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Dspace@UCLV: Institutional Digital Repository for scientific production at Universidad Central "Marta Abreu" de Las Villas

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Abstract:

This paper presents the main features and functionalities of DSpace@UCLV, the first of several digital repositories developed by the Universidad Central "Marta Abreu" de Las Villas to socialize, preserve and increase the visibility of the scientific and academic productivity. DSpace@UCLV it was developed using the platform DSpace. It has been organized in 66 communities according to the departments and research's centers structure of the university. A metadata set from the Dublin Core Qualified was defined for the documents description, according to the type of documents that this repository will store and with the Metadata Export Guidelines released by OpenAIRE. Its visual interface is "responsive" through the use of Mirage 2, making possible the access through the use of mobile devices.

This platform has been operational since September 2015 and can be accessed through the URL: <http://dspace.uclv.edu.cu>. At this moment Dspace@UCLV stores more than 4800 thesis, the number of documents will increase annually through the self-archiving of scientific output of professors and

researchers. The operation of this repository is supported by an institutional policy approved by the university's board.

Keywords: repository, digital repositories, open access, scientific production

Introduction

The Open Access Movement (OAM) started in 1993 as an initiative of the Open Society Institute, (Babini *et al.*, 2010; Soares-Guimarães *et al.*, 2012) however it was not until 2001 that this movement reached real force, during a meeting in the city of Budapest by scientists representing various organizations, institutions and other personalities in order to join forces and ideas to generate sources of knowledge and recent academic achievement. Thus in 2002 it was announced the declaration of Budapest, signed by 270 organizations and more than three thousand scientists worldwide. (Ochoa Agüero *et al.*, 2011; Vidal-Ledo *et al.*, 2013; Melero, 2014)

Open Access (OA) has established two deployment paths: Golden and the Green Path (Aleixandre-Benavent *et al.*, 2015; Cano-Inclán *et al.*, 2015; Torres-Salinas *et al.*, 2016)

Digital Institutional Repositories (DIR) are tools derived from the initiative of OA, it allow to manage and disseminate electronic resources produced by members of a community. (Vidal-Ledo *et al.*, 2013; Torres-Salinas *et al.*, 2016) The first repository called *arXiv* was developed for pre-prints exchange at University of Los Alamos, following the proposal made by the physicist Paul Ginsparg. (Melero, 2014; Torres-Salinas *et al.*, 2016)

Recognizing the opportunities offered by the OA to increase the visibility, impact, recognition of the scientific and academic production; and also by the participation of the Universidad Central "Marta Abreu" de Las Villas (UCLV) in the 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), the UCLV has chosen to develop an Institutional Digital Repositories System (IDRS) to socialize the scientific and academic results achieved in each of faculties; in order to reduce the spread of information and provide a tool for viewing, searching and scientific content retrieval achieved in this university. (Machado-Rivero *et al.*, 2016)

DSpace@UCLV is the first of several DIR that UCLV has implemented in this moment, is specifically designed to store, preserve and disseminate the scientific production of this university. It is one of the components of IDRS that UCLV plans to have operating between 2016 and 2017. (Machado-Rivero *et al.*, 2016)

The development of DSpace@UCLV has been achieved thanks to the availability in the center of three key elements: Technological infrastructure, Human Resources and Institutional Policy.

Technological infrastructure

UCLV has an internal network and servers capable of storing large volumes of information and support dissimilar platforms and multiple repositories at the same time. It has the necessary connectivity to ensuring accessibility to services and also the repositories interoperability with other tools and systems available on Internet. UCLV has increased connectivity with the national and international environment, expanding their bandwidth. Inside the campus, there is one of the most developed networks of Cuban universities, with a large number of interconnected computers, as well as one of the most modern data centers of the country.

Human Resources

The UCLV has been described as one of the institutions of higher scientific productivity in Cuban higher education. (Arencibia-Jorge, 2010; Arencibia-Jorge *et al.*, 2013a; Arencibia-

Jorge *et al.*, 2013b) At this moment is the center of Cuban higher education with a larger number of careers, combining specialties from different scientific profiles. All this promotes a constant productivity in several scientific areas. Moreover, the institution has a University's Library, with a trained staff for the management of the DIR (56 specialists and 43 technicians, including 4 PhD and 15 MSc). This entity is reflected in the institutional policy as IDRS Coordinator, as usually happen in the digital repositories from various universities. (Terezinha-Elisabeth & Maria-Inês, 2011)

Institutional policy

The institutional board at UCLV approved a policy with the aim to establish work patterns, defining the roles of the various departments involved in the development of the IDRS and laid the legal foundation for the operation of these services in line with existing legislation on copyright and intellectual property. (Terezinha-Elisabeth & Maria-Inês, 2011) The proposed policy was drawn up by the University Library, having the Copyright Law, the Libraries Act of Cuba Republic and other applicable laws in the country related to copyright and ownership industrial as legal basis. (República de Cuba. Asamblea Nacional del Poder Popular, 1977; República de Cuba. Ministerio de Cultura, 2003; República de Cuba. Consejo de Estado, 2010)

DSpace platform

DSpace@UCLV (Figure 1) was developed using DSpace platform (version 5.1), the open source software most used worldwide for this purpose. (Ochoa Agüero *et al.*, 2011; Cano-Inclán *et al.*, 2015; Machado-Rivero *et al.*, 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' button on the right. Below this is a light blue navigation bar with a home icon and the text 'Principal'. The main content area is white and contains several sections: 'Acerca de DSpace@UCLV' with a descriptive paragraph, 'Colecciones destacadas' with a list of three items, and a right-hand sidebar. The sidebar includes a search bar labeled 'Búsquedas', a 'LISTAR' section with a 'Todo el Repositorio' button and other options like 'Comunidades & Colecciones', 'Por fecha de publicación', 'Autores', 'Títulos', and 'Materias', and a 'MI CUENTA' section with an 'Acceder' button.

Figure 1. Dspace@UCLV homepage. Source: Dirección de Documentación e Información Científico Técnica (2016)

Using equal or superior versions to Dspace v5 allows the possibility to use Mirage 2, which enables visual interfaces to be "responsive", allowing inquiry through mobile devices, one of the current trends in consulting on line information services. (Nieto & Lorenzo, 2014)

Structure of communities, sub-communities and collections

DSpace@UCLV boasts 66 communities, of which 3 are designed to accommodate the bachelor, masters and doctoral theses; while the remaining are aimed at the various teaching departments and research centers in UCLV. The community of a department or research's center it's divided into collections that organize the scientific production of it, they are:

- Journal articles
- Books and book sections
- Conference papers

Workflow at DSpace@UCLV

Digital documents stored at university library are introduced to the system by the library staff. The scientific production of departments is deposited using the self-archiving way by authors. Library staff also play an important role controlling the metadata quality suggested by authors during the submission. (Machado-Rivero *et al.*, 2016)

The repository allows rapid identification of personnel belonging to the UCLV, to run queries to the LDAP server from the center. Moreover, DSpace executes the users' managing and roles assigned to these within the platform (community and collections manager, metadata editors and reviewers, etc.)

Metadata model

As a policy, a set of metadata for each document type was approved (table 1), using extended Dublin Core as an essential basis (Arnold-Jenda, 2013; da Matta Vegi *et al.*, 2013; Gregory & Williams, 2014; Anibaldi *et al.*, 2015; Dirección de Documentación e Información Científico Técnica, 2016), allowing comply with international standards established for the description as well as interoperability with other system using the OAI-PMH protocol (Open Archives Initiative-protocol for Metadata Harvesting). (Babini *et al.*, 2010; Ochoa Agüero *et al.*, 2011; Terezinha-Elisabeth & Maria-Inês, 2011; Mayo-Guerra & Castillo-Ascencio, 2015; Ochoa-Agüero *et al.*, 2015) Although, metadata set was defined according with the Metadata Export Guidelines released by OpenAIRE. (Artini *et al.*, 2015)

Table 1. Metadata set defined for each document typology store at Dspace@UCLV.

Thesis			
Fields	Dublin Core Metadata	Mandatory	Optional
<i>Document type</i>	dc.type	X	
<i>Language</i>	dc.language.iso	X	
<i>Authors</i>	dc.contributor.author	X	
<i>Thesis's Advisors</i>	dc.contributor.advisor	X	
<i>Thesis Title</i>	dc.title	X	
<i>Thesis's Sponsor</i>	dc.description.sponsorship		X
<i>Thesis Alternative title</i>	dc.title.alternative		X
<i>City</i>	dc.coverage.spatial	X	
<i>University and Department</i>	dc.publisher	X	
<i>Defense Date</i>	dc.date.issued	X	
<i>Abstract</i>	dc.description.abstract	X	
<i>ISBN</i>	dc.identifier.isbn		X
<i>DOI</i>	dc.identifer.doi		X
<i>Keywords</i>	dc.subject.		

<i>Controlled terms (taken by librarians from international treasuries or other controlled vocabulary)</i>	dc.subject.other	X	
<i>Use License</i>	dc.rights.license	X	
<i>Rights holder</i>	dc.rights.holder	X	
<i>Bibliographic Reference</i>	dc.identifier.citation	X	
Journal Article			
Fields	Dublin Core Metadata	Mandatory	Optional
<i>Document type</i>	dc.type	X	
<i>Language</i>	dc.language.iso	X	
<i>Author</i>	dc.contributor.author	X	
<i>Title</i>	dc.title	X	
<i>Alternative title</i>	dc.title.alternative		X
<i>ARXIV</i>	dc.identifier.arxiv		X
<i>PMID</i>	dc.identifier.pmid		X
<i>DOI</i>	dc.identifier.doi		X
<i>Journal title</i>	dc.source.journal	X	
<i>Publisher</i>	dc.publisher	X	
<i>Journal Volume</i>	dc.source.volume		X
<i>Journal Issue</i>	dc.source.issue		X
<i>Article start page</i>	dc.source.initialpage		X
<i>Article end page</i>	dc.source.endpage		X
<i>Publication date</i>	dc.date.issued	X	
<i>Abstract</i>	dc.description.abstract	X	
<i>Keywords</i>	dc.subject	X	
<i>Controlled terms (taken by librarians from international treasuries or other controlled vocabulary)</i>	dc.subject.other	X	
<i>Use License</i>	dc.rights.license	X	
<i>Rights Holder</i>	dc.rights.holder		X
<i>Sponsor</i>	dc.description.sponsorship	X	
<i>Publication level</i>	dc.type.group	X	
<i>ISSN</i>	dc.identifier.issn		X
<i>EISSN</i>	dc.identifier.eissn		X
<i>Bibliographic Reference</i>	dc.identifier.citation	X	
Paper presented in a Conference			
Field	Dublin Core Metadata	Mandatory	Optional
<i>Document type</i>	dc.type	X	
<i>Language</i>	dc.language.iso	X	
<i>Authors</i>	dc.contributor.author	X	
<i>Document title</i>	dc.title		X
<i>Document Alternative title</i>	dc.title.alternative		X
<i>Conference name</i>	dc.source.conferencetitle	X	
<i>Conference editors</i>	dc.source.editor		X
<i>Source Title</i>	dc.source.title		X
<i>Publication level</i>	dc.type.group	X	

<i>Conference location</i>	dc.coverage.spatial	X	
<i>Publication date</i>	dc.date.issued	X	
<i>Publisher</i>	dc.publisher	X	
<i>Start page</i>	dc.source.initialpage		X
<i>End page</i>	dc.source.endpage		X
<i>Keywords</i>	dc.subject	X	
<i>Controlled terms (taken by librarians from international treasuries or other controlled vocabulary)</i>	dc.subject.other	X	
<i>Abstract</i>	dc.description.abstract	X	
<i>Use License</i>	dc.rights.license	X	
<i>Rights Holder</i>	dc.rights.holder	X	
<i>Sponsor</i>	dc.description.sponsorship		X
<i>ISSN</i>	dc.identifier.issn		X
<i>EISSN</i>	dc.identifier.eissn		X
<i>DOI</i>	dc.identifer.doi		X
<i>ISBN</i>	dc.identifier.isbn		X
<i>EISBN</i>	dc.identifier.eisbn		X
<i>Bibliographic reference</i>	dc.identifier.citation	X	
Books			
Fields	Dublin Core Metadata	Mandatory	Optional
<i>Document type</i>	dc.type	X	
<i>Language</i>	dc.language.iso	X	
<i>Authors</i>	dc.contributor.author	X	
<i>Editors</i>	dc.contributor.editor		X
<i>Book Title</i>	dc.title	X	
<i>Book Alternative Title</i>	dc.title.alternative		X
<i>Place of Publication</i>	dc.coverage.spatial	X	
<i>Publisher</i>	dc.publisher	X	
<i>Publication Date</i>	dc.date.issued	X	
<i>Keywords</i>	dc.subject	X	
<i>Controlled terms (taken by librarians from international treasuries or other controlled vocabulary)</i>	dc.subject.other	X	
<i>Use License</i>	dc.rights.license	X	
<i>Rights Holder</i>	dc.rights.holder	X	
<i>Sponsors</i>	dc.description.sponsorship		X
<i>ISSN</i>	dc.identifier.issn		X
<i>EISSN</i>	dc.identifier.eissn		X
<i>DOI</i>	dc.identifer.doi		X
<i>ISBN</i>	dc.identifier.isbn		X
<i>EISBN</i>	dc.identifier.eisbn		X
<i>Bibliographic Reference</i>	dc.identifier.citation		X
Book Section			
Field	Dublin Core Metadata	Mandatory	Optional
<i>Document type</i>	dc.type	X	

<i>Language</i>	dc.language.iso	X	
<i>Chapter's Authors</i>	dc.contributor.author	X	
<i>Chapter Title</i>	dc.title	X	
<i>Chapter Alternative Title</i>	dc.title.alternative		X
<i>Book Authors</i>	dc.source.author		X
<i>Book Editor</i>	dc.source.editor		X
<i>Book Title</i>	dc.source.title	X	
<i>Place Published</i>	dc.coverage.spatial	X	
<i>Publisher</i>	dc.publisher	X	
<i>Publication Date</i>	dc.date.issued	X	
<i>Initial page</i>	dc.source.initialpage		X
<i>End page</i>	dc.source.endpage		X
<i>Keywords</i>	dc.subject	X	
<i>Controlled terms (taken by librarians from international treasuries or other controlled vocabulary)</i>	dc.subject.other	X	
<i>Use License</i>	dc.rights.license	X	
<i>Rights Holder</i>	dc.rights.holder	X	
<i>Sponsor</i>	dc.description.sponsorship		X
<i>ISSN</i>	dc.identifier.issn		X
<i>EISSN</i>	dc.identifier.eissn		X
<i>DOI</i>	dc.identifier.doi		X
<i>ISBN</i>	dc.identifier.isbn		X
<i>EISBN</i>	dc.identifier.eisbn		X
<i>Bibliographic Reference</i>	dc.identifier.citation		X

Search and retrieval interface

The implemented interface is user friendly, providing the various search options (author, title, date, and topics) or perform the same following the structure of communities, sub-collections, collections and documents.

Once users chose a document, the system displays an interface in which user can view the summary of the document, data about authors, date of preparation or publication of the item, also displays the cover page of the document, the URI of the item within repository including metadata, allowing them to determine the relevancy of it to their interest.

Interoperability with other repositories

As we stated above, DSpace uses the OAI-PMH (Babini *et al.*, 2010; Ochoa Agüero *et al.*, 2011; Terezinha-Elisabeth & Maria-Inês, 2011; Ochoa-Agüero *et al.*, 2015), the same protocol that will be used in the rest of the DIR that will integrate the IDRS at UCLV. Other OA platforms like Open Journal System, Open Monography Press and Open Conference System are being used to develop the IDRS at UCLV. A main search engine metadata will reap each DRI, allowing consult all in only one user's interface. (Machado-Rivero *et al.*, 2016)

At this moment Dspace@UCLV is indexed by Google Scholar and IDRS coordinator at UCLV has initiate it registration on OpenDoar and the Ranking Web of Repositories.

Interoperability with other national institutions

As mentioned in the introduction to this work, UCLV is inserted in an international project, in which are associated with the Universidad de Pinar del Rio (UPR), Universidad de las Ciencias Informaticas (UCI), Universidad de Camaguey (UC) and Universidad de Holguin (UHo). (Cano-Inclán *et al.*, 2015) Although not part of the same program, Universidad de Oriente (UO)

has joined to the initiative of the mentioned entities. The development of digital repositories is one of the common goals of this group of higher education institutions, once reached will allow linking them and manage large volumes of data and documents (figure 2), increasing access and availability of information sources for students, professors and researchers. (Machado-Rivero *et al.*, 2016)

In order to facilitate the interoperability, this group of universities will use the same set of metadata (table 1), and also will follow the Metadata Export Guidelines released by OpenAIRE. (Artini *et al.*, 2015) Other repositories that can interoperate, once the DIR is operating within these centers are those of INFOMED and CITMA (Ochoa-Agüero *et al.*, 2015), as well as any others that operate following the basis of the OAI-PMH.

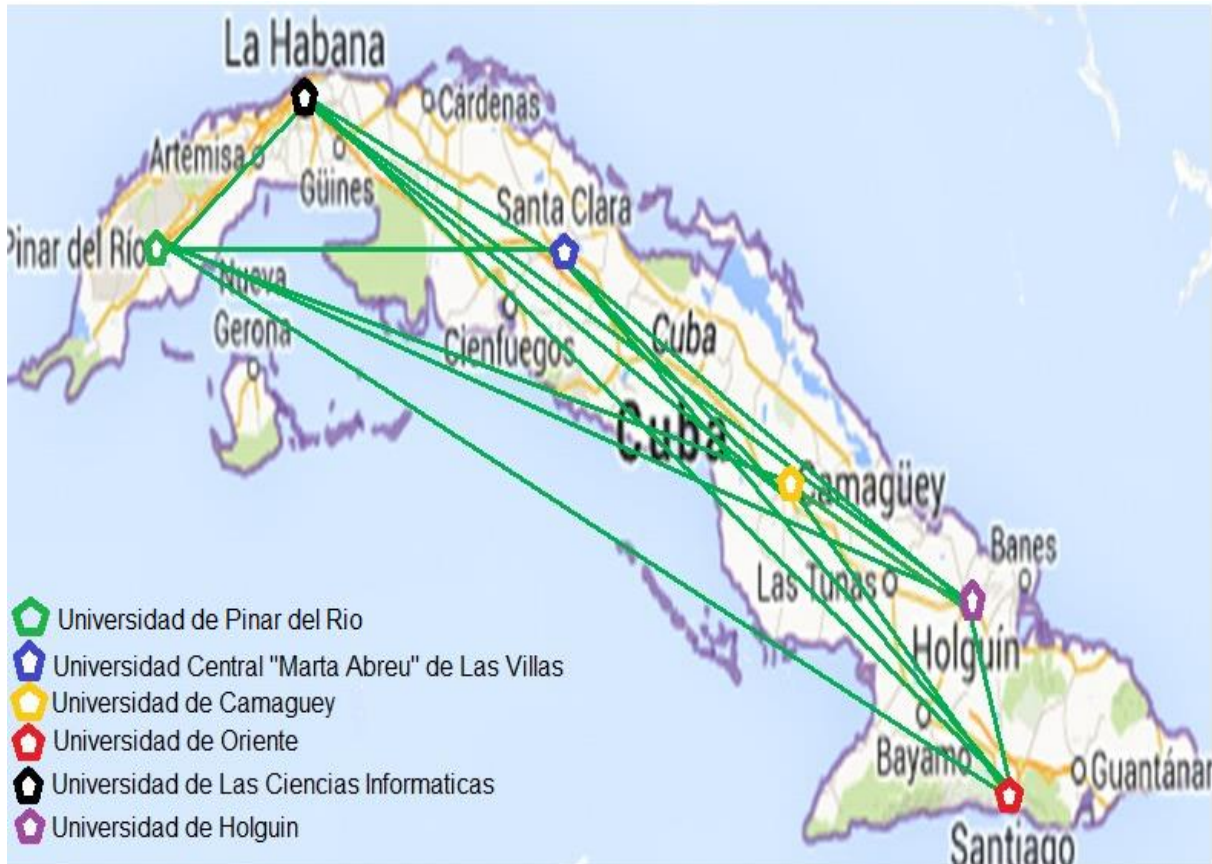


Figure 2. Digital Repository Network integrated by the universities members of the Network of University Cooperation sponsored by VLIR. Source: Machado-Rivero *et al.* (2016)

Impact of the SRDI at UCLV within the educational

The implementation of this network of repositories not only increase the visibility of the academic and scientific production of UCLV, also will impact over the dynamic of the educational process. (Ochoa Agüero *et al.*, 2011; Molina-Piñeiro *et al.*, 2015) Access to sources and information resources that once could only be found in person in the library will be increased.

The maintenance and development of these platforms, as well as the exploitation of their full potential, allow the implementation of knowledge and skills that many students receive as part of their training. It will create a space for the emergence of student scientific groups, which under the guidance of specialists will continue raising the quality of these systems and services.

Impact of the Digital Repository Network in Cuban Open Access and Repository Movement

The Cuban National Commission for Open Access Developed was created in 2009, with the aims to enhance the AOM in the country. (Casate-Fernández & Senso, 2013) The main achievements of this movement till 2014 haven been focused on the implementation and use of the Open Journal System as platform for Cuban Scientific Journals Management, especially in the health area.

The expansion of DR in Cuba exhibit a slow grow since 2009 to 2014, characterized by the development of the Doctoral Thesis Repository by INFOMED and a few initiatives with international visibility like: EcuRed, Digital Repository of the Tropical Geography Institute, *Scriptorium* (Digital Repository of the University of La Habana).

The goal of the international project: Network of University Cooperation "Strengthening the role of ICT in Cuban universities for the development of society", to create a Digital Repository Network, will enhance the Cuban OAM. A group of professionals from the 6 universities (specialist on information management and informatics) have been organized and trained, they work coordinated through the network creating open access polices for this kind of institutions, implementing DR and their interoperability, developing new functionalities to solve the Cuban OAM needs and the issues they probably will find doing so. Other organizations out of the project have received trainings by this team and are implementing initiatives related with DR. Also, the Cuban High Education are taking the experiences and good practices of this network to implement it in to the rest of the universities. One of the further results of this group it's to organize a Dspace Cuban Community, which work with the international developers to increase the impact of OAM.

Dspace@UCLV and DR from UPR are available for users in Cuba and out the country, DR from the rest of the network will be available at the end of 2016.

Conclusions

Open Access is a viable option for accessing and sharing information resources for countries whose financial resources don't allow the access to large and expensive international databases. DSpace@UCLV is a platform that promotes the socialization of information and knowledge generated within the Universidad Central "Marta Abreu" de Las Villas.

UCLV currently has the necessary scientific productivity, technological and human resources to implement its Institutional Digital Repositories System, and thus disseminate all scientific and academic productivity.

The activities of the 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 provide a great opportunity to organize and improve the development the Cuban Open Access Movement.

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