Library and Information Science in Developing Countries:

Contemporary Issues

Adeyinka Tella
University of Ilorin, Nigeria

Abdulwahab O. Issa
University of Ilorin, Nigeria

Information Science
REFERENCE

Chapter 14
Establishing the Digital Library:
Don't Ignore the Library Standards and Don't Forget the Training Needed

Alan Hopkinson
Middlesex University, UK

ABSTRACT

The literature on Digital Libraries tends to be about developing your own digital library, but most usage of digital libraries worldwide is access to commercial databases of full-text material: initially scholarly materials, but more recently, newspapers and monographs. There is no difference in principle between the industrialized world and developing countries; everyone want to access the same materials. Electronic materials are cheaper to deliver to developing countries when compared with printed materials. The main problems concern spending wisely the little money that developing countries have and establishing the infrastructure to get the digital material to the users who need them. The standards needed to implement digital libraries are universal, and librarians in developing countries need to be aware of these standards and support their implementation in their systems, develop an appropriate infrastructure, and put resources into training so that the tools can be used to good effect. The Open Access movement must be taken into account and repositories set up for institutional materials as in the industrialized world.

INTRODUCTION

Much of the literature about electronic libraries is devoted to the implementation of software to host digital materials or deals with the technology of digitising one's own collection. Much of the published literature deals with projects some of which have become the foundation of technology for commercial applications. Dempsey (2006) discusses these kinds of aspects in his paper "The (Digital) Library Environment: Ten Years

After" where he considers how the digital library environment has changed in the ten years since *Ariadne* (an electronic journal about electronic library issues) was first published. However the majority of accesses to digital libraries worldwide are to the commercial digital libraries of journal articles and conference papers, with the recent addition of monographs which their publishers have allowed to be loaned for a set periods or sold outright over the internet. This material is devised by the owners of the material to be reasonably accessible with the proviso that they must protect the copyright of the authors and their own income from the sale or licensing for use of the material. Moreover since much material that used to be in print is now becoming digital only, this has management implications for libraries. Libraries have to set up new infrastructures to supplement the old printed collections and move towards a digital library which is unlikely to be totally digital for the foreseeable future but will be a hybrid library, a mixture of digital and print. This is the situation in the industrialized world but it cannot be and in fact is not very different in developing countries. Copyright is worldwide and establishing one's own digital library may be technically possible but it is fraught with the possibility of infringing copyright.

ACADEMIC MATERIAL IN DEVELOPING COUNTRIES' LIBRARIES

In developing countries there has always been a problem for libraries acquiring books and journals. In the days of print journals, they were too expensive to purchase at the price they were available in the industrialized world, and additionally there were postage costs to be accounted for making it actually more expensive to provide materials to developing countries than to the industrialized world. In the case of journals, there was a feeling that a run should be complete and subscriptions could often not be kept up for financial reasons. Today material can be transferred digitally either on CD ROM or over the internet which reduces postage charges although it requires a certain level of bandwidth if the material is accessed over the internet.

Electronic Journals

Digital journals (e-journals) have been in existence now for some years. Initially they were made available on CD-ROM for the benefit of developing countries, but nowadays a large number of academic institutions in developing countries have bandwidth good enough to download articles from e-journals. CD-ROM is now an obsolete medium except for organizations which are usually not-for-profit and provide materials for use in developing countries. For example CABI (Commonwealth Agricultural Bureau International) publish in partnership with KIT (the Royal Tropical Institute, Amsterdam) *TROPAG and RURAL*, a bibliographic, abstracting and indexing database that brings together literature on tropical agriculture from the developing rural areas of Africa, Asia, the Pacific and the Americas. This database is available on CD-ROM as well as on the Internet (updated bi-annually) (CABI, 2011). E-journals for the most part, especially those aimed at the industrialized world, are available today only on the internet and are not bought like traditional journals. A new publishing model has been devised and they are licensed and not purchased outright. Publishers have set up bundles of journals for sale to try and maximize their income. Libraries while purchasing bundles often gain access to journals they may not know about and which may not even be useful to the majority of their readers. Publishers have to take into account how easy it is for users to copy material and make it illegal. The photocopier made a difference to publishing as libraries had to set up mechanisms to ensure that the readers did not make copies of articles and sell them, so users can only photocopy items for

their own use. Digital material is even easier to copy and so the publishers have strictly defined through licensing what a user can do. Organizations like EIFL who claim (EIFL, 2010) to be *"Working in collaboration with libraries in more than 45 developing and transition in Africa, Asia and Europe, [to] enable access to knowledge for education, learning, research and sustainable community development"* have been instrumental in ensuring that organizations in developing countries are able to access this material which is available using a new publishing model. However many journals have back files which may or may not be available only while the current subscription is kept up. Even the wealthiest libraries in the world have been concerned that if a publisher goes out of business or gets taken over by another organization, libraries which have paid for a license for journals may not in the end get access. To alleviate this, libraries have formed a consortium based at Stanford University in the USA known as LOCKSS, Lots of Copies Keeps Stuff Safe, (LOCKSS, 2008) which obtains permission from the owners of digital data to host the material on multiple servers belonging to the consortium members. Access to this can be activated if a company goes out of business or even if a server goes down for a limited period of time. It could for example be activated if internet connection fails between the host and the customer.

Electronic Books

E-books have been around for a number of years but they are only just beginning to take off. They have existed as CDROMs for some time since publishers do not seem too concerned about their being copied which would be possible with computers today. At the University of York, for example, (University of York Library 2010) they have on CD-ROM Cambridge Grammar of English, Digital Domesday, Hengwrt Chaucer, History of Parliament, Margaret Thatcher Public Statements, and Pevsners Buildings of England.

As compared with e-journals, it has been even more difficult for publishers to come up with a purchasing model which would suit libraries and or individuals. A book is much more valuable as a commodity for a publisher than an article in a journal so a publisher is likely to make much greater effort to ensure it is not freely copied to the extent that it may not be easily available at all. Additionally the e-resource hosts have had to come up with the technology to support the solutions devized. Library book suppliers have become involved since their customers have been pushing them to make e-books available to their users. These suppliers, such as Dawson Books and Coutts, have set up hardware platforms for the storage of e-books. Library users can download these or read these in a web-browser. Either way the user is identified by logging on to the platform. Different library suppliers have a different selection of books on their platforms. Basically the users can be told to access the URL of the suppliers, and then log in making themselves known to the platform.

The digital material is usually if not invariably accessed through Adobe Acrobat which reads PDF files. PDF files have incorporated certain features to prevent the files being copied or if they can be copied and stored on a computer they will expire after a certain amount of time: in this case, the number of days requested by the user as a loan. Incidentally this often requires the library to have the latest version of Adobe mounted on the servers in the library. If you are reading a document through a browser, it is often loaded page by page to the computer (to stop mass copying of a file). When Adobe is installed on a computer, it can be set up in such a way to disable some features essential for reading digital material of this kind. This can cause problems when users in a library attempt to access and read an e-book.

In one model, the book is 'virtually' issued to the reader so that no other user can read it. It can be issued for a number of requested days and the platform will usually impose a maximum.

A library can purchase more than one copy of a book so more than one reader can read it at once.

Another model again requiring the user's identification allows the library to buy a certain number of accesses per year, say 500. The library will have to purchase further accesses in the second and subsequent years. If 500 are exceeded within a year the library can pay for more.

A third model permits multiple simultaneous 'virtual borrowings' and averages them out. If the access is frequently more than one at a time the library will be asked to contribute to extra licenses. This requires 'supervision' by the system with a report which currently would be made by manual intervention.

Any of these models may have added to them a facility to enable the user to purchase a copy for themselves. Problems may occur as a user in a library will not want the file to be restricted to the computer at which it was purchased. The user may have to create an account on the server from which the file is downloaded. In practice it appears users can save files to a USB storage device. It also requires the library reader to have a debit or credit card account.

The e-books market for loaning e-books in libraries is still in flux and it is not yet clear what is being done by the publishers for developing countries in the way that affordable licenses have been provided through the intervention of organizations like EIFL.

MOVES TOWARDS OPEN ACCESS

Books are usually published by a single author. The publisher is protecting the author's rights by setting up mechanisms to prevent mass copying. The author will receive royalties. However traditionally authors are not paid for journal articles. Publishers have set up infrastructures to enable journal articles to be read. In the past they printed journals and mailed them to libraries or individual subscribers. Now they provide internet access and other value added services which are not there in traditional journals such as access to full text which can lead to researchers discovering more relevant articles of interest to them. The indexes may be available universally across the internet. The actual content will only be available either to subscribers or on an individual charge basis. Publishers do not usually worry too much about individual articles being copied as they make their money from subscriptions. Libraries in many countries have made agreements with publishers to allow library users to copy proportions of a journal for their own use. This is not easy for a library to police.

Newspapers are still treated in this way as people want to buy a physical newspaper to read. Many newspapers made available a digital version alongside the printed making it freely available for publicity purposes. Sometimes it is a reduced version of the published version and may have advertisements which generate extra revenue for the publisher. This is changing as quality readers are introduced which enable the user to download the content of newspapers and read them. Some specialist newspapers which are mainly purchased by subscription have provided a digital copy alongside to subscribers only. The New York Times similarly made a subset of its content freely available with the possibility to subscribe for more. Mostrous (2010) reports that *The Times* (of London) was due to start charging for its digital version in June 2010 as indeed it has always charged for its digital back files (to defray the cost of digitization for earlier issues), but current issues are now immediately available in digital form since printed copies are derived from digital. Newspaper readers are now having them delivered to electronic book readers including iPads. *The Times* has a special iPad application to enable people to read the newspaper on an iPad.

In the case particularly of e-journals, a situation can arise where an author writes an article but cannot allow his students to see a copy because neither the author himself (usually) nor the

library at the institution where he teaches (often) subscribes. Authors are usually nowadays offered an electronic equivalent to an off-print for their own use to appease the many authors who would not otherwise see their own articles in print. This copy will usually last for ever but the Publishers do their best to ensure it cannot be copied indefinitely.

A number of organizations have felt that there is an injustice here. Universities and research funders pay for research to be done. Publishers make this available without paying for the privilege. E-journal publishers such as Elsevier have made large profits. The British House of Commons Select Committee on Science and Technology summoned Elsevier to answer questions as a result of which they have allowed content to be placed on servers, but not in the published format, sometimes without illustrations (Elsevier, 2004). Universities and research institutions have been encouraged to set up servers with free access from the internet for their own researchers' output and place on the servers, with permission, the text of the research.

Various open access initiatives have been formed. At Southampton University Stefan Harnad, a professor in electronics and computer science, was perturbed by the situation where academic work is no longer affordable to the researcher and the publishers are in effect censoring the work by price. He has therefore developed software called eprints (Harnad, S., 2009) and established an organization eprints.org with its website to distribute the software. This is freely available to anyone to use to set up an electronic library of journal articles. This software was used by 269 libraries worldwide as of December 2010. Developing countries material is often found in repositories in industrialized countries when authors write joint papers.

The UK Joint Information Systems Committee of the UK Higher Education Funding Council have set up a project called SHERPA (www.sherpa.ac.uk) which *catalog*s the permissions that can be given for authors to place the articles they have written on their institution's repositories. Most universities in the UK have set up repositories for their academics' articles to be stored in digital form.

The availability of articles as e-prints replaces the custom which was prevalent until the 1990s of authors receiving from the publisher off-prints and posting them to requesters. Institutional repositories are the main type of digital library which a library can regard as representing its own collection but to comply with copyright many of the items will not actually be present but will be only links to the publisher's website where searchers will probably find that they do not have the rights to see the material itself.

LIBRARY CATALOGS AND CATALOGING FOR THE DIGITAL ERA

Electronic resources are therefore available for many kind of materials. How can a library user find these? Libraries traditionally have purchased books and cataloged them. Journals usually receive one entry in the library catalog giving details of the holdings. What happens with electronic materials? There can be few libraries in the industrialized world that do not have an online public access catalog. These catalogs store records which can be imported through the MARC record structure. This is a standard developed in 1966 for the Library of Congress to enable it to circulate electronic records rather than catalog cards, the original intention being that libraries would produce their own catalog cards. Catalogs around the world, ranging from OCLC's Worldcat to the smallest special library, can download records from each other's databases. Records are available for digital materials as well. MARC records consist of fields which can be separately manipulated for display in a catalog. Serials Solutions is a company that can provide records for journals

to supplement those cataloged by the catalogers. Serials Solutions work with electronic journal suppliers such as EBSCO to provide a record of what the library is entitled to (Serials Solutions, 2010). Many journals are, as mentioned above, now sold as bundles and libraries would not have time to catalog all the journals to which they are entitled without the services of organizations like Serials Solutions. A data element has been added to their MARC catalog records to hold the URL where the electronic journal or e-book is found. The situation is made more complex by the fact that there may be different routes to electronic material not all of which have been licensed by an individual library. Free journals are included as well. Additionally libraries can add their own e-books which are freely available on the internet. For example, in the UK, government reports used to be published and printed by HMSO (Her Majesty's Stationery Office). When an important report was released people would queue outside their bookshop to purchase the report. Today these reports are available online so the cataloger in the library needs to create a record for them and link to its location (URL) on the internet. Subject librarians need to work closely with catalogers to get the material included in the catalog on time.

These records are available only to those catalog software packages which have implemented the MARC format. Systems need to be developed in line with standards. Most packages have implemented the MARC standard including two widely used in developing countries, the CDS/ISIS family of software and ABCD which is currently being developed to supplement and supersede CDS/ISIS (Hopkinson, A. 2009). The MARC standard is itself dependent on other standards. The ISBN comes to mind. Records can be selected from external databases using the ISBN to get the exact record. A cataloger with a book in front of him or her can request the records from external databases using the ISBN. ISBN is a 10 or 13 digit number which uniquely identifies any edition of a book. In the case of ISBNs used with e-books the book trade has decided to allocate a separate ISBN to each copy from each different host as the book trade is using ISBN for rights management, to determine the royalties that should be paid via each supplier. ISSN is often used as a unique identifier in systems for digital journals. Underlying traditional catalogs are cataloging rules. To the same extent they are necessary in the digital era to provide consistency of access points. Digital materials are too numerous to catalog in the traditional way and because they are often accessible as full text they do not need so much cataloging Therefore records have been created using Dublin Core since the Dublin Core Metadata element set has been developed for cataloging digital materials. Incidentally Dublin Core has been adopted first as an American NISO standard (ANSI, 2007, May) and subsequently as an ISO standard (International Organization for Standardization, 2009). But MARC is the main standard for the storage and exchange of bibliographic records and it in turn derives its data element definitions from the *Anglo-American Cataloging Rules*, soon to be superseded by RDA, *Resource Description and Access* which was published in 2010 (Joint Steering Committee for the Development of the RDA, 2010).

Potentially every computer could store its data in a different way but in practice systems use the same character sets which have been developed from standards. Libraries needed diacritics long before other IT systems and so there is a suite of character sets for different languages and scripts. These have now to a large extent been superseded by UNICODE (International Organization for Standardization, 2011).

If your integrated library system does not use these standards it will be difficult to participate in the international information community which all libraries need to be part of today.

SETTING UP THE INFRASTRUCTURE

It is not self-evident how a library must set up its infrastructure for e-materials. If a library has many runs of journals some of which finish abruptly it may be that they finish abruptly because they are now digital and no longer published in print format. A note could be put at the shelves; or students can be persuaded instead to find anything they want by looking in the catalog first before going to the shelves. Journals and electronic books some of which may be free-of-charge may be added by the cataloger to the catalog as mentioned in the previous section including in the catalog record a link to the location on the internet, the URL. Journals and books can be seen physically in a particular location. How can students know about digital materials which are not physical but virtual? It is necessary to promote their existence in a more active way than it was with printed materials. Training may be required for librarians in this. In some countries there is a tendency for librarians to feel they do not need to be involved with electronic materials. They are found on the internet and only accessible through computers so they are the province of the Information Technology (IT) department, or so goes the thinking. IT professionals on the other hand are not specialists in searching for or through the content of electronic materials. They do not wish to be bothered to give out passwords. Librarians are the best people to look after electronic libraries and training is needed for them to learn to set up an infrastructure.

Establishing the infrastructure is not that difficult. The catalog can and probably should be the basis for it. In the MARC format there are many different fields for different purposes, identifying different parts of the bibliographic record. There is a field 856 which is intended for the URL which the licensor of the material has made available to a library to allow it to have access to the material. On the other hand this can usually be found otherwise by doing a search in Google for the title of the journal or other resource. Some electronic libraries require, particularly for single monographs, the library user to go into their own website and register themselves there so it will not be possible to go direct from the library catalog to the resource itself. One such example is the British Library's pilot database of UK theses eThos where the user must be taken to the front page of the database and then make their own search within, even though downloading an electronic copy is completely free-of-charge. This is so that the British Library knows who has been searching for and downloading theses. Before digitization each requestor of a thesis had to sign a sheet in the thesis to indicate they had read the thesis. This was to enable the detection of plagiarism.

Many electronic resources are freely accessible. These include government publications from around the world, journals which are open access (found through the *Directory of Open Access Journals* at www.doaj.org, for example and many other websites produced by informal publishing). Links to the URLs can be made from the catalog to those which are likely to be of use to the users of the catalog. Those journals which have commercial publishers will require some kind of authentication. The most common way for this to be done is by IP address authentication. 'Internet Protocol' is a methodology used by the internet to enable messages sent through the internet to go to the correct destination. It consists of a 4-part number (e.g. 158.94.64.59). One institution might have the entire set of numbers beginning 158.94. The library registers its IP address range with the publisher and the publisher's computer is aware that any access (i.e. request for data to be transferred) from the computers with those IP addresses is legitimate. This does not allow users to access from other locations. So if a student is not on-campus he or she will not be recognized by the publisher's computer. A further method is by username and password which will allow access from anywhere. Of course there are op-

portunities for fraudulent use by users offering their passwords to other persons. Internet access is controlled in such a sophisticated way that it is often possible for computers to check on accesses using the same user name from different parts of the world and block these users from continuing to access the materials. Additionally there is a system called Shibboleth which in the UK is supported by Eduserv through a system known as Athens. Publishers allow access through this system which allows usernames and passwords identifying a user belonging to an institution to gain access from inside or outside of the IP range. More information was made available about this at the CALIBER Conference in 2009 in Pondicherry in the workshop led by John Paschoud (Paschoud, 2009). The main source of information of Shibboleth is on its website at http://shibboleth. internet2.edu/project.html.

Additionally there is a product called EZproxy (pronounced easy proxy) which enables a systems librarian to set up access for all resources requiring IP authentication from a computer outside the registered IP range by means of a proxy server. The URL included in the catalog includes the address of the proxy server and can be an alternative to the normal URL via IP address. Here is an example: http://ezproxy.mdx.ac.uk/login?url=http://portal. acm.org/citation.cfm?id=J832&picked=prox

This is the method of getting to http://portal. acm.org/citation.cfm?id=J832&picked=prox via Middlesex University's proxy server.

We mentioned above the need to make access available via the catalog. This does not preclude additional lists of resources which are available, such as lists of journals or databases in alphabetical order or classified by subject. Of course this will be a necessary way of dealing with access in those universities which do not yet have any integrated library system with a public catalog. Establishing access to the e-resources which are available in a library is very time-consuming. Incidentally these lists of electronic journals and databases can also be provided but at a cost by companies such as EBSCO and Serials Solutions in their 360 services (Serials Solutions, 2010).

TRAINING

Librarians need training to be able to serve their users in the digital era. Setting up the appropriate infrastructure, indeed understanding the digital information topography, are best learned by experience. In the industrialized world this infrastructure has been evolving along with and alongside the information world over a period of 15 years. At Middlesex University for example, we have provided the physical infrastructure through an extensive program of providing hardware for students and academics to use, network infrastructure for them to be able to access the internet and authenticate themselves to the publishers' websites and the staffing infrastructure to support this and supply training for our own users to the extent that is necessary. As a result of having developed our own systems, we have been able to invite people from developing countries including Bangladesh, Ghana, India, Kenya and Nigeria under the Commonwealth Professional Fellowship scheme to see how we do this and take the knowledge back and share it with colleagues in their own countries (Commonwealth Scholarships Commission, 2010). We participated in a project to improve the physical infrastructure of the Yerevan State University library by providing under a European Union funded project servers for a virtual learning environment and training in the use of new technologies. We realized that the most important activity was to train the librarians in using the new technology, after persuading them it was their responsibility and not that of IT staff. This resulted in a further EU-funded project which expanded from Armenia to Georgia and Uzbekistan (Zargaryan, 2009). Library staff and university lecturers went to Robert Gordon University in Aberdeen to participate in a master's course in library and information science

and one of the results of that was that on their return some of the participants from the Ilia State University Library in Georgia produced in their own language a very attractive poster and leaflet promoting the electronic resources that are available to their members and explaining how they have to be accessed.

Libraries today need to provide training in information literacy as well as promotional material and guidelines for their use as most databases have different access methodologies. There needs to be an induction session for all new students in every university library as to how to access the electronic resources that are available. This can be quite difficult for new students to follow as they have so many other things to learn on arrival, so there must be follow up sessions and tools on the library website to help students and other members of the university. Library staff of course also need to be trained to be one step ahead of the students. There will be today in most universities in developing countries academic staff who have studied recently in universities in the industrialized world and they will expect to see the same kind of facilities to be introduced if they are not already available. In an earlier TEMPUS project that the author undertook with Robert Gordon University in Syria (European Union TEMPUS, 2006) we set up a website to access the electronic resources which had been negotiated by EIFL on behalf of the Ministry of Higher Education in Syria (SYReLIB e-library, 2010). We held a seminar using the website as a way of introducing information literacy to the librarians and this was attended also by a law lecturer who wanted, for himself, to know what was available as he had found e-resources invaluable whilst undertaking a doctorate in western Europe. We also helped to organize the dissemination of passwords to potential users.

CONCLUSION

Becoming part of the universal digital library requires a library to provide an infrastructure to enable its users to access externally held materials from the universal digital library. The internet requires a much more sophisticated interface to enable the merging into a library's collection of external digital resources. It also requires the library management system to adhere to standards to enable this interface and requires also a certain level of information literacy in its library staff to develop the same for the users of the library. Training programs of various kinds need to be established to enable the librarians to become librarians in a digital world and pass on the information literacy skills required to their library users. Many institutions now have the bandwidth to access e-resources from the internet, but do they have the infrastructure?

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