The evolution of the open science institutional repository at the Autonomous University of Carmen and recommendations for it is continued population

La evolución del repositorio institucional de ciencia abierta en la Universidad Autónoma del Carmen y las recomendaciones para el poblamiento continuo

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ABSTRACT

This paper presents the birth of the institutional repository of open science of the Autonomous University of Carmen called Runacar in February 2020 and its evolution to date. In this sense, throughout the implementation of the institutional repository in the University they have encountered a diversity of problems at the time of the population of the repository, on the one hand, by the integration of the resources of academic, scientific, technological and innovation information generated in the University, and on the other hand, the resources that integrate the professors-researchers of the University. Therefore, the methodology used and the recommendations for the continuous population of the institutional repository are evidenced, as well as to keep the appropriate metadata record for interoperability with the national repository and with the Mexican network of institutional repositories.

Keywords: Digital repositories; Institutional repository; open access, library collections; repository development; repository legislation; digital library

RESUMEN

Este trabajo presenta el nacimiento del repositorio institucional de ciencia abierta de la Universidad Autónoma del Carmen denominado Runacar en febrero de 2020 y su evolución hasta la fecha. En este sentido, a lo largo de la implementación del repositorio institucional en la Universidad se han encontrado una diversidad de problemas a la hora de la población del repositorio, por un lado, por la integración de los recursos de información académica, científica, tecnológica y de innovación generados en la Universidad, y por otro lado, los recursos que integran los profesores-investigadores de la Universidad. Por ello, se evidencia la metodología utilizada y las recomendaciones para el poblamiento continuo del repositorio institucional, así como para mantener el registro de metadatos adecuado para la interoperabilidad con el repositorio nacional y con la red mexicana de repositorios institucionales.

Palabras clave: Repositorios digitales; Repositorio institucional; acceso abierto, colecciones bibliotecarias; desarrollo de repositorios; legislación sobre repositorios; biblioteca digital.

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1. Introduction

The birth of institutional repositories in universities and public research centers in Mexico, arise from the 2015 calls published by the National Council of Science and Technology – CONACyT, a decentralized public entity of the Mexican government dedicated to promoting and stimulating the development of science and technology, with the responsibility of developing national science and technology policies (CONACyT, 2022; Babini & Rovelli, 2020).

In this sense, the CONACyT defines the Open Science policy, in which it is called:

> Open Science in practice whose objective is to increase and facilitate access to scientific research, materials and information resulting from these processes, which have been financed with public resources, for all citizens through the maximum dissemination of scientific, technological and innovation knowledge. (Open Science, 2017)

Therefore, Open Access is defined as access through a digital platform and without subscription, registration or payment requirements, to the results of research, educational, scientific and innovation materials, financed totally or partially with public resources or that have used public infrastructure in its realization (General Guidelines, 2017).

Although today there are numerous investigations and working papers on Open Science, its definitions and terms, (Abadal, 2012; Anglada & Ernest, 2018; Source, 2015; Bartling & Friesike, 2013; Chesbrough, 2015; Society, 2012), it should be noted that in (Vidal et al., 2018) he states that "Open science is a movement that encourages scientific research, methodologies and data obtained from them can be distributed, reused and accessible by all levels of society free of charge and freely". However, the working document made by (Sánchez-Vargas) of the Policy Design and Evaluation Unit of the Ministry of Science, Technologies and Innovation of Colombia, where it groups different definitions and identifies a diversity of terms, proposes the following definition:

> Open science corresponds to the evolution towards a more effective science, accessible, transparent, interdisciplinary and democratic to the extent that more diverse audiences participate and benefit, all this made possible by information and communication technologies. It includes a number of components that give it its connotation of openness, such as open and reproducible research, open peer review, open access to publications and open data, those derived from publicly funded processes and open research. (2017)

In this same sense, it can be summarized that Open Science has as its main purpose the accessibility of scientific research for all citizens.

In general, the Autonomous University of Carmen (UNACAR) joins this new evolution of science through the Institutional Repository (IR) called Runacar, to facilitate the access of the international scientific community to the results of the research carried out by its members and increase the visibility of the scientific production of the institution, also contribute to the preservation of the *Academic, Scientific, Technological and Innovation Information Resources* (RIACTI) deposited there. On the one hand, this research presents the evolution of the RIACTI in the RI, as well as the key metadata in the RIACTI harvestable by the National Repository (RN) and by the Mexican Network of Institutional Repositories (REMERI). On the other hand, the recommendations for the integration of the RIACTI harvestable by the RN and REMERI are presented. At most with the aim of presenting the evolution with the Institutional Repository, and the advantages of preserving the RIACTI and its continuous town, as well as facilitating free and open access to the university community with the benefit that students consider the Runacar as the first source of consultation or bibliographic search for their projects, research or development of your theses, both undergraduate and postgraduate.

2. Methodology

This case study results in the elaboration of recommendations for the success of an institutional repository considering the regulations and legislations in force in Mexican universities. This methodology is considered as a quantitative research technique, since the development of this focuses on the study of the implementation of a particular problem, such is the case of the institutional repository. The methodological process to carry out this case study is delimited to three steps, in the first step, to the location of sources and data collection, in the second step in the analysis and interpretation of information and results, and finally, in the elaboration of recommendations for the success of an institutional repository.

2.1 Source localization and data collection

Before starting this section, it is important to define the term of repository, according to the Royal Spanish Academy (RAE) defines it as a "Place where something is saved"; from the lat. *repositorium* "wardrobe, cupboard". The term repository is generally understood as an information repository or information store or acquis. In this work the institutional repositories will be addressed, these in turn, more than being a simple depositary implies many things, and in other terms it is understood as an institutional repository to the place where digital information of the universities is preserved, preserved and disseminated.

Also, in the literature there is a wide variety of definitions of institutional repositories, then some more outstanding ones are described, for example, Albadal defines an institutional repository "It is a website that collects, preserves and disseminates the academic production of an institution, allowing access to the digital objects it contains and its metadata" (Albadal, 2012). Lynch defines it as a set of services that a university offers to members of its community for the management and dissemination of digital materials created by the institution and its members (Lynch, 2003). However, for Tramullas-Saz and Others, he mentions that institutional repositories have become the main way to publish, preserve and disseminate the digital information of organizations, thanks to the conjunction of open access, free software and open standards applied in this domain (Tramullas-Saz & Garrido-Picazo, 2006). For López, he mentions that there must be four fundamental characteristics for a repository to be considered a digital repository (López, 2013):

- **Self-archiving:** since the content is deposited by the creator, owner or a third party on their behalf.

- **Interoperability:** use of standardized processes that would make it possible to connect with other open OAI-PMH (*Open Archives Initiative–Protocol Metadata Harvesting*) repositories.

- **Free and open access**

- **Long-term preservation**

McDowell (McDowell, 2007) determines apart from these characteristics, some more, such as:

- It is an institutional service open to the entire university community and to all kinds of topics.

- Its objective should be to gather, preserve and give access to the production of researchers and teachers in multiple formats. Any repository that places limits on this production, for example, only learning objects or only thesis objects, etc. would be excluded.

- You must receive content actively either through a web form or simply through email.

With this data you can already define what an Institutional Repository (IR) is, the characteristics that must be met, to be considered as such. Therefore, it can be summarized that institutional repositories store, preserve, disseminate, and give access to the intellectual production of the members of an institution (university, research center, etc.). They can contain only the intellectual / scientific production (articles, theses, and dissertations, *working papers*, data, lectures, etc.) of the institutions, or also gather special collections, administrative documentation, etc. (López, 2013). Currently there are many universities that have implemented the repositories either nationally or internationally.

2.2 Analysis and interpretation of information

Considering that the National Council of Science and Technology (CONACyT) has promoted the implementation of Institutional Repositories through its 2015, 2016 and 2017 calls, it has managed to integrate to date, 108 institutional repositories, 150,048 information resources, 23,806,336 consultations (RN, 2022). In this sense, the Autonomous University of Carmen (UNACAR) has been integrated into this project of implementation of an Institutional Repository (IR) in the 2017 call, however, the synergy of the IR, has driven to create new regulations within the University, as well as, the Technical Guidelines for the Institutional Repository of Academic Information Resources, Scientific, Technological and Innovation, published (UNACAR, 2020) in the University Gazette (Informative organ of the UNACAR) for the integration of academic, scientific, technological and innovation information resources (RIACTI) in order to make it interoperable with the National Repository. It is also strengthened with the new Postgraduate Regulations of the Autonomous University of Carmen (UNACAR, 2021) to guide the information resources generated in the postgraduate programs for the benefit of the IR and contribute to the evaluation indicators of the postgraduate programs belonging to the National Quality Postgraduate Program (PNPC).

Once the software tool (Dspace version 6) recommended by CONACyT for the administration of RIACTI has been implemented, it is important to follow the technical recommendations on collections in any institutional repository (IR) as shown in Table 1.

Table 1. Collections.

Identifier	Area of Knowledge	Subdisciplines
1	Physical Sciences, Mathematics and Earth Sciences	Logic, Mathematics, Astronomy and astrophysics, Physics, Earth sciences
2	Biology and Chemistry	Chemistry and Life Sciences
3	Medicine and Health Sciences	Medicine and human pathology
4	Humanities and Behavioral Sciences	Anthropology, Linguistics, Pedagogy, Psychology, Art and Letters, Ethics, Philosophy.
5	Social and Economic Sciences	Demography, Economics, Geography, History, Legal Sciences and Law, Political Science, Sociology
6	Agricultural Sciences and Biotechnology	Agricultural sciences
7	Engineering and Technology	Technological sciences

Source: (RN, 2022).

In this same sense, the identifier that belongs to the area of knowledge of the communities organized in the IR is shown, for example, the metadata *DC.Identificator* belongs to the identifier number of the area of knowledge of the CONACyT catalog, that is, DC stands for DublinCore, and the *Identificator*, is the metadata element that uniquely identifies that element within the RI. Likewise, Table 2 shows the 17 RIACTI harvestable or allowed by the metasearch engine of the National Repository (RN). However, in the case of the Mexican Network of Institutional Repositories, it accepts an additional resource, such as bachelor's theses.

Table 2. Classification of metadata and type of publication allowed in CONACyT.

No.	Metadata	Description
1	*Article*	Article or editorial in an academic periodical.
2	*bookPart*	Part or chapter of an arbitrated book.
3	*ConferenceObject*	Document related to a congress, meeting or other similar event that cannot be placed in any of the specific types.
4	*workingPaper*	Preliminary technical scientific article, subject to peer review, which has been published as part of a series edited by the institution where the research was conducted, also known as a research paper.
5	*Lectura*	Presentation or dissertation made within a congress or similar event.
6	*Book*	Monographic work focused on a particular theme.
7	*conferenceProceedings*	Publication of items presented within a congress or similar event.
8	*Patent*	Document describing the patent registration.
9	*conferencePaper*	Paper or intervention presented at a congress included in the memory of the event.
10	*conferencePoster*	Poster or academic or scientific poster, where the research result is presented graphically and succinctly within a congress or similar event.
11	*Preprint*	Consists of a preliminary scientific or technical article, subject to peer review, but intends to be published.
12	*Review*	Review of a document that involves an evaluation of a work and has gone through a peer review.
13	*doctoralThesis*	Research carried out to obtain the doctoral degree.
14	*doctoralDegreeWork*	Academic work, different from the thesis, subject to the review and acceptance of an advisory committee that allows obtaining the degree of doctor.
15	*masterThesis*	Research conducted to obtain the master's degree.
16	*masterThesisWork*	Academic work, different from the thesis, subject to the review and acceptance of an advisory commission that allows obtaining the master's degree.
17	*academicSpecialization*	Exclusively for terminal works of a specialty that is studied after the degree and is subject to the review and acceptance of an advisory commission.

Source: (RN, 2022).

2.3 Preparation of recommendations

Once the digital platform called Runacar (http://www.repositorio.unacar.mx) has been implemented at the Autonomous University of Carmen, the technical guidelines for the Institutional Repository (IR) of Academic, Scientific, Technological and Innovation Information Resources are considered. , the updating of the postgraduate regulations and the population policy of the Runacar with the intention of maintaining the IR in the medium and long term.

In the open science policy in the university, it is recommended to elaborate a principle and an institutional policy of open access to scientific, technological, cultural and innovation information, so that the university community aligns these principles and the institutional policy to favor accessibility, visibility, usability, and the impact of scientific research.

In the Technical Guidelines for the Institutional Repository of Academic, Scientific, Technological and Innovation Information Resources, a chapter of general provisions, content and communities, operational committee, Policies of use, and finally, dissemination is recommended. The general provisions recommend that the main objective, definitions, and their application be indicated. In the chapter content and the communities, the type of content that the RI should accept is indicated, that is, the RIACTI harvestable for the metasearch engine of the National Repository (RN), the communities that mention the areas of knowledge and / or collections allowed in the RI, the deposit, and the depositaries. A chapter for operational administration called the operational committee where the attributions and ordinary sessions for the acceptance and publication of the RIACTI in the RI are indicated. In the chapter on usage policies, the authorization, use, metadata, license, privacy, and preservation of RIACTI in IT is indicated. Finally, in the dissemination chapter, it is indicated on the dissemination in the different university media and the legal interpretation.

In the institutional postgraduate regulations, it is recommended to incorporate the transfer of rights of the works carried out during the postgraduate (specialty, master's, and doctorate), whether theses or articles published in open access for the benefit of the quality indicator for the evaluation of the postgraduate and maintain its status within the national postgraduate program quality (PNPC).

Finally, the population policy of Runacar, indicates annually the gradual increase of the RIACTI, on the one hand, the RIACTI harvested by the metasearch engine of the RN, on the other hand, the RIACTI harvested by the metasearch engine of the Mexican Network of Institutional Repositories (REMERI). Likewise, the refereed articles generated at the University through the editorial committee (Journals, Books, among others) should be considered with the intention of being the potential supplier for Runacar. Also, it is recommended to add the bachelor's theses as a differentiator of the local and regional research of our country, these in turn are only harvested by REMERI.

3. Results

In this section, it shows the results of the application of the recommendations through the communities in the Institutional Repository of Open Science – Runacar are evidenced, the communities with the most publications and increases are shown through table 3, indicating that the area of knowledge of the Social Sciences contains the largest number of RIACTI followed by Humanities and Behavioral Sciences, Medicine, and Health Sciences. It should be noted that the RIACTI analyzed are harvestable by the RN, which means that it has greater visibility and accessibility at the national level.

Table 3. Communities with the most publications.

Communities	January 2021	January 2022	Increment
HUMANITIES AND BEHAVIORAL SCIENCES	126	190	64
SOCIAL SCIENCES	49	149	100
ENGINEERING AND TECHNOLOGY	43	71	28
MEDICINE AND HEALTH SCIENCES	43	75	32
BIOLOGY AND CHEMISTRY	35	50	15
PHYSICAL SCIENCES, MATHEMATICS AND EARTH SCIENCES	9	11	2
AGRICULTURAL SCIENCES AND BIOTECHNOLOGY	4	11	7
TOTAL	309	557	248

Own source.

4. Discussion

Since the approval of the Institutional Open Science Policy and the Technical Guidelines, in January 2020, the RIACTI of full-time professors (PTC) at the university and members of Runacar are considered low with respect to other IR members of the CONACyT network in similar situations, however, table 3 shows an increase of 248 RIACTI per year. Whereas, we have Acalán: magazine of the Autonomous University of Carmen, as the permanent bimonthly provider. Likewise, the strategy of permanent dissemination through *flyers* in the institutional web portal of the University is maintained, inviting the PTC to promote the use, protection, and publication of their products in Runacar.

From the approval of the postgraduate regulations of the Autonomous University of Carmen, in January 2021, the master's programs belonging to the national quality postgraduate program (PNPC) of the University, are mandatory to register the products generated by the Basic Academic Nucleus (NAB) to the Institutional Repository for the benefit of the evaluation indicators for each program. However, prior to the approval of the graduate regulations, the NAB of the Master of Engineering in Mechatronics and Master of Innovation and Educational Practices were already active members of Runacar, of the eight master's programs. However, it should be considered as a permanent strategy through article 21, section III, of the postgraduate regulations, to follow up coordinated with the faculty director and coordinator of the NAB of the educational programs in the PNPC for the integration of the NAB to be active members of Runacar.

Finally, to have a more objective projection of the annual increase in IR, considering what is mentioned in the previous paragraphs, there is only a total of 557 RIATIC in Runacar, of which only 413 are interoperable with the RN (https://www.repositorionacionalcti.mx/) and 496 interoperable with REMERI (http://www.remeri.org.mx/app/index.html). Considering that only two master's programs and the bimonthly distribution of the magazine Acalán have been registered. In this same, a strategy is recommended to integrate bachelor's theses into the IR for the benefit of strengthening local and regional research, as other universities do.

5. Conclusion

It can be concluded that, it is still a challenge to promote an Institutional Repository of Open Science-Runacar, even have regulations and guidelines, although it is important to consider an institutional regulation on theses, whether bachelor's, master's and doctorate at the University, for the benefit of students and full-time professors; promote open science as a strategy of greater visibility of their research for teachers, and encourage the use of institutional repositories in students as a first source of consultation for their learning, study or research, and that therefore, students acquire greater skills for the management and application of knowledge.

A natural progression of this work is to analyze use of anti-plagiarism system, this will allow validating the contents of the bachelor's and master's theses in terms of their originality. With respect to these, is necessary to carry out more studies to regulate the use of undergraduate theses by REMERI.

It is important that at a technical level all the hardware and software requirements for the implementation of repositories are met. Ideally, it should be free software for the repository manager as well as for the operating system, preferably Linux.

Finally, it can be concluded that the evolution shown here is reflected in the recommendations developed during the implementation of a repository, and that it goes beyond a simple management or administration of an institutional repository, since it involves the institution itself to increase or populate the repository with institutional regulations or regulations for the benefit of student learning, and in the products or resources generated by the professors attached to the institution. In this same sense, given the current technological openness, it is necessary for Mexican universities to join the government initiative to establish an institutional repository so that, through the network of repositories, the student, academic and scientific community has access to research results.

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