mexico, it was observed that the Universidad Veracruzana, the National Polytechnic Institute and the Autonomous University of Nuevo León top the list and the 13th position is occupied by the Digital Theses Repository of the Mexico's College. Thesis of the UAM Iztapalapa Unit in the 11th place, National Autonomous University of Mexico's RAD[2] occupies the 9th place.

Table 5. Top institutional repositories in Mexico

ranking	World Rank	Instituto	Tamaño	Visibilidad	Files Rich	scholar
1	582	Repositorio Institucional de la Universidad Veracruzana	338	534	356	1110
2	619	Repositorio Academico Digital Universidad Autónoma de Nuevo León	671	991	542	265
3	727	Repositorio Institucional Universidad Autónoma del Estado de México	319	1069	541	511

2 RAD UNAM is just a meta-search engine (not a repository as such). The National Autonomous University of Mexico has numerous repositories that are not reflected in the repositories web ranking (July 2016), so the results should be taken with reservation

4	1080	Universidad Autónoma de Querétaro Repositorio Institucional	1191	1418	897	737
5	1128	Tesis Institucionales Instituto Politècnico Nacional	631	1365	666	1151
6	1277	Repositorio Institucional de acceso abierto del Tecnológico de Monterrey	1013	1584	795	1068
7	1325	Repositorio Institucional Universidad Autónoma del Estado de Hidalgo	701	1642	1192	1114
8	1461	Nínive Repositorio Institucional de la Universidad Autónoma de San Luis Potosí	1429	1756	1449	1121
9	1662	ITESO CONACYT Documentacion en Ciencias de la Comunicacion	1914	1332	761	1871
10	1690	Repositorio Digital Institucional Instituto Politécnico Nacional	589	844	515	2045
11	1970	RAD Repositorio Institucional Red de Acervos Digitales UNAM	1402	1517	1065	2021
12	2078	Universidad Autónoma Metropolitana Unidad Iztapalapa. Tesis Electrónicas TESIUAMI	2225	1575	987	1984
13	2221	Tesis Digitales El Colegio de México	2232	1915	1481	2045

Source: Repositories Ranking Web, February 2017

Table 5 shows again the table of the ranking of institutional repositories in Mexico, but with data from February 2017, where it can be seen a variability in some positions in regard to July 2016. Table 4 shows it can be appreciate the variations, as well as data that have allowed or in its case have caused them to rise or fall positions.

The institutional repository of the Universidad Veracruzana maintains the first position, having 11 points of increase in its visibility, 7 points in Files Rich, with a decrease of 18 and 4 points in size and *Scholar* respectively.

The Institutional Digital Repository of the National Polytechnic Institute has gone from the second to the tenth place, in size achieved an increase of 103 points, in visibility 25 points and in Scholar 1697 points, but a low of 6 points in *Files Rich*.

The Digital Academic repository of the Autonomous University of Nuevo Leon went from the third to the second site, having 274 and 161 points in size and *Files Rich*, but an increase of 47 and 7 points in visibility and *Scholar* respectively.

The Digital Assets Network (DAN) of the National Autonomous University of Mexico, went from occupying the 9th place to the 11th, achieving an increase of 58, 290, 205 and 33 points in size, visibility, *Files Rich* and *Scholar* respectively.

The Technological and Higher Studies Institute of the West, held position 7 and is now in position 9. The catalog of Documentation in Communication Sciences (Database) managed to increase 265, 9 and 68 points in size, visibility and *Scholar* respectively, but it dropped 69 points in *Files Rich*.

Table 6. Analysis of the ranking of repositories in Mexico from July 2016 to February 2017

Repository	July 2016 Ranking	February 2017 Ranking	Size	Visibility	*Files Rich*	*Scholar*
Universidad Veracruzana	1	1	-18	+11	+7	-4
National Polytechnic Institute	2	10	+103	+25	-6	+1697
Autonomous University of Nuevo León	3	2	-274	+47	-161	+7
National Autonomous University of Mexico's RAD	9	11	+58	+290	+205	+33
ITESO CONACYT	7	9	+265	+9	-69	+68

Source: Own elaboration based on data from the July 2016 and February 2017 Repositories Ranking Web

These figures show that for international criteria repositories should reduce their size in the number of fragmented files and provide full-text files; increasing their visibility by making use of the new social media platforms is essential and of great impact for the positioning and dissemination of content among students, considering that they are the ones who make use of these communication tools. Increasing the variety of ways in which data and information are presented is fundamental, as long as they are formats that may be visible in new generation equipment such as: Smartphone and Tablet. Finally, the Google metrics and standards that allow the indexing of contents in their databases and allow occupying a better place in organic search results are key factors that allow a greater usability of files in the network, as well as their retrieval, preservation and dissemination.

After looking at the current situation of the repositories worldwide and studying their behavior in particular for Mexico, data obtained from the questionnaire applied to teachers, researchers and professionals who carry out activities related to the dissemination of knowledge were analyzed. Questions and results obtained are presented.

Chart 3. Have you done any type of academic or research publication inside or outside the university, center or institution to which you belong?

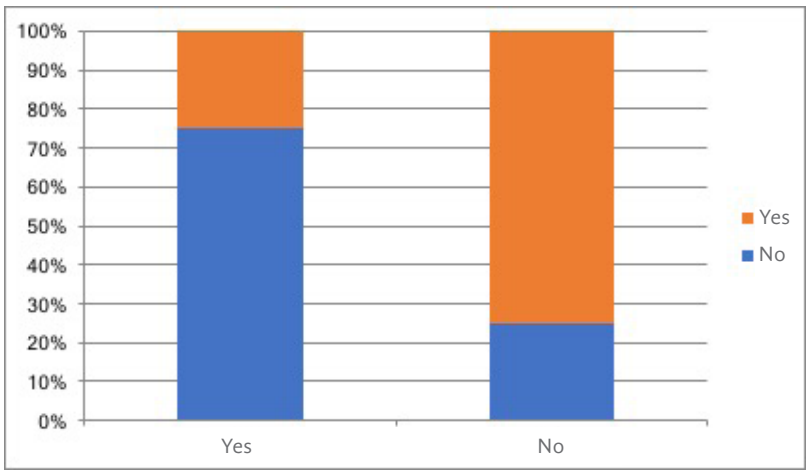
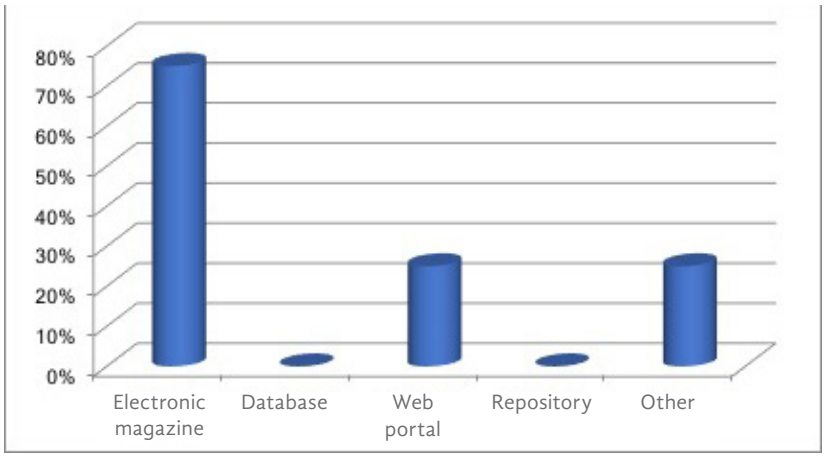


Chart 3 shows that 75% have made some type of publication either in the institution to which they belong or in some other, including public, private, national and foreign universities.

Chart 4. Where have you published?



In chart 4 it can be seen that 75% of publications belong to electronic journals, followed by web portals by 25%. It should be mentioned that databases or repositories are not yet a means by which academics or researchers are inclined to use as a means of dissemination to increase the visibility of their materials. But 25% indicated that they have made publications in other media.

Chart 5. What type of academic, research or other material have you published?

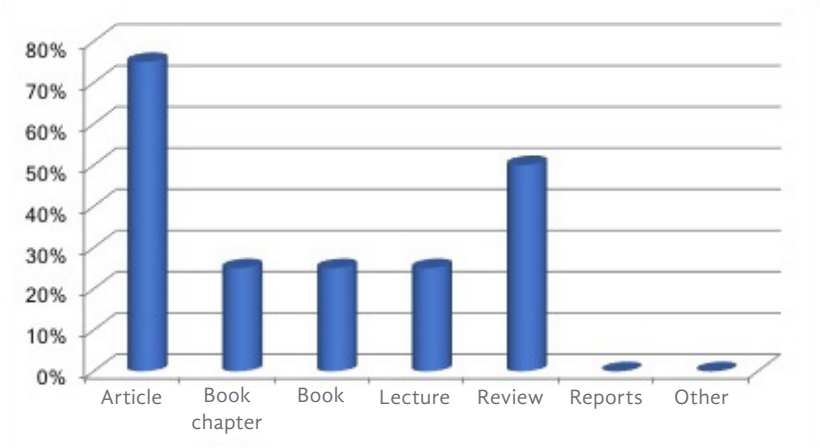


Chart 5 shows the different materials that are published in public, private, national and foreign institutions, of which the articles have been the type of publishable material preferred by authors of academic and scientific content, obtaining 75%, followed by book reviews by 50% and books, books chapter or lecture only 25%. Regarding reports or other materials in the present study, no data were obtained, remaining at 0%.

Chart 6. Do you publish in open acess?

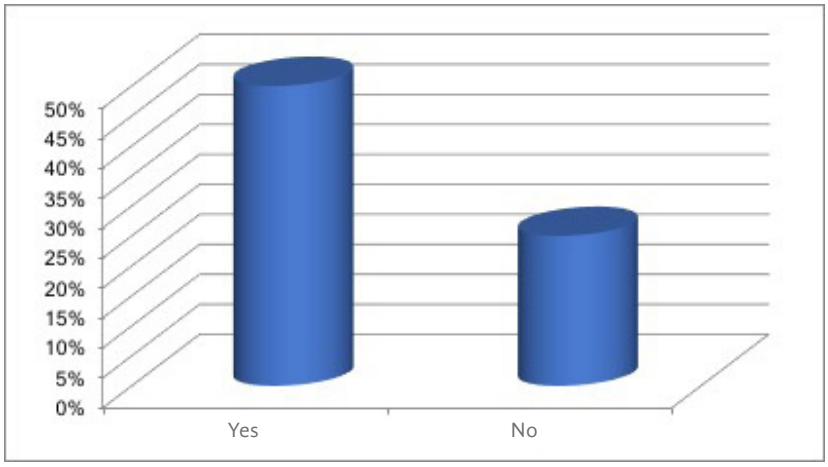


Chart 6 shows that 50% publish in open access and 25% do not, opting for private journals in which they have to pay, both authors and readers, to publish or have access to these materials, in some cases the author obtains royalties for work consulted.

Other data obtained through the questionnaire were:

50% of those who have published are very sure that their information will be available to be consulted all the time, 50% of the consultations on the Internet are made through their smartphone, followed by 25% on a Tablet and 25 on computers desktop. The contents consulted usually appear in 100% in HTML format, 70% in PDF format, 25% in ePub format (electronic book or eBook), in image or video. Finally, 100% consider that a single source of information should provide data in a variety of formats such as: audio, image, video, html or pdf.

CONCLUSIONS

A repository is basically a database that not only provides referential information, but stores digital objects that can be of different nature (text, image, audio or video) and in a wide variety of formats (HTML, PDF, epub, mp3, mp4, etc.). In the repository, each resource or digital object is identified and characterized by a set of standardized metadata; such metadata provide descriptive information (author, title, year) of resource administration (creation of the resource, rights, access control), and preservation (type of format, weight, version.). Such specifications allow the retrieval of each particular resource through the Internet (Bongiovani, 2010, Abadal, 2012, Bustos and Fernández, 2009). The ability to share data and enable exchange between different systems (interoperability), allows to create a database network; such is the objective of Conacyt's call in 2015 on Repositories, which allows institutions that do research to have a repository so they can later become part of the National Repository.

Institutional Repositories are those that belong, store, share and retrieve information from institutes, universities and research centers (Lynch, 2003 cited in Melero 2008). The digital repositories are being used as a good tool for the management and preservation of the resources produced by the academic and research communities of Higher Education Institutions, and they have rapidly permeated this field, displacing to a certain extent the role that digital libraries play in the management of academic and research materials.

The creation of a repository requires the joint effort between groups of different specialties, since it is necessary to organize the contents, operational policies and technologies to be used in multidisciplinary repositories that, as mentioned by Redalyc and UAMEX (2013), are generated in particular by universities, institutes and centers.

Desirably it should be an institutional directive that governs the implementation of a project of this nature, especially in large-scale organizations

where the problems are greater and in which standardization activities require the standardization of practices and technologies of heterogeneous groups.

The benefits that entail the implementation of an institutional repository of open access for institutions, researchers, technologists, academics, university students, and society in general are:

1. Provide a self-archiving system to researchers, teachers, university students and the general public for the storage, preservation and dissemination of academic and research content
2. Maximize the visibility of scientific and academic production
3. Develop monitoring systems for the generation of repository usage statistics
4. Increase production and publication inside and outside the university
5. Comply with the new provision of the Science and Technology Law regarding the Repository
6. To have a platform for the common exchange of information produced at the University
7. Facilitate access to repository content from different electronic devices connected to the internet.

The social impact that will have will be decisive for the improvement in its management processes and technological innovation and will allow providing tangible indicators of the academic and scientific production that the university has; as it will also address the new model of public administration (The New Public Management) directing efforts to guarantee effectiveness, efficiency and quality in resources (Aguilar, 2013), free access and transparency in public information (research financed with public resources). The impact factors will be consulted, as well as statistics on use and consultation of materials.

To ensure the permanence and growth of the repository's academic heritage, editorial policies must be established to ensure that academics, researchers, teachers and students can publish and, above all, have guidelines that guarantee the academic quality of the documents stored in the repository.

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