JATLIM International

http://www.jatlim.org

INTERNATIONAL JOURNAL OF APPLIED TECHNOLOGIES IN LIBRARY AND INFORMATION MANAGEMENT

Manuscript Number: JATLIM - 01.01/4/2015-007

International Journal of Applied Technologies in Library and Information Management 1 (1) 7-052 - 061

Research Management and Accessibility in Academic Libraries through Interoperability of Repositories

Enite Anita Urhefe
Federal University of Petroleum Resources, Effurun, Delta State.
anitaurhefe@yahoo.com

Edonkumoh V. Ebiye
Niger Delta University, Bayelsa State.
Veedonkz4info@gmail.com

Abstract

Academic libraries are working in new areas to support the publishing activities of their institution's faculty members, including helping them to manage and archive research data that they produce. Many institutions have multiple locations in which faculty can deposit their data and this distributed arrangement presents challenges for searching, unifying collections, and archiving. In order to foster some interoperability between these multiple data repositories, university libraries need to develop a system that brings together such multiple systems to enable the harvesting and replication of metadata and content across the systems. This paper focuses on present initiatives of interoperability and the benefits of enhancing interoperability among the different systems in institutional repositories.

Keywords: *institutional repository, interoperability, research management, academic libraries.*

1.0 Introduction

There is need for academic libraries to address a plethora of scholarly and research resources created and stored in separate databases by their faculty and students. While these resources pose new challenges, they also present new opportunities for libraries to extend their capabilities to organize these new resources, make them widely accessible, and preserve them for future use. Walters (2006) observes that, this is also integral to academic knowledge dissemination processes.

In recent years, Open Access repositories (OA) and their associated services have become an increasingly essential component of the global e-Research infrastructure in universities. In fact, the rate of growth has been so explosive that in the December 2, 2006, SPARC Open Access Newsletter, Peter Suber predicts that in 2007 "institutional repositories will soon be a new fact of life for universities, like libraries or web sites, and the discussion will shift from their utility to the best practices for filling them" (Suber 2007). He goes on to write about the diversity of materials in repositories:

> *"I'm tempted to predict a continuing tension between the narrow conception of institutional repositories (to provide OA for eprints) and the broad conception of IRs (to provide OA for all kinds of digital content, from eprints to courseware, conference webcasts, student work, digitized library collections, administrative*

records, and so on, with at least as much attention on preservation as access). But I have to predict that the broad conception will prevail".

Suber's prediction has already found its way into the modern academic library scene because there is need for best practices for wide dissemination of institutional repository materials. There is need to establish an interconnected repository network. That is, a network that can provide a unified access to an aggregated set of scholarly and related outputs that machines and researchers can work with dynamically. However the capacity for repositories to create a unified body of scholarly materials is entirely reliant on interoperability. Interoperability is the technical "bond" that makes it possible to connect repositories to each other and to other systems and transfer information, metadata, and digital objects between each other. COAR (2012) defines Interoperability as the ability of systems to communicate with each other and transfer information back and forth in a usable format. It allows users to exploit modern computational power so that repository content can be combined, extract data content from repositories, create new tools and services out of repositories, and generate new knowledge from them.

There are expectations in the academic community for the production, distribution, and interchange of scholarly publications and to force an assessment of the relative roles of authors, librarians, and publishers, as well as the possibility of entirely new individuals (actor) who will emerge as the publishing model evolves. In this case, institutional repositories might well act to preserve an institution's intellectual product while contributing to a fundamental, long term change in the structure of scholarly communication.

With interoperability of institutional repository, researchers need not know where a specific item was published or where an article is stored before they can find the appropriate information. Instead users depend on search engines to retrieve articles, and they can discover information which they might have otherwise missed through open access publications. There have been arguments about the taxonomy and naming of open access mechanisms. However for the purpose of this paper, two main forms of open access publication have been identified namely;

Open access journals

Open access archives

1.2 Open Access Journals

These are journals published online and are accessible free of charge. The Directory of open access journals which currently covers over 2,500 journals and give access to over 125,000 articles, as stated in Dewatripont (2006), defines open access journals as "journals that use a funding model that does not charge readers or their institutions "for access". A striking characteristic of open access journals is that, income is not generated through subscriptions but through alternative business models. Suber (2007) opines that, both the spread of open access archiving policies by funding agencies and universities and the spread of institutional repositories has come to a permanent stay. Although not all academia has welcomed the adoption of open access policies by depositing their work, but there is a strong indication that open access movement is a significant trend that will not be discarded easily. Arunachalam(2003), notes that open access has been acclaimed as a solution for developing countries, as it has the potential to facilitate all round information flow, by enhancing the visibility of scholarly publications from developing countries, and this all round information flow can only be made possible through interoperability of existing repositories.

According to CARL (2005) *open access archives* are repository in which copies of published articles are deposited to be access free of charge by all. This is mostly referred to as self archiving. The scope of open access archives are not restricted to only published academic articles, but both pre-prints, conference proceedings, technical papers, research reports, white papers, theses, dissertations, manuals, teaching materials, and other forms of grey literatures. It can also include other digital materials created by academia, such as administrative documents, course lectures, and other learning materials. Deposit of material in an institutional repository might be made mandatory by the institution. The collections contained in open access archives are works generated by staff and students of universities or research institutions, and they are also maintained by the institution. Such collections are referred to as *institutional repositories*.

An institutional repository (IR) is a digital archive for collecting, disseminating, and preserving digital copies of the intellectual output of an institution, especially a research oriented institution. SPARC (2002) also defined an institutional repository as "a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside of the institution, with few if any barriers to access". In other words, the content of an institutional repository is institutionally defined, scholarly, cumulative and perpetual, and also Open and interoperable.

Institutional repositories bring to the institution such increase visibility and impact of research output, interoperability and availability of technical support. IR performs the function of providing open source solutions for the purpose of being more compatible with the ideology of freedom and independence of the internet.

1.2 Objectives of an Institutional Repository

To provide open access to institutional research output by self-archiving it.

To enable global accessibility for an institution's scholarly research.

To store and preserve other institutional digital assets which include unpublished or grey materials, such as theses or technical reports.

To ensure the long term sustainability of an institutional repository, it is important that the repository is fully embedded in the strategy and culture of the institution. In research-intensive institutions such as the university, performing research assessment exercises is mission critical. The repository has a role to play in this key activity, the management and development of the repository further aligns itself to the heart of the institution's purpose; from the core values and strategic aims through the delivery of essential services. As research assessment methods move to embrace bibliometrics and other metrics, the need to maximize usage and citation impact will become even more important. There is, therefore a growing case for repositories to be used as part of the research management infrastructure of the institution. McCulloh (2006), stated the benefits of institutional repository to include the following:

Opening up outputs of the institution to World-wide audience.

Maximizing the visibility and impact of these outputs as a result.

Showcasing the institution to interested audience, such as prospective staff, prospective students and other independent bodies.

Collecting and organizing digital output.

Managing and measuring research and teaching activities.

Providing a workspace for work-in-progress, and for collaborative or large-scale projects

Enabling and encouraging interdisciplinary approach to research.

Facilitating the development and sharing of digital teaching materials and aids.

Supporting students' effort by providing access to theses and dissertations and a centre for the development of e-databases.

CARL (2005) also points out that, to make the content of these repositories accessible to all worldwide, open access have to be OAI-compatible; this means they comply with the Open Archive Initiative's Metadata Harvesting Protocol, which ensures that they are interoperable and searchable by any search engine.

2.0 Rationale for Repositories Interoperability

The rationale for universities and research institutes implementing institutional repositories according to SPARC (2002) is based on two interrelated propositions:

It supports a broad, pan-institutional effort

It offers direct and immediate benefits to each institution that implements a repository.

While institutional repositories centralize, preserve, and make accessible an institution's intellectual output, it also forms a focal point for interoperable repositories that integrate different model of scholarly publishing, which are identified by Peters (2002) as "individual, discipline-based, institutional, consortia, and national". Given this landscape, there are often multiple locations where an individual faculty member can publish and archive data, each of which may have its own approach to and policies regarding archiving and management. These variations in service may make one repository more appealing to a faculty member, and thus implicates the researcher's choices and thus the availability of research data. The salient question is how might two kinds of repositories, IRs and domain-specific data repositories, come together? Green and Gutmann (2007) envision a collaborative system whereby the IR facilitates communication and exchange of data between the researcher and the domain repository. The ability for different repositories to exchange metadata and content would provide an important service to enable faculty data to be housed and discovered in more than one system.

Interoperable repositories support the researcher's ability to search seamlessly across repository types, facilitating interdisciplinary research and discovery. This is increasingly valuable as the trend towards such multidisciplinary approaches increases in the sciences, social sciences, and humanities. Supporting this view, Prosser (2004) believes that institutional repositories and OA journals hold out the promise of a fairer, more equitable, and more efficient system of scholarly communication and can better serve the international research community.

2.1 Interoperability and Open Access

Interoperability enable user to access intellectuals product generated by the institution and increase awareness of research contributions beyond the institution's community. For the repository to provide access to the larger research community, user outside the institution's community must be able to find and retrieve information from the repository. Therefore, institutional repository systems must be able to support interoperability in order to provide access via multiple search engines and other discovery tools. This simplicity reduces the barriers to repository operation for many institutions,

because only a file system is required to hold the content and hence the ability to create and share metadata with external systems. Corrodo (2005) focuses on the benefits, to include, open source, and open standards, such as lower costs, greater accessibility, and better prospects for long term preservation of scholarly works.

Interoperability comprises persistent naming, standardized metadata formats, and a metadata harvesting protocol which describes the nature of the digital data stored in repositories (including the content, structure, and access rights administration). The metadata harvesting protocol allows third-party services to gather the metadata from distributed repositories and conduct searches against the assembled metadata to identify and ultimately retrieve documents. These mechanisms can be applied to any type of digital library, creating a global network of digital research materials (SPARC, 2002).

By facilitating interoperability, the Open Access movement has accelerated the relative quality of the traditional scholarly publishing model and increased the potential for institutional repositories within a reconstituted publishing scheme. Lagoze and Van de Sompel (2001), and Lynch (2001) have described the movement which occasioned the Open Access Initiative (OAI), which was established to develop and promote interoperability as solutions to facilitate the dissemination of content information.

3.0 Research Management and Interoperability

Many institutions have some form of institutional research management system (IRMS, sometimes called a CRIS- Current Research Information System) which draws together key information from all main information technology (IT) systems. The IRMS can be linked to the repository so that it can access all the bibliographic data and research outputs. Using the central repository in this way can lead to resource efficiencies across the institution. Without this arrangement the information about research outputs may otherwise need to be gathered from several individual departments or research groups (White, 2012).

The institution can also exploit the benefit of having bibliographic experts, often based in the library, checking the data that go into the repository. The quality assurance procedures of repository workflow provide the consistency and accuracy which is so important for research management and assessment.

3.1 Interoperability Initiatives

There are key interoperability initiatives that are currently widely implemented. These initiatives are not intended to be an exhaustive directory of all interoperability initiatives, but rather it provides information on the major interoperability strategies that should be considered for implementation. COAR (2012) also noted that no repository should implement all of these initiatives. Some are specifically designed for selected regions of the world, and many initiatives are designed to serve similar purposes. Each institution should select the initiatives that are most appropriate for its environment. The Table below contains a list of these initiatives.

Table 1: List of Interoperability Initiatives

Name of initiative	Aim of initiative	Area of operation	Geographical focus	Current status	Sponsoring organization	URL
AuthorClaim	To link scholars with records of the works they have produced.	Author identification	Global	currently maintained	Funded by an Open Society Institute grant to the ACIS project.	www.authorclaim.org
CRIS-OAR	To increase the interoperability between CRIS and repositories through metadata exchange	Cross-System Content Transfer	Europe	Completed	Knowledge Exchange	http://bit.ly/cris-oar
DataCite	Assigns persistent identifiers to published datasets.	Persistent identifiers	Global	Currently maintained	British Library and other founding members.	www.datacite.org
DINI Certificate for Document and Publication Services.	Develop modern information and communication technologies in the information infrastructures of higher education institutions and other research institutions	Describes technical, organizational, and legal of document and publication service such as an OA repository.	Global	Currently maintained	German Initiative for Network Information	www.dini.de/dini-zertifikat/english
The Handle System	Handles are designed to provide unique and persistent identifiers of digital objects	Persistent identification	Global	Currently maintained	Corporation for National Research Initiatives (CNRI).	www.handle.net
KE Usage Statistics Guidelines	Describe a metadata format for data usage to be transferred from a repository to a central server.	Usage statistics	Global	Currently maintained	Knowledge Exchange Partners (DEFF, DFG, JISC, SURF)	www.knowledge-exchange.info\Default.aspx?ID395
OAI-ORE	Defines the standards for the description and exchange of aggregations of compound objects.	Managing compound objects	Global	Currently maintained	Open Archive Initiative.	http://www.openarchives.org/ore/
OAI-PMH	Facilitates metadata harvesting from compliant repositories	Metadata harvesting	Global	Currently maintained	Open Archive Initiative	www.openarchives.org/pmh

Open Access Statistik (OA-Statistik)	Gathers internationally comparable usage statistics in order to increase the acceptance of OA among authors.	Usage statistics	Germany , but can also be applied anywher e in the world	Currently maintained	DINI / German Research Foundation	www.dini.de/projekte/oa-statistik/english
Open Researcher & Contribution ID (ORCID)	Create unique identifiers and author records to link scholars to their research outputs.	Author identification	Global	Active	ORCID	www.orcid.org
PersID	Create persistent addresses for all types of web-based digital objects.	Persistent identifiers	Global	Active	PersID partners:	www.persid.org
Statistics on the Usage of Repositories (SURE)	Provides guidelines for the creation and exchange of statistics about the usage of content in OA repositories	Usage statistics	Global	currently maintained	Open Society Institute grant to the ACIS project	http://wiki.surf.nl/display/statistics/Home
Simple Web-Service Offering Repository Deposit (SWORD	Provides a mechanism for authors to deposit a single article into multiple repositories.	Cross-System Content Transfer	Global	currently maintained	JISC, UKOLN	www.swordapp.org

4.0 The Library Role

Establishing an institutional repository (IR) program indicate that the library move beyond a custodial role to contribute actively to the evolution of scholarly communication. Libraries have to provide most of the documented preparation expertise such as; document format control, archival standard, etc., in order to help authors contribute their research to the institution's repository. Academic libraries can most effectively provide the expertise in terms of metadata tagging, authority controls, and other content management requirements that increase access to, and the usability of the data itself.

Academic libraries as logical administrative proponents of IR facilitate development of university intellectual property policies, encourage faculty authors to retain the right to self-archive, and broaden both faculty and administration perspectives on these issues. In order to enhance participation, many librarians are working to evaluate the utility of their IR from their institution's perspective. *Walters (2007) states that* some institutions have undertaken projects to study faculty work practices in order to design the repository system which

best meets faculty needs. Faculty researchers produce the original research itself; academic editors and peer-reviewers select and validate the quality and priority of the research; academic libraries process, house, and distribute the journals to end users; and library resources support archival preservation all at little or no direct cost to the journal publishers themselves. (Van de Sompel 2000) and (Arms 2000).

A study by McDowell (2007) indicates that datasets have only a small percentage of items in IRs. In this context, many librarians assist faculty members in publishing their datasets, whether it is in their IR, a domain specific data repository, or another location. For example, Witt and Carlson *(2007) states that* Purdue University library has established the Distributed Data Curation Center (D2C2) to support the curation and archiving of faculty-produced data for management and archiving in order to ensure interoperability of the different databases.

For several years, members of the social science data community have been promoting the need for standards for citing data. Some have developed specific standards recommendations designed to interoperate with data repository systems (Altman and King 2007). All these studies shed light on the need to design data repositories in alignment with the needs of institutions and researchers.

CONCLUSION

Institutional repositories are built on a grassroots practice of posting research online, especially on personal web sites, and also on departmental sites or in disciplinary repositories. This explains why there is need for expanded exposure of and access to repositories through interoperability. Because interoperability provide a central platform in uniting scholarly communication of different categories by stimulating innovation in a disaggregated publishing structure as they serve as tangible indicators of an institution's quality, thus increasing its visibility, prestige, and public value. More importantly as research assessment begin to include citation analysis as evaluation technique; research will be based on metrics developed to provide a quantitative measure of research impact which can be achieved through interoperability. Therefore interoperability will have a key role to play in enhancing access to repositories, since Open Access enhances citation impact. And academic libraries can play a critical role in building this awareness through outreach programs and consequently chose interoperability initiatives that demonstrate the practical impact of institutional repositories. While the faculty themselves have to cooperate with libraries to provide the logical institutional catalyst to effect interoperability among repositories.

References

Altman, M. and Gary K. (2007). A Proposed Standard for the Scholarly Citation of Quantitative. Data. *D-Lib Magazine* 13 (3/4). Retrieved 12/15/ 2014 from http://www.dlib.org/dlib/march07/altman /03altman.html.

Arms, W. Y. (2000) "Automated Digital Libraries: how Effectively can Computers be used for the Skills of Professional Librarianship. D-Lib Magazine 6(7/8) Retrieved 12/5/2014 from: http://www.dlib.org/dlib/march07/altman /03altman.html.

Arunachalam, S. (2008). Open Access to Scientific Knowledge. *DESIDOC Journal of Library and Information Technology 28* (1): 7-14.

COAR (2012) Retrieved February 20, 2015. From http: // coar-repositories.org.

Corrado, E.M. (2005). The Importance of Open Access, Open Source, and Open Standards for Libraries. *Issues in Science and Technology Librarianship. Retrieved on 23/7/2014 from:* http://www.istl.org/05-ring/article2.htm

Dewatripont, M. (2006) Study on Economic and Technical Evolution of the Scientific Publication Markets in Europe: Final Report, Commissioned DG Research, European Commission, Brussels, Retrieved 1/22/2015. From http://ec.europa.eu/research/science society /pdf/scientific publication-study-en.pdf.

Green, A. G., and Gutmann, M.P. (2007). Building Partnerships among Social Science Researchers, Institution based Repositories and Domain Specific Data Archives. *OCLC Systems & Services* 23 (1): 35-53.

Lagoze, Carl, and Van de Sompel H. (2001) "The Open Archives Initiative: building low-barrier interoperability framework." *Joint Conference on Digital Libraries 2001*. Available: http://www. openarchives.org/documents/oai.pdf

Lynch, C. A. (2001) " Metadata Harvesting and the Open Archives Initiative." *ARL*

McCulloch, E. (2006). Taking Stock of Open Access: Progress and Issues. *Library Review 55* (6). Accessed 6/7/2012 from: http://eprints.cdlr.strath.ac.uk/2325/01/Mcculloch_openaccessELIS.pdf

McDowell, C. S. (2007). Evaluating Institutional Repository Deployment in American Academe since early 2005. *D-Lib Magazine* 13 (9/10)Retrieved 9/2014 From: http://www.dlib.org/dlib/september07/mcdowell/09mcdowell.htm

Peters, T. A. (2002). Digital Repositories: Individual, Discipline-based, Institutional, Consortial, or National? *The Journal of Academic Librarianship*, 28 (6)

Prosser, D.C. (2004). The Next Information Revolution: How Open Access Repositories and Journals will Transform Scholarly Communications. *Liber Quarterly: The Journal of European Research 1* (14).Retrieved on 10/8/2014. http://webdoc.sub.gwdg.de/edoc/aw/liber/lq- 1-04/prosser.pdf

SPARC (2002). Retrieved January 20, 2015 from www.arl.org/space

Suber, P. (2007) *Open Access Overview: Focusing on Open Access to Peer-Reviewed Research Articles and their Preprints*. Retrieved on 9/20/2014. From http://www.earlham.edu/%7Epeters/writing/arcl.htm

Suber, P. (2006) Predictions for 2007. *SPARC Open Access Newsletter*, no. 104. Retrieved 9/12/2014. From http://www.earlham.edu/~peters/fos/newsletter/12-02-06.htm

Tyler O. W.(2006), "Strategies and Frameworks for Institutional Repositories and the new support Infrastructure for Scholarly Communications," *D-Lib Magazine* 12 (10)

Walters, T. O.(2007)." *The New Academic Library-building Institutional*

Repositories to Support Changing Scholarly and Research Processes. Retrieved on 2/3/2015. From http://arcl.org.

White, W. (2012). *Institutional Repositories for Research Management and Assessment*. A briefing paper. Retrieved January 15, 2015. From www.openoasisi.org

Witt, M. and Carlson J. R. (2007). *Conducting a data interview (conference poster)*. Washington DC, USA. Retrieved February 5, 2015. From http://arcl.org.