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E-science and open access repositories in Spain

Open access
repositories

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Abstract

Purpose – The purpose of this article is to highlight the role of science repositories in the development of e-science. It aims to provide an overview of the open access collections currently operating in Spain.

Design/methodology/approach – This paper is an examination of the tools, type of contents, coverage and aims of the digital research collections generated by Spanish academic bodies.

Findings – There is only a limited development of institutional repositories, although it is possible to detect a growing tendency to create them. At the present moment, these digital collections seem principally to be seeking visibility for scientific output such as theses, journals, work in progress, preliminary results and other fringe or unconventional literature, without currently making use of academic teaching and learning materials or corpora relating to the cultural heritage.

Practical implications – It would be desirable for government to become involved in encouraging open access within a new model for academic communication. It would appear crucial for the repositories aimed at spreading knowledge of scientific research to set in place mechanisms for rigorous peer assessment, so as to ensure the quality of the scholarly work deposited.

Originality/value – This paper considers the role of science repositories in the development of e-Science. The availability of resources for e-science, the need to support the compilation of repositories of information in electronic format and the access to digitized content is a matter of maximum priority for any national science policy. Designing a new model for academic communication requires collaboration from the authorities, from universities, from librarians and also support from researchers themselves.

Keywords Sciences, Digital storage, Spain

Paper type General review

1. New models of academic communication and e-science

What is called “e-science” represents a new way of doing research that might even be termed revolutionary. It is based on the setting up of repositories and the development of infrastructures to permit analysis and sharing of information among researchers based in different places. This e-science offers scholars in each discipline a different way to carry out their research. The key point would seem to lie in the co-ordination of efforts within a national framework so as to generate full and viable solutions to cover the information needs of researchers.

Although several countries with a large concentration of researchers, such as The Netherlands and Finland, have sought national solutions for the problems noted, only the UK has succeeded in bringing together all the aspects involved in the distribution of academic content. Since 2001, the British academic community, through the Research Support Libraries Group or RSLG, has been pressing for the creation of a new national body to provide strategic leadership in the development of research libraries: a Research Libraries Network or RLN. The aim of this organization is to make recommendations for the creation of an over-arching strategic framework in the UK to establish co-ordinated mechanisms for providing academic information such as to



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ensure that researchers will continue to have access to the whole range of information resources, independently of where they may happen to be located.

In Spain the report *El libro Blanco de la e-ciencia en España 2004*, published by the Spanish Foundation for Science and Technology[1], defines e-Science as the set of scientific activities carried out by means of the use of distributed resources accessible through the internet. The development of high-speed communications networks dedicated to research and to collaborative technologies and applications is creating an ideal scenario for interactions between researchers. For this reason, as the document points out, while e-science can be undertaken on an individual basis, it is more effective when combined with overall collaboration.

This report gave a total for Spanish academic output of around 30,000 scholarly papers per year. Moreover, universities subscribing to publications in which their research staff participates without financial reward yearly spend about €50 million on information. In recent years growth both in this expenditure and in the use of information has been constant. The Spanish research community faces considerable challenges that require access to multiple resources, as also an infrastructure that will facilitate sharing of knowledge and collaboration. Apart from having available considerable computing power and a large data storage capacity, the use of specialized instrumentation, access to resources for simulation and display, consultation of databases and routes into collaborative applications are among the requirements that are essential in order to meet these challenges.

In the classification of e-science, three horizontal layers have been distinguished. These correspond to the resources available (computing, storage, information and others), to the communication networks permitting access to these, and to middleware or intermediary software. This final layer allows applications to use resources held at remote locations in a joint or co-ordinated fashion.

Development of e-science is fundamental in determining the scientific and technological capacity of a country within a globalised economy. The report *El libro blanco de la e-ciencia* proposes that such a development within Spain should be oriented along two lines. On the one hand, there should be horizontal actions valid for all applications, that is, resources, networks and middleware that should be directed through the strategic action of the national plan. On the other, there should be vertical actions for each specific field that would depend on the relevant national programme.

It further adds that the availability of resources for e-science (computing, storage, information and the like) should be ensured. Connectivity to the end user should be strengthened by an appropriate expansion of regional and university campus networks (or their equivalents). Participation by Spanish industry in the development of e-science should be encouraged.

Among the specific actions put forward in the report, explicit mention is made of the need to support the compilation of repositories of information in electronic format. This is to extend university research and facilitate collaboration between groups, as well as to aid participation by the Spanish scientific community in major international research projects.

The provision of information is one of the crucial infrastructures for a research culture. Access to digitised content is a matter of maximum priority for any national science policy. It must be headed by those institutions that have a tradition of organizing and making available contents: the current hybrid libraries. With respect to

the traditional management of collections, the internet has completely altered the manner in which materials are provided. In this way, it has changed for ever the relationships between publishers, libraries and readers. Designing a new model for academic communication requires collaboration from the authorities, from universities, from librarians and also support from researchers themselves.

2. Accessing academic content by means of open-access collections

Open access and open repositories, in the sense of archives where digital resources are stored, arose from within the so-called e-print community, keen to maximize the diffusion and impact of the scholarly papers (pre- or post-print) deposited in them. This notion took concrete shape and was described in three declarations, the Budapest Open Access Initiative[2], the Bethesda Statement on Open Access Publishing[3] and the Berlin Declaration[4]. Additionally, in January 2004 the OECD published a communiqué[5] in which it urged signatory countries to promote free access to scientific documentation generated by research financed with public funds so as to get maximum benefit from the investment made and to promote progress and exchange of scientific knowledge.

The Budapest Open Access Initiative takes open access to mean free public availability on the internet of academic research. The sole limitation on reproduction and distribution, and the only function of copyright, should be to give authors control over the integrity of their work and the right to be appropriately recognized and cited.

The strong points of the open access movement lie in its advantages with respect to the availability of, and access to, electronic publications. However, it requires the support of an academic community that will back up this concept for diffusion and impact of scholarly output, because it implies a paradigm shift in the model for academic communication.

The success of the open access movement is in the hands of educational authorities, researchers, universities, publishers and the managers of research repositories. The main obstacles to be overcome are related to the quality of research, recognition of authorship and the financing of periodicals with free access.

In the current model for communicating research results, the universities are the big losers and publishers are the principal winners. The main monopoly publishers, such as Elsevier, Springer or Wiley, have gone into the electronic publishing market and through the sale of fixed packages from their lists of publications on the Big Deal pattern they are doubtless making substantial profits.

The pressure that universities can bring to bear so as to achieve a change in the pattern of academic communication is crucial. This is because the income of publishers' scholarly periodicals comes almost totally from institutional subscriptions, chiefly taken out by university libraries, yet it is the universities themselves that provide the contents for these publications.

Together with research repositories, other digital repositories have grown up under the wing of libraries and to a lesser extent of archives and museums. Their aim is to encourage the diffusion of the artistic, bibliographic and documentary heritage of which these institutions are the custodians.

One characteristic common to all these repositories is the fact that they have been created by using software packages with open source licensing and developed by working groups linked to the open archives initiative community. This is based on the

implementation of a shared protocol: Open Archives Initiative-Protocol for Metadata Harvesting (OAI-PMH)[6]. The fundamental features of OAI-PMH are:

- *Flexibility to adapt to any context.* it can provide information about any sort of resource, whether physical or digital.
- *Great ease of implementation.* The components of the OAI model basically involve a metadata harvester, a search and retrieval interface and a shared repository made up of a collection of individual repositories. These are combined with a set of requests and responses made through the hypertext transfer protocol (http).

Its structure is perfectly intelligible for any information professional and can be adopted by them to boost the development of retrieval systems based on this protocol. A proof that OAI is not just a protocol for search and retrieval of academic papers of bibliographic material on the web is the fact that it can transmit and present information in various formats, among them encoded archival description (EAD). This is a minimum common format for any simple or unqualified Dublin Core environment.

The success of the open access movement lies in its advantages with respect to availability and access for electronic publications, and the support of a scholarly community that backs this conception for the diffusion and impact of academic output.

This community, spread over many nations, has generated a range of tools and services for managing publication, archiving, retrieval and searching for information in open-access resources, and even for measuring impact, that can act as a support for undertaking new projects in this area.

3. Institutional repositories in Spain

On the basis of data from the registry of open access repositories (ROAR) (<http://archives.eprints.org>), Spain with its 13 repositories holds 12th place on a world level in setting up open-access collections, certainly lagging behind figures like those of France with 28 or Italy with 22, and a long way behind the UK with its 68 collections or Germany, where there are 60 such initiatives. Figure 1 attempts to show where Spain stands relative to nearby countries.

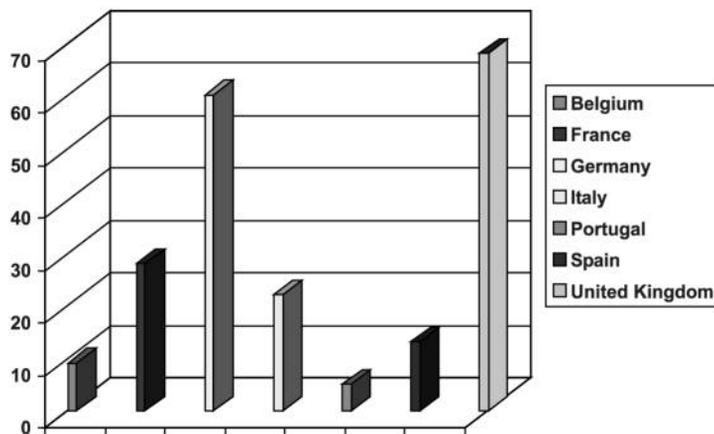


Figure 1.
Repositories per country
according to ROAR

Table I presents an overview of the OAI repositories generated by Spanish academic bodies. To trace them, ROAR was consulted, as also were OpenDOAR: The Directory of Open Access Repositories (OpenDOAR) (www.opendoar.org) and the Open Archives Register of Data Providers (OARDP) (www.openarchives.org/Register/BrowseSites). From these three sources, 15 repositories have been located. However, the three repositories that contain a single periodical title (*Intangible Capital*, *Statistics and Operations Research Transactions* and the history journal *Tiempos modernos*) have been excluded from this listing.

The joint repositories promoted by the Consorcio de Bibliotecas de Cataluña (CBUC) would seem highly noteworthy. Their institutional framework goes beyond the CBUC itself to include universities and other establishments not belonging to the consortium. All of these repositories were created and are maintained co-operatively by the CBUC and the Centro de Supercomputación de Cataluña (CESCA). Details of them follow.

The oldest and best established is TDX-TDR, for access to doctoral theses over the net. Currently 14 universities are participants: Universidad de Barcelona, Universidad Autónoma de Barcelona, Universidad Politécnica de Cataluña, Universidad Pompeu Fabra, Universidad de Gerona, Universidad de Lérida, Universidad Rovira i Virgili, Universidad Abierta de Cataluña, Universidad Ramon Llull, Universidad de las Islas Baleares, Universidad de Valencia, Universidad Jaume I, and Universidad de Cantabria y Universidad de Murcia. According to Anglada de Ferrer *et al.* (2005), its operations started in 1999 and it has over 2,700 theses with more than 160,000 consultations per month.

As for RECERCAT, this is a repository dedicated to gathering working papers, preliminary results and other unpublished or fringe materials from research work in the universities of Catalonia. At the present moment, only some of the libraries in the Catalan consortium are adding items to it, these being: Universidad Autónoma de Barcelona, Universidad Politécnica de Cataluña, Universidad Pompeu Fabra, and Universidad de Barcelona y Universidad de Vic.

In the case of Dialnet, the largest repository is that of articles from periodicals, with a total of 61,418 entries, while the second biggest deposit is the recently started collection of doctoral theses, in which several Spanish universities are participating. The Dialnet project commenced in 2000 at the initiative of the Universidad de La Rioja, with a view to offering summaries of items in Spanish journals. Other universities have gradually been joining in the project. According to ROAR the incorporation of OAI entries was started in December 2004.

Other noteworthy initiatives are *Tecnociencia E-revistas*, *Avalia* and *Invenia*. The first of these was set up under the sponsorship of the Spanish Foundation for Science and Technology (FECyT) to facilitate the inclusion of the Spanish electronic scientific journals in the *Tecnociencia* website, promoted by this foundation. The second is a portal for specialist literature related to health sciences. Finally, *Invenia* is an open-access collection compiled by a research and development website which includes the *Aedhe – Empresarios del Henares* business organization.

As projects covering single institutions, mention may be made firstly of the E-Prints collection of the Universidad Complutense de Madrid, with OAI entries from October 2004 onwards, according to ROAR having some 3,340 items. The two repositories maintained by the Universidad Politécnica de Cataluña, set up in 2005, have several hundred items. There is PFC, TFC i Tesines, comprising final year projects and

Table I.
OAI repositories
generated by Spanish
academic bodies

Repository	Body responsible	Type of content	URL	Directories
Avalia-t	Axencia de Avaliación de Tecnoloxías Sanitarias de Galicia	Scientific literature	http://avalia-t.sergas.es	ROAR
DIALNET	Universidad de La Rioja	Journals	http://dialnet.unirioja.es	OARDP ROAR
DIALNET-Tesis	Universidad de La Rioja	Theses	http://dialnet.unirioja.es	ROAR
E-Prints UCM	Universidad Complutense de Madrid	Scientific literature	www.ucm.es/eprints	DOAR OARDP ROAR
Invenia	Invenia	Scientific literature	www.invenia.es	OARDP
Technological Innovation Manuscripts-Incunables	Universidad de Valladolid	Library holdings: bibliographic heritage	http://gutenberg.dcs.fi.uva.es:8080	OARDP
RECERCA: Diposit de la Recerca de Catalunya	Consorcio de Bibliotecas Universitarias de Cataluña (CBUC)	Scientific literature	www.recercat.net/index.jsp	DOAR OARDP ROAR
Tecnociencia: E-revistas	Fundación de Ciencia y Tecnología (FECyT)	Journals	www.tecnociencia.es/e-revistas	ROAR
Tesis Doctorales en Red (TDX-TDR)	Consorcio de Bibliotecas Universitarias de Cataluña (CBUC)	Theses	www.tdx.cbuc.es	DOAR OARDP ROAR
Universidade da Coaña. UDspace	Universidad de La Coruña	Scientific literature	http://dspace.udc.es	DOAR OARDP ROAR OARDP ROAR
Universitat Politècnica de Catalunya (UPC) – DSpace.Revistas	Universidad Politécnica de Cataluña	Journals	https://eprints.upc.es:8443/revistes	DOAR OARDP ROAR
Universitat Politècnica de Catalunya (UPC) – PFC, TFC i Tesines]	Universidad Politécnica de Cataluña	Scientific literature	http://biblioteca.upc.edu/pfc	DOAR OARDP ROAR

reports, and dissertations (minor theses), amounting to 717 items and DSpace.Revistas with 594 entries. As for the repository of the Universidad de La Coruña, which started its operations in October 2005, it includes 263 items.

With regard to the software used by Spanish repositories, Dspace has been chosen by RECERCAT, Universidad de La Coruña and Universidad Politécnica de Cataluña for its collection of periodicals. The TDX-TDR repository uses ETD-db. For its part, the Universidad Complutense de Madrid makes use of the Eprints version Eprints 2.3.11. E-revistas uses the open-source software ARC developed by the Old Dominion University.

Several Spanish universities are currently working on the establishment of repositories: this is the case for the Universidad de Granada and their Project DIGIBUG. The present line of work of CBUC is directed to adapting printed periodicals to electronic format so as to facilitate access and preservation. This is the RACO project, which began towards the end of 2004. Finally, the consortium is working on a project for repositories for pictures, photographs, and digitised texts, as well as investigating the need for a repository for teaching materials.

Last but not least, mention must be made of the repository of manuscripts and incunabula at the Universidad de Valladolid, whose aim is the diffusion and preservation of the heritage of written and printed materials. It is with this same intention that the repository PADICAT is being set in train. This is given over to digital storage of the bibliographic heritage of Cataluña and is an initiative supported by the Library of that Region. It is not clear whether there is any initiative currently under way in the field of archives.

4. Conclusions

It may be observed that there is only a limited development of institutional repositories, although it is possible to detect a growing tendency to create them. In addition, in recent months there have been announcements of further projects from several universities.

At the present moment, these digital collections seem principally to be seeking visibility for scientific output such as theses, journals, work in progress, preliminary results and other fringe or unconventional literature, without currently making use of academic teaching and learning materials or corpora relating to the cultural heritage.

It would appear crucial for the repositories aimed at spreading knowledge of scientific research to set in place mechanisms for rigorous peer assessment, so as to ensure the quality of the scholarly work deposited. This is an essential step if open-access research is to gain the same recognition as work published in specialist academic journals.

It would be desirable for government to become involved in encouraging open access within a new model for academic communication. It would appear the time is now ripe to press for a national project to support e-science, along the lines of the French HAL (Hyper Articles on Line) initiative, and open archive in which all disciplines, institutions and universities deposit their research output.

In any case there is a need for active commitment by all those involved in the production of scientific knowledge, as also of those who manage the cultural heritage. There is also a requirement that the setting up of repositories of digital resources

should be supported by institutions that can guarantee their reliability as preservers of the scientific and cultural wealth of the nation over the long term.

Notes

1. www.fecyt.es/e-ciencia/libroblanco.htm
2. www.soros.org/openaccess
3. www.earlham.edu/~peters/fos/bethesda.htm
4. www.zim.mpg.de/openaccess-berlin/berlindeclaration.html
5. www.oecd.org/document/0,2340,en_2649_34487_25998799_1_1_1_1,00.html
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