

Sharing scientific and academic outputs from Cuban universities through a network of digital libraries

PhD. Manuel Osvaldo Machado Rivero

Library at Universidad Central Marta Abreu de Las Villas. Santa Clara. Villa Clara. CUBA.
E-mail address: mosvaldo@uclv.edu.cu

Luis Carlos Alvarez

Universidad de las Ciencias Informáticas. Havana. CUBA.

PhD Febe Angel Ciudad Ricardo

Universidad de las Ciencias Informáticas. Havana. CUBA.

Prof. Marc Goovaerts

Hasselt University. Hasselt. BELGIUM.

PhD. Amed Abel Leiva Mederos

Library at Universidad Central Marta Abreu de Las Villas. Santa Clara. Villa Clara. CUBA.

PhD. Grizly Meneses Placeres

Library at Universidad Central Marta Abreu de Las Villas. Santa Clara. Villa Clara. CUBA.

PhD. Didiosky Benitez Erice

Faculty of Mathematic Physics and Computer Sciences. Universidad Central Marta Abreu de Las Villas. Santa Clara. Villa Clara. CUBA.

PhD. Rosa Margarita Rodriguez Fernandez

Library at Universidad de Holguin. Holguin. CUBA.

Prof. Redel Pérez Pupo

Library at Universidad de Holguin. Holguin. CUBA

MSc. Nirma Maria Acosta Nuñez

Library at Universidad de Pinar del Rio. Pinar del Rio. CUBA

MSc. Adrian Eduardo Cancino Gutierrez

Library at Universidad de Camagüey. Camagüey. CUBA



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Abstract:

In 2015 libraries from five Cuban universities supported by an international project sponsored by the Flemish Interuniversity Council (VLIR), started the development of digital libraries using Dspace to manage all the scientific and academic outputs stored in their collections with the aim to socialize, preserve and increase the visibility of the scientific and academic production at national and international level.

This paper presents the main features of the first Cuban Digital Library Network, the characteristics of each repository and other platforms, their interoperability and the development of a national harvester system to allow the information's search and retrieval through a single interface.

At this moment all five digital libraries are full operating allowing the visibility and socialization of more than nine thousands thesis produced by students and postgraduate's programs from five Cuban universities. During 2017 academic and research's staff will add their scientific production (journal articles, books and book's chapter, and other scientific documents) making possible to duplicate the amount early cited. A librarian team defined a metadata set from the Dublin Core Qualified to homogenize the documents description, according to the type of documents that these digital libraries will store and with the Metadata Export Guidelines released by OpenAIRE.

Cuban Ministry of High Education, following the experience of the five universities included in the consortial environment it decide to lead a national project to expand this experience to the rest of Cuban universities (more than 21). The interoperability of more than 20 digital libraries will allow the genesis and management in 2018 of the bigger digital collection available in Cuba, including scientific and academic and also other digital collections stored in our libraries. Also a national catalog will be available with the information about all printed collection stored in Cuban universities.

Keywords: Digital Libraries, Repositories, Digital Collections, Libraries, Cuban Ministry of High Education.

Introduction

Since the past century many institutions, especially libraries at universities, have been developing Digital Libraries (DL) with the aim to facilitate user's access to their Digital Collections [DC] (Noguez Ortiz, 2010; Anwarul Islam & Ikeda, 2014; García Sánchez, 2016; Pappy, 2016). In general, DL allow the access to thousands of users from different locations to unique documents, sometime not accessible for all in a printed version cause it's degradation, promote the cultural expansion, preserve the knowledge, don't need physical space grow to increase collections and other advantages (Yung Ming, 2014; Cabrera Fagundo, 2015).

Digital Library Federations define DL as:

Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities (Digital Library Federation, 1998 cited by Anwarul Islam & Ikeda, 2014).

DL became a very important tool for Cuban Universities, that's the fact that for Cuban organization access to digital documents growled faster than to printed thank to the donation of material by foreign academic collaborators, the increase of internet access and the digitalization of document permitted to libraries by Cuban Author's Right Law (República de Cuba. Asamblea Nacional del Poder Popular, 1977).

For the management of DC, Cuban universities have used different platforms as Greenstone, Eprint (Pyrounakis *et al.*, 2014) and some Cuban initiatives like QuipusBiblio or others, also dissimilar metadata schemas for material description have been used. This heterogeneity about platforms and rules for documents description has made impossible the interoperability between all those DL, and for that reason universities can't share their DC according with their user's need.

INFOMED it's consider the first most successful Cuban initiative in the development of DL (Cabrera Fagundo, 2015). A DL supported by all the medicine universities and health institution on Cuba, each one working together as a big consortium. This is an example about how the work in a consortial environment it's possible under a national management.

Cuban University Libraries working in a consortial environment

Cuban libraries are organized in different library's systems according with the Law for Libraries at Republic of Cuba where one of those system is the university libraries (República de Cuba. Consejo de Estado, 2010).

Cuban Ministry of High Education (CMHE) have twenty one university libraries and other important information centers located at research institutions across the country, all of them integrating the Libraries Network System of the Cuban Ministry of High Education. The Scientific Information and Communication Technologies Division (SICTD) is the administrative and methodological structure responsible for the coordination of information technologies and libraries activities at CMHE. However, the lack of a national policy has braking the development of a national catalog and DL for high education in Cuba. This lack allowed the use of different standards and technologies in each university library and then the impossibility of an efficient interoperability between them.

Since 2016 the SICTD defined the integration of library process and services under national standards as one of its goals. This decision are making possible the work under a consortial environment, where each university contribute to the consortium with all their available resources (technologies, digital and printed collection, human resources, etc.) to accomplish national and common goals under the same polices. Also this decision are improving the visibility and impact of the university's scientific and academic production.

SICTD has taken account the experience of an international project that involved five important Cuban universities. This project allowed the development of a consortial environmental between the university libraries of those institutions, with the release of new tools and policies for the management and exchange of scientific and academic information, especially through DC.

The role of ELINF project in the development of Digital Collection at Cuban Universities

In 2013 five important Cuban universities started an international program of collaboration sponsored by the Flemish Interuniversity Council (VLIR) from Belgium. The program included three projects, one of them called: *ICT supporting the educational process and the knowledge management in higher education* (ELINF). This project (at this moment in the last year of phase one) includes the development of digital collection throw the implementation and improvement of institutional repositories (IR) for scientific and academic outputs and also digital libraries (Alvarez Fernández *et al.*, 2016; Machado Rivero *et al.*, 2016).

Institutional Repositories at ELINF project.

At this moment the IR of the five Cuban universities included on the project (Universidad "Hermanos Sainz" de Pinar de Río, Universidad de las Ciencias Informaticas, Universidad Central "Marta Abreu"

de las Villas, Universidad “Ignacio Agramonte” de Camagüey and Universidad “Oscar Lucero” de Holguín) are full operating allowing the visibility and socialization of more than nine thousands thesis produced by students and postgraduate's programs, articles published by researchers in per-review journals and other scientific output are being added during 2017 and 2018, making possible to duplicate the amount early cited.

The institutions mentioned above work as a small consortium, with a development team to generate and improve tools, and an expert committee to evaluate and approve policies and further improvements. The expert committed approved the use of Dspace as the platform to support IR, this open source software is one of the most used worldwide for this purpose (Pyrounakis *et al.*, 2014; Cano Inclan *et al.*, 2015; Alvarez Fernández *et al.*, 2016; Machado Rivero *et al.*, 2016). Also this committee published a guide with the goal to normalize the description of each type of document (Fimia Leon *et al.*, 2017), using a Dublin Core Extended schema of metadata (Anibaldi *et al.*, 2015). The mentioned guide was elaborated taking account the Metadata Export Guidelines released by OpenAIRE.

Three of the five IR are indexed by OpenDoar, the rest are waiting for their inclusion in that directory. The IR from Universidad Central “Marta Abreu” of Las Villas [UCLV] (figure 1) is also included in to the Ranking Web of Repositories developed in Spain by the Cybermetrics Lab under the aegis of the Spanish National Research Council (CSIC), and which is probably the project with the greatest reach and weight in the application of cybermetric indicators to repository analysis (Aguillo *et al.*, 2010).

A central harvester was developed with the aim to make possible the metadata and documents harvest from the five IR using a single and unique visual interface, the Open Archives Initiative-Protocol for Metadata Harvesting [OAI-PMH] (Mayo Guerra & Castillo Ascencio, 2015; Ochoa Agüero *et al.*, 2015) and the Open Archives Initiative Object Reuse and Exchange [OAI-ORE] (2016).

The image shows the homepage of DSpace@UCLV. At the top, there is a dark blue header with the logo 'DSpace@UCLV' on the left and a 'Login' link on the right. Below the header is a light blue navigation bar with a home icon and the text 'Principal'. The main content area is white and contains several sections. On the left, there is a section titled 'Acerca de DSpace@UCLV' with a paragraph describing the repository. Below this is a section titled 'Colecciones destacadas' with a list of three thesis collections. At the bottom left is a section titled 'Comunidades'. On the right side, there is a search bar with the text 'Búsquedas' and a magnifying glass icon. Below the search bar is a 'LISTAR' section with a list of links: 'Todo el Repositorio', 'Comunidades & Colecciones', 'Por fecha de publicación', 'Autores', 'Títulos', and 'Materias'. At the bottom right is a 'MI CUENTA' section with a link labeled 'Acceder'.

Figure 1. Dspace@UCLV homepage. Source: Dspace@UCLV: Repositorio Digital Institucional para la producción científica de la Universidad Central “Marta Abreu” de las Villas. (Machado Rivero *et al.*, 2016)

IR at universities are an example of the inside-out collection model, during centuries the dominant model has been outside-in, when documents are purchased or licensed from external sources and made available to a local community. The inside-out model, where materials elaborated inside institution (digitized special collections, research outputs, etc.) are shared with external audience (Dempsey *et al.*, 2014).

Dark Archive at ELINF project

Dark Archives are those digital documents that exist in libraries (organized by collection, topics or other system for information organization), but only can be used by members of the community associated to the library (university community in this case), because institutions have not the legal rights to socialize those documents (books, journal articles, etc.) throw internet. In Cuban university libraries those dark archives are supported using well known platforms like GreenStone or Eprints (Pyrounakis *et al.*, 2014), or other software.

The universities members of the VLIR Network decided migrate their DC to Dspace because in that platform can be used an structure of communities and collections according with the different science's domains, the potential of the search engine and the availability of a Dspace development community in Cuba to support that platform. Those Dark Archives are only available for students, professors, researchers and other members of the university's staff. Also a central harvester was implemented to harvest metadata and documents from all the Dark Archives using OAI-PMH and OAI-ORE.

Online catalog at ELINF project.

In 2010 Universidad Central Marta Abreu de Las Villas started to use ABCD, a new software to library automation. ABCD is an open source solution available free of cost, it caters the needs of modern libraries and documentation centers as it covers not only international bibliographic format (e.g. MARC) but also local and simple formats dealing with any type of documents (Smet & Dhamdhare Sangeeta, 2010). After some years using ABCD, UCLV proposed the use of this software in all the Cuban universities based on the possibilities to generate a national catalog and the work with international standard for documents description as Marc XXI.

ELINF project decided to develop new version of ABCD based on the experiences of universities included on the project with this software. For that reason a development team was selected (including programmers and librarians). Last January 2017 ELINF released ABCD 3.0 (figure 2) a complete new version of the software, the installation and human resources capacitation started immediately in all Cuban universities with the approbation and support of SICTD.



Figure 2: Logo of ABCD 3.0 a complete version developed in Cuba.

Cuban Digital Library Network

Cuban High Education Ministry lead twenty one universities and four research institutes among the country, each one with one library. All Cuban university libraries are under a national methodological lead, acting as a consortium.

Cuban Digital Library Network is a project of theCHEM, the main goal of this idea is to manage all the DC available in each university or research institution in a more efficient way and offer new information services, making accessible all the scientific output to the national and international community, and the documents stored in Dark Archives only for university's students or staff (this access limitation according with the authorization that Cuban Author Right Law establish for libraries (República de Cuba. Asamblea Nacional del Poder Popular, 1977), that allows this kind of institution to digitalize and socialize documents just for the academic and scientific community and nonprofit uses).

Cuban Ministry of High Education following the experience of the five universities included in the consortial environment of ELINF project, approved recently two mandatory documents:

- Policy for the development of Institutional Repositories and the development of Digital Collections.
- Policy for the implementation of ABCD 3.0

Those policies generate an administrative and legal framework to socialize all the experiences, tools and good practices developed by ELINF project to the rest of the Cuban universities. Also establish all the procedures and rules to homogenize the work in all the libraries of the mentioned ministry, a very important step to facilitate the interoperability between platforms and the exchange of metadata, documents and knowledge between Cuban universities, and from this point with the international community.

Cuban Digital Library Network will be integrated at the beginning by three main components:

- I. Institutional Repositories for scientific and academics outputs
- II. Dark Archives
- III. National Catalog of the Cuban High Education Ministry

Institutional Repositories for scientific - academic outputs:

Each Cuban university will implement an IR to socialize all the scientific and academic output of the institution, using the same metadata and documents description schema. Each IR will expose metadata and documents to search engines like Google and Google Scholar, and also to a national harvester allowing users different ways to access and search for information.

Dark Archives:

One of the difficult observed with the documents considered as Dark Archives is the great number of that digital documents available in our universities but not processed by our libraries. At this moment many researches and professor are donating their private digital collection to our libraries, with the aim to make that information more visible and share it with the university community. If libraries make the metadata assignation to those documents following the traditional way, the process will not be faster enough for users, who demand a quick availability of information. To

solve this problem a tool named Darkaiv was developed by UCLV's students. Darkaiv is a software product aimed at the automatic metadata extraction and the publishing of scientific papers. This tool enables handling of large document collections for the creation of digital libraries, combines automatic extraction (using different technologies) with manual review of metadata and provides an evaluation of metadata according to its completeness (Enriquez Rodríguez & Hernández Morales, 2016).

National Dark Archive will be a network between all universities Dark Archive, like the IR for scientific output, but this contents will not be exposed at international level, just for Cuban universities according with the Cuban law for author rights. A national engineer harvests from each university using OAI-PMH and ORE protocols, users could search information using the national harvester or accessing to each local Dark Archive.

National Catalog of the Cuban High Education Ministry

National Catalog it's been supported by the implementation of ABCD 3.0, with the use of the same tool and the format Marc XXI to document's description, the interoperability between all the universities catalog will be faster and easy, allowing the design and implementation of a national catalog where user could find any information about all printed resources located in universities library.

Other services that will be include next year in Cuban Digital Library Network will be the Scientific Journals edited by publishers located at Cuban Universities, and the Network for Scientific Research Exchange also developed by ELINF project.

At this moment Cuban Digital Library Network has the tools, human resources and digital collection needed to become in to the most important DL of Cuba.

Conclusions

University's communities each day are operating more and more in a network environment that is now rich in available resources, for that reason libraries are changing their models, increasing the offers of online services and products. In that context Digital Library has proved to be an excellent option, has led to tremendous changes in the provision of knowledge and resources.

Cuban university library has changing to an inside-out model, because universities focus attention on distinctive institutional resources and librarians direct increased curatorial attention toward special collections, new academic products, research preprints and postprints, and also pedagogical resources. ELINF project has demonstrated the achievement of consortial work between Cuban university libraries, developing tools and polices for information management, increasing the visibility and exchange of scientific and academic output of five institutions at national and international level. The experiences achieved for ELINF have been shared with the rest of the Cuban universities and could be extended to other organizations in the country as a way to improve the information and knowledge management.

Cuban High Education Ministry are developing the most important digital collection of Cuba with the implantation of Cuban Digital Library Network. Local digital collections at universities are becoming less local and more national or international, allowing access and exchange of important information resources, and at the same time interacting with other digital libraries.

Consortial environment has demonstrated to be an excellent choice, especially for those institutions with less resources but the same goals and policies.

Acknowledgments

International project: Network of University Cooperation "Strengthening the role of ICT in Cuban universities for the development of society". Sponsored by the Flemish Interuniversity Council (VLIR) from Belgium.

References

2016. *Open Archives Initiative Object Exchange and Reuse* [Online]. Nueva York: Open Archives. Available in: www.openarchives.org/ore/. [Cited: april 2017].
- AGUILLO, I.F., ORTEGA, J.L., FERNANDEZ, M. & UTRILLA, A.M. 2010. Indicators for a webometric ranking of open Access repositories. *Scientometrics*, **82** (3), pp. 477-486.
- ALVAREZ FERNÁNDEZ, L.C., RUIZ RICARDO, B. & PÉREZ RIVERA, D. Open Access and Digital Repositories in the Cuban Universities. In: MINISTERIO DE COMUNICACIONES, ed. *Informática 2016*. Havana. 2016. Havana: Ministerio de Comunicaciones.
- ANIBALDI, S., JAQUES, Y., CELLI, F., STELLTO, A. & KEIZER, J. 2015. Migrating bibliographic datasets to the Semantic Web: The AGRIS case. *Semantic Web* [On line], **6** (2). Available in: <http://content.iospress.com/articles/semantic-web/sw128>. [Cited: april 2017].
- ANWARUL ISLAM, M. & IKEDA, M. 2014. Convergence issues of knowledge management in digital libraries: Steps towards state-of-the-art digital libraries. *VINE: The Journal of Information and Knowledge Management Systems* [On line], **44** (1). Available in: <http://dx.doi.org/10.1108/VINE-05-2013-0029>. [Cited: april 2017].
- CABRERA FAGUNDO, A.M. 2015. Bibliotecas digitales: un breve estudio bibliométrico. *Revista Cubana de Información en Ciencias de la Salud* [On line], **26** (4). Available in: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2307-21132015000400005. [Cited: 23 april 2016].
- CANO INCLAN, A., DE DIOS ARIAS, R.A., GARCÍA GARCÍA, O. & CUESTA RODRÍGUEZ, F. 2015. Institutional repositories: current status in the international, Latin American and Cuban environment. *Rev. cuba. inf. cienc. salud* [On line], **26** (4). Available in: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2307-21132015000400002&lang=pt. [Cited: april 2017].
- DEMPSEY, L., MALPAS, C. & LAVOIE, B. 2014. Collection Directions: The Evolution of Library Collections and Collecting. *Portal: Libraries and the Academy* [On line], **14** (3). [Cited: April 2017].
- DIGITAL LIBRARY FEDERATION. 1998. *A working definition of digital library* [Online]. Digital Library Federation. Available in: <http://old.diglib.org/about/dldefinition.htm>. [Cited: April 2017].
- ENRIQUEZ RODRÍGUEZ, F.A. & HERNÁNDEZ MORALES, L.D. 2016. *Darkaiv: sistema para la extracción y publicación automática de metadatos de publicaciones científicas* [Thesis]. Santa Clara: Universidad Central "Marta Abreu" de Las Villas.
- FIMIA LEON, Y., BENITEZ ERICE, D., MACHADO RIVERO, M., LEIVA MEDEROS, A., ÁLVAREZ FERNÁNDEZ, L., MARTÍNEZ CALVET, M., et al. 2017. *Propuesta de directrices y metadatos para los repositorios institucionales de las universidades de la Red TIC*. Santa Clara: Samuel Feijóo.
- GARCÍA SÁNCHEZ, D. 2016. *Bibliotecas digitales: Criterios de clasificación para una tipología bibliotecaria* [Thesis]. Madrid: Universidad Complutense de Madrid.
- MACHADO RIVERO, M.O., BENITEZ ARCE, D., RODRIGUEZ HIDALGO, R.C., LEIVA MEDEROS, A.A., RIVERO CAÑIZARES, D.J., LORENZO RODRIGUEZ, M., et al. 2016. Dspace@UCLV: Repositorio Digital Institucional para la producción científica de la Universidad Central "Marta Abreu" de las Villas. *Congreso Universidad* [On line], **5** (5). Available in:

- <http://www.congresouniversidad.cu/revista/index.php/congresouniversidad/article/view/1248>. [Cited: april 2017].
- MAYO GUERRA, E. & CASTILLO ASCENCIO, I. 2015. Repository of the scientific production of the professionals of an university hospital. *MEDISAN* [On line], **19** (5). Available in: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1029-30192015000500015&lng=es&nrm=iso&tlng=es. [Cited: april 2017].
- NOGUEZ ORTIZ, A. 2010. Evaluación de las bibliotecas digitales: su teoría y modelos. *Investigación Bibliotecológica*, **24** (52), pp. 97-115.
- OCHOA AGUERO, A., PÉREZ AGUILA, D. & PORTÚ, B. 2015. Repositorio Institucional de contenido educativo de la Escuela Latinoamericana de Medicina. *Panorama Cuba y Salud*, **10** (2), pp. 2-9.
- PAPPY, F. 2016. *Digital Library: interoperability and uses*. London: Elsevier.
- PYROUNAKIS, G., NIKOLAIDOU, M. & HATZOPOULOS, M. 2014. Building Digital Collections Using Open Source Digital Repository Software: A Comparative Study. *International Journal of Digital Library Systems* [On line]. Available in: <http://www.igi-global.com/article/building-digital-collections-using-open-source-digital-repository-software/105108>. [Cited: april 2017].
- REPÚBLICA DE CUBA. ASAMBLEA NACIONAL DEL PODER POPULAR. ASAMBLEA NACIONAL DEL PODER POPULAR ed. 1977. *Ley de Derecho de Autor. Ley 14*. La Habana: Asamblea Nacional del Poder Popular. Available in: <http://www.gacetaoficial.cu/html/iderechoautor.html>. [Cited: April 2017].
- REPÚBLICA DE CUBA. CONSEJO DE ESTADO. 2010. Decreto Ley No. 271: De las Bibliotecas de la República de Cuba. *Gaceta Oficial de la República de Cuba*, **VIII** (30), pp. 873-7.
- SMET, E. & DHAMDHERE SANGEETA, N. 2010. ABCD: An open source automation tool for libraries. *Journal of Librarianship and Information Science*, **4** (4), pp. 215-219.
- YUNG MING, C. 2014. Why do users intend to continue using the digital library? An integrated perspective. *Aslib Journal of Information Management* [On line], **66** (6). Available in: <http://dx.doi.org/10.1108/AJIM-05-2013-0042>. [Cited: April 2017].