

INFORMATION AND COMMUNICATION TECHNOLOGIES: OPPORTUNITIES AND CHALLENGES FOR NATIONAL AND UNIVERSITY LIBRARIES IN EASTERN, CENTRAL AND SOUTHERN AFRICA¹

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ABSTRACT

Organizations, including governments, in the world today are taking advantage of the many opportunities provided by modern Information and communication technologies (ICTs). To libraries, ICTs present an opportunity to provide value-added information services and access to a wide variety of digital-based information resources to their clients. Further, libraries are also using modern ICTs to automate their core functions, implement efficient and effective library cooperation and resource sharing networks, implement management information systems, develop institutional repositories of digital local content, and digital libraries; and initiate ICT-based capacity building programmes for library staff and information literacy programmes for library users. However, for most libraries in sub-Saharan Africa, including the SCANUL-ECS region, use of ICTs is largely restricted to traditional library automation, i.e. replacing manual operations by computerised methods. Innovative use of information and communication technologies in libraries is not widespread and it is made difficult, if not impossible, by several challenges or constraints, including lack of funds to sustain the ICT infrastructure, inability by librarians/libraries to keep up with the pace of developments in ICTs, inadequate ICT facilities in the libraries, lack of staff with appropriate skills to manage ICTs both at the strategic and operational levels, absence of institutional policies and strategies to support and guide the use of ICTs, and lack of adequate knowledge and skills to manage digital information resources and to deal with issues relating to copyright intellectual property rights in a digital information environment.

1. INTRODUCTION

Information and communication technologies (ICTs) is defined as a diverse set of technological tools and resources used to communicate and to create, disseminate,

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store, and manage information (Blurton 1999:46), and they encompass a wide range of rapidly evolving technologies including telecommunications technologies, such as telephony, cable, satellite, TV and radio, computer-mediated conferencing and videoconferencing, as well as digital technologies, such as computers, information networks (Internet, the World Wide Web, intranets and extranets) and software applications.

ICTs came about as a result of the digital convergence of computer technologies, telecommunication technologies and other media communication technologies. The adoption and use of ICTs by organisations and individuals is more wide spread in the world today than before. ICTs are being used in health, military, agriculture, education, commerce, and many other fields. ICTs are also being used in various types of libraries.

The central purpose of libraries is to provide a service: access to information (Buckland 1992), and modern information and communication technologies, especially computers, information networks and software applications, are making it possible for libraries to provide a variety of library and information services to their clients. Taking into account the rate at which innovative use of ICTs is being introduced and the ever declining costs of ICT facilities, it will not be long before libraries also start using satellite and mobile phone technologies to deliver information services to their clients located in remote and inaccessible areas.

Although there are several libraries in the world that are yet to use computers or automate their core functions, it is important to note that libraries were among the early institutions to consider using information technologies. For example, in 1958, the Library of Congress considered using computers (Lilley & Trice 1989:46) and in the same year the Director of the National Library of Medicine (NLM) in the United States, Dr. Frank B. Rogers, began looking into computer use, and during the early 1960s, the NLM hired General Electric's Defence Systems Department to develop a new "*method of using computers for composition, storage, and retrieval, and printing services for Index Medicus*" which resulted in the development of MEDLARS (Medical Literature Analysis and Retrieval System) (Adams et. al. n.d.).

Libraries in Eastern, Southern and Central Africa (referred to in this papers as the "sub-region") have not been left out on the adoption and use of ICTs in the provision of library and information services. University libraries in the sub-region, especially those in South Africa, have been leading the way in the adoption and use of ICTs in libraries in sub-Saharan Africa. Slowly the use of ICTs has spread to other types of libraries, i.e. national libraries and public libraries (Chisenga 2004). However, there are disparities in the numbers of ICT facilities available and in the levels of ICT usage among the libraries within the same country and between countries in the sub-region³. The disparities can be attributed to a number of factors, among them the lack of

³ The author is aware of the disparities existing among libraries in South Africa, and between South Africa and the rest of the countries in the SCANUL-ECS sub-region.

awareness about the opportunities provided by modern ICTs to libraries and several constraints faced by librarians/libraries when implementing ICT projects.

2. THE OPPORTUNITIES

Although the discussion below examines the opportunities presented by ICTs to all types of libraries in the world, the key question being discussed is the following:

- What is it that university and national libraries in Eastern, Central and Southern Africa have been doing or not doing that can now be done better using modern information and communication technologies?

There are several functions and activities that libraries have been performing which can now be done better using ICTs and at the same time there are others that previously were difficult or impossible to carry out which are now possible as a result of ICTs. Today, the major opportunities presented by ICTs to libraries are mainly in the following areas:

- Organization of information for use
- Provision of value added ICT-based information services
- Library cooperation and resource sharing
- Management information systems
- Institutional repositories (digital local content)
- Digital libraries
- Capacity building

2.1 Organisation of information for use

Traditionally, computers in libraries have been used and are still being used by a large number of libraries to automate (replace manual operations by computerised methods) all or some of the following core library activities:

- *Acquisitions and budgets*, i.e. creating and processing book acquisitions and printing of book orders
- *Cataloguing*, i.e. creating online bibliographic records
- *Circulation control*, i.e. registration of library users, issuing of library materials, making reservations of materials, generation of circulation statistics
- *Serials Control (Periodicals)*, i.e. generation of subscription notices for serials, processing of serials
- *Online Public Access Catalogue (OPAC)*, i.e. providing access to the library catalogue
- *Short loans and reserves (especially in academic libraries)*, i.e. issuing of materials on reserve.

There are several off the shelf library software systems (i.e. Millennium, Horizon, Adlib, Amlib, LibrarySoft, etc), and OpenSource systems such as UNESCO's CDS-ISIS, Koha and Emilda, available for automating the above library functions. In addition to library automation, libraries are also using ICTs to execute a variety of office operations such as word processing, accounting, database management, and communication (i.e. using electronic mail), using off the shelf software applications such as Microsoft Office Suite, Lotus SmartSuite and Corel WordPerfect Office.

Considering that the costs associated with ICT facilities, especially computers, are much lower than they were in the age of mainframe and minicomputers, the use of computers to automate library functions is a major opportunity now available to most libraries in sub-Saharan Africa. Unfortunately, library automation in sub-Saharan Africa has been rather slow and there are libraries on the continent that are yet to automate their core functions. Results of a study of the current status of digital libraries in universities in sub-Saharan Anglophone Africa (excluding South Africa)⁴ conducted by Rosenberg (2005), from September 2004 to January 2005, highlights the current situation regarding library automation in Africa. Among the 62 university libraries whose responses were analysed, the results showed that library automation among them began in the early 1990s' and:

- Only nine (15%) libraries considered themselves to be fully automated
- Forty libraries (65%) were yet to complete the library automation process. Either they were still working on the automation of the cataloguing process or had not moved to other processes
- Thirteen libraries (21%) had not started any automation.

A study on the use of ICTs in African public libraries⁵ by Chisenga (2004) also showed similar results. Out of 22 libraries that participated in the study only three (14%) libraries were fully automated, four (18%) were still in the process of automating their core activities.

2.1.1 Remotely hosted library systems

The Internet and the World Wide Web (WWW) have provided a different dimension to traditional library automation. Traditionally, libraries have installed automated library systems on computers located within their premises or those of the parent institution. This arrangement is slowly changing. Now it is possible for suppliers of automated library systems to host the system on their computers and allow libraries that either do not have an adequate ICT infrastructure or simply do not want to maintain their own system, to use the system. The libraries, using the Internet and the Web, are able to conduct library functions such as processing of acquisitions, cataloguing, issuing of loans, and provision of access to the OPAC, remotely, while the supplier of the system

⁴ Of the 17 countries included in the analysis of the results, only three countries - Cameroon, Ghana and Nigeria do not belong to the sub-region.

⁵ The study also included national libraries and out of 10 countries that were covered, Ghana and Nigeria are the only countries that do not belong to the SCANUL-ECS region

takes care of software upgrades, security, system management and maintenance. Remotely hosted library systems are also being implemented by consortia of libraries.

Examples of remotely hosted library systems include the following:

- LibraryNet Web Server (<http://libraryworld.net/cgi-bin/home.pl>)
- Unicorn Library Management Systems available under the Sirsi.net Hosted Services (<http://www.sirsi.net>)
- Autolib.ASP (<http://www.autolib.co.uk/autolibASP.asp>)
- PALS Library System (<http://www.libtech.co.za/home.htm>), which is being used by some public library systems, among them the Mpumalanga Provincial Library and Information Services, in South Africa.

2.2 Provision of value-added ICT-based information services

Traditional library automation and use of computers for office automation is largely geared towards improving the efficiency of internal library operations, and doing library work more economically. Modern ICT tools, especially the Internet and Web-based technologies, now provide libraries with an opportunity to offer library users with access to a variety of value added library and information services, including:

- Web-based Online Public Access Catalogues (OPACs)
- Networked digital information resources
- Electronic based interlibrary loan and document delivery services
- Online user education
- Readers' advisory and e-reference services
- Providing facilities for accessing information

2.2.1 Web-based Online Public Access Catalogues (OPACs)

The Internet and Web-based technologies have made it possible for libraries to provide access to their catalogues on the local intranets, extranets and sometimes via the Internet. This arrangement, especially when the OPAC is available on the Internet, makes it possible for library users to access the facilities from anywhere in the world and for 24hrs a day, 7 days a week. This is possible because most library software systems now include Web-based interfaces to OPACs, as opposed to telnet-based access systems. Library users also find it easier to learn and use the OPACs from different library systems since they only have to know how to use one universal access client, the Web browser. Web-based OPACs also allow for linking to other information resources such as tables of content, full-text documents, and works/titles by the same author.

A quick scan of the Web for library OPACs in the SCANUL-ECS region, on 21 January 2006, revealed that universities are providing access to their OPACs via the Internet.

The author was able to access and search the OPACs of several university libraries in South Africa, and of the following institutions:

- Makerere University, Uganda
- Sokoine University of Agriculture, Tanzania
- University of Botswana
- University of Dar es Salaam, Tanzania
- University of Nairobi, Kenya
- University of Namibia
- University of Swaziland
- University of Zimbabwe

Libraries that have automated their functions but whose OPACs are not accessible on the library Web pages include the Thomas Mofolo Library of the National University of Lesotho and the Copperbelt University (Zambia). The University of Malawi Library's OPAC is only accessed via the local intranet/network; the pages of the University of Zambia Library could not be retrieved because either the pages had been removed or were temporarily unavailable; and the link to the OPAC of the Catholic University of Angola was not working.

Noticeably, national libraries from the sub-region are missing from among the libraries that are providing access to web-based OPACs. On the member's list of the SCANUL-ECS websites (<http://www.scanul-ecs.org/membership.asp>) only the National Library of South Africa (NLSA) and Kenya National Library Services (KNLS) are listed as having websites. Visitors to the website of the National Library of South Africa (<http://www.nlsa.ac.za>) can access its OPAC at <http://natlib1.unisa.ac.za>; while although the Kenya National Library Service has a website (<http://www.knls.or.ke>) there is no link to its OPAC. Meanwhile the Botswana National Library Service which has computerised its functions and has an OPAC does not have a Website through which online access to its OPAC can be provided.

2.2.2 Networked digital information resources

Modern ICTs have made it possible for libraries to provide their users with access to networked digital information resources, i.e. online databases, electronic scholarly journals, encyclopedias, public government information, etc, provided by various publishers or suppliers. In cases where information resources are supplied by commercial suppliers, libraries are negotiating agreements on behalf of their users, for the rights to access these resources. Library users connect to networked information resources using Web browsers running on workstations in their offices or at home, or public workstations located in the library or at cyber cafés. It is also now possible for libraries to provide customised information services delivered directly to library users' desktops and this is being achieved using portals which are defined as Web-based applications accessed over the Internet, intranet or extranet, that provide a personalised and adaptive interface which enables users to discover, track, and

interact with other people, applications, services and information relevant to their interests (Chisenga 2004, Morrison 2000).

Connecting to networked information resources has made it possible for library users to access more electronic information resources than those actually owned by their libraries. More and more libraries in sub-Saharan Africa are taking advantage of the availability of online resources to supplement the library and information services being provided to their clients. In the study by Rosenberg (2005:8), only six (10%) out of 62 libraries indicated that they did not offer access to e-journals. Libraries, especially university libraries, in qualifying countries⁶ in the SCANUL-ECS region, are providing access to various external online resources including access to more than 800 journal titles (full-text) on the Access to Global Online Resources in Agriculture (AGORA) portal (<http://www.aginternetwork.org>) provided by the Food and Agriculture Organization of the United Nations (FAO) and its partners, and to more than 3000 journal articles provided on the Health InterNetwork Access to Research Initiative (HINARI) portal (<http://www.who.int/hinari/en/>) a system run by the World Health Organization (WHO). In addition to these resources, libraries participating in the Programme for Enhancement of Research Information (PERI) by the International Network for the Availability of Scientific Publications are able to provide their clients with access to several online databases and to over 17,000 full-text journal titles.

In addition to providing access to external networked digital information resources, some libraries in the SCANUL-ECS regional are also making use of ICTs to provide access to local databases either on the intranet or the Internet. For example, the University of Dar es Salaam is providing access to about eight local databases on the intranet. These include Biodiversity Database, Regional Bibliographies Database, Civil Society Bibliographic Database, Profile of Civil Society in Tanzania, and the Database of African Theses and Dissertations (Tanzania). Visitors to the website of the National Library of South Africa (<http://www.nlsa.ac.za>) can also access and search the Index to South African Periodicals (ISAP) and the national bibliography, a list of records for items received by the National Library of South Africa on legal deposit; and the National Library of Namibia's NAMLIT database can be accessed <http://www.wisis.unam.na/www.wisis/NML.01/form.htm>. NAMLIT database is hosted by the University of Namibia Library and contains bibliographic records of documents about Namibia and/or published in Namibia.

2.2.3 Interlibrary lending and electronic document delivery

As opposed to the traditional interlibrary lending (ILL) system, which relies on postal services to deliver print-based documents to users, ICT-based interlibrary lending

⁶ Countries with an annual GNI per capita per annum of US\$1000 or less at 31 December 2000 qualify to access AGORA for free; while countries with GNP per capita below \$1000 are eligible for free access to HINARI and institutions in countries with GNP per capita between \$1000-\$3000 pay a fee of \$1000 per year / institution to access HINARI.

systems use electronic networks to deliver copies of journal articles and other documents in digital format (mainly in Portable Document Format (PDF) to users' desktops. For example, using the Ariel document delivery software, libraries can scan articles, photos, and other documents directly; transmit the electronic images to other Ariel workstations anywhere in the world, using either FTP (File Transfer Protocol) or e-mail; and convert them to PDF for easy patron delivery (Infotrieve 2004). The major implication of this arrangement is that it is now possible for library users to get their articles requested through interlibrary lending systems within the shortest possible time. All things being equal, it is possible to get journal articles from a library across the globe within minutes. In addition, pilfering and sometimes loss of materials on interlibrary loans sent via the post, which occurs in some countries, is now a thing of the past.

However, one aspect worth noting regarding e-resources and interlibrary lending is that in some cases the licensing arrangements prevent libraries from "loaning out" the materials they hold electronically. Therefore, even if the e-resources are available, a library, depending on the agreement it has with the supplier of the e-resources, may not be able to fulfill the interlibrary lending requests.

In the SCANUL-ECS region, the only existing formal interlibrary lending network that has adopted the use of ICTs facilities (Ariel) in its operations among its members is found in South Africa. In September 2005 the network had 88 sites using Ariel, including one site in Botswana (the University of Botswana) and three sites in Namibia (among them the University of Namibia) (SABINET Online 2005). Libraries outside the South African ILL network, i.e. those participating in the PERI programme, are also able to obtain journal articles electronically from the British Library's document supply service.

2.2.4 Online User Education

Libraries are using ICTs, especially the Web, to implement online based bibliographic or library use (library literacy) programmes targeting their clients. Among others, these programmes include online or CD-ROM based tutorials on searching online resources and virtual tours of library collections, and these are mainly accessed on intranets, extranets or the Internet. Use of ICTs enables libraries to avoid problems associated with the use of lecture-based approaches or library orientation programmes. Problems such as dealing with large numbers of students or having a shortage of staff to deliver the programmes or too little time to deliver so much information to students. In addition, ICTs offer students an opportunity to follow the programmes at their own pace in their own time.

In the SCANUL-ECS region, the use of the Web to deliver library literacy programmes is not wide spread. The common and popular method of delivering user education programmes is by means of lectures and library tours (orientation programmes). However, some university libraries are using ICT based methods/means to deliver their information literacy programmes, among them are the University of Botswana which

uses Website (Fidzani and Molebatsi 2005:26), Monash South Africa which is providing online self-help tutorials (Kibirige 2005:132), Rand Afrikaans University (now University of Johannesburg) which is delivering information literacy course through WebCT on Edulink (Molepo & van Vuren 2005:144), and the University of South Africa which is using Web-based tutorials (Selematsela & ten Krooden 2005:150). The Sokoine University of Agriculture also has a tutorial on Information Search Technique on its website, and the University of Pretoria has developed an online tutorial - *Academic Information Service Training Tutorial* - which helps library users to get to know the library and its services better. The tutorial is accessible on the Library website at: <http://www.ais.up.ac.za/opleiding2005/home.htm>.

2.2.5 Readers' Advisory and E-Reference Services

ICTs offer libraries an opportunity to provide Web-based versions of readers' advisory services and reference services. These include services such as informing users via the Web about new releases or additions to the library collection, selective dissemination of information (SDI), announcements, and facilities for readers to interact with the reference staff (Virtual Reference Desks), etc. In academic institutions offering courses via distance learning, libraries are able to support their students through ICT-based advisory services.

Several university libraries in South Africa are also providing access to various readers' advisory services and e-references. For example "Ask A Librarian" services are available on library websites/webpages of the University of Pretoria, University of the Free State, University of Johannesburg, and the University of the Witwatersrand. In Botswana, students registered on distance learning at the University of Botswana, through the Library's website, can complete a form and request for information services. Students can also request for materials on interlibrary lending and renewal the loan period for library books.

2.2.6 Providing facilities for accessing information

Information and communication technologies have made it possible for libraries to act as access points to the global information resources. Libraries are providing computers, Internet facilities and other ICT based facilities for use by library users, generally at no cost to library users.

In most countries in sub-Saharan Africa, few public institutions and homes have access to computers and Internet facilities. Therefore, library users are looking up to national libraries and public libraries to provide them with the infrastructure and facilities to enable them have access to global information resources. Unfortunately, a large number of national libraries are not in a position to provide ICT facilities for public use. In some libraries where the facilities are provided, users are asked to pay for the use of the facilities, as is the case at the *Kenya National Library Services (KNLS)*. KNLS runs a cyber cafe at its headquarters where 15 computers are connected to the Internet. The services offered at the cyber café include Web browsing, access to e-

mail services via Yahoo or Hotmail, access to CD-ROMs, word processing services and access to online periodicals, books and databases (Ondari & Kitendo 2004: 62).

In universities, the situation is equally the same. A large percentage of the student population do not own computers, do not have access to telephone facilities in their rooms and in addition student hostels are not connected to the university campus wide network to allow students that have computers to access the internet via the university network. Therefore, students mainly expect the university library to provide computers and Internet facilities to enable them to access global information resources, and unfortunately, this is not happening in some university libraries. The proportion of library computers connected to the Internet in university libraries in sub-Saharan Africa is much lower as shown by the results of the study by Rosenberg (2005:7) in which only 22 (35%) of libraries had 75% or over of their computers connected to the Internet, whilst 9 (15%) were not connected at all.

2.3 Library Cooperation and Resource Sharing

Libraries have a long history of cooperating and sharing resources, especially in the creation of union catalogues or sharing bibliographic records, which also help in locating materials for interlibrary lending. In the manual library environment, libraries contributed library catalogue cards to a central union catalogue, which could only be accessed by visiting the library or institution where it was hosted. Later, the use of computers made it easier for libraries to create and share bibliographic records in digital format. However, early automated library systems were generally incompatible and made it impossible to interconnect library online catalogues because of different system designs, use of proprietary hardware and software, database structures, command languages, search engines, and communication standards or protocols. This meant that if libraries were to share bibliographic records, they still needed to contribute their records to a central online bibliographic database, and a good example from the sub-region is that of the old SABINET (Southern Africa Bibliographic Information Network) arrangement in South Africa, in which libraries created bibliographic records on a centralized database.

Advances in ICTs have made it possible to develop library software systems that are based on international standards and this allows for real-time interaction between different library systems and computers distributed over wide and local area networks, using various standards, e.g. Z39.50, and the Internet and World Wide Web protocols. This has made it easier for libraries to share bibliographic records or develop common OPACs, share the use of library systems, and conduct electronic document delivery in seamless environment. Shared OPACs have also allowed the unlocking of historic print collections to users throughout the country, region and the world. Before this development, and in the absence of up-to-date national bibliographies, it was very difficult to know what was held in another library.

2.4 Management information systems

Libraries generate and manage a lot of data and information, and according to Burford (2003) the data may:

Come from interactions with users, it may come from administrative activities, it may come from collection development, use and maintenance activities. All libraries also co-exist with larger entities: universities, municipalities, and professional organizations to name a few. And libraries turn that raw data into statistical information that is reported to those larger entities. That information is also used within the library for a variety of purposes: benchmarking, accreditation, resource allocation, personnel decisions, trend analysis, policy decisions, measuring effectiveness, assessing training needs, and strategic planning. Frequently that data is collected on paper, sometimes daily but frequently through semiannual sampling and transcribed into a useable format using spreadsheets.

The major functions of MIS in libraries is to *assist staff with the daily decision making process; to maintain better accountability and control of resources; to monitor budget allocations; to improve overall library effectiveness by focusing on outcomes; to generate internal and external reports; to improve long-term planning; and to facilitate performance measures activities (Lakos 1999)*. In an era where libraries are faced with budget cuts and are also required to justify their existence, provision of up to date and reliable management information becomes crucial. ICTs are making it easier to collect and process management information across the entire library system and make such information/data available on demand. Modern library systems now integrate modules for the provision of management information to library managers, and some systems, i.e. Adlib which is implemented at the University of Dar es Salaam, incorporate facilities for graphic display of various statistics and export statistics directly to spreadsheet software. Other systems like Amlib, have a separate database just for statistics, which are kept for as long as the library needs them. The library can also configure which statistics should be kept.

In some cases, libraries are also benefiting from the integration of library systems with other administrative and information systems, i.e. financial system, personnel system, etc, operating within the parent institutions. This is the case in universities that are using the Integrated Tertiary Software (ITS) in South Africa. ITS integrates the following modules: Student Management Systems, Financial Management Systems, Human Resources (Personnel) and Payroll Systems, Library System, and Management Information Systems. Libraries using the ITS Library System have access to management information generated by the other systems or modules within the university.

2.5 Institutional Repositories

In addition to materials that are acquired from outside, university libraries also collect a lot of materials published locally. Most university libraries have special collections of local materials such as theses and dissertations, research reports, examination papers, conference papers, newsletters and seminar papers, journal articles by academic members of staff. ICTs have made it possible to provide access to these resources in full text, accessed via the institutions' intranet, extranet or over the Internet. This is being done through Institutional Repositories (IRs).

An institutional repository is defined as *a database with a set of services to capture, store, index, preserve and redistributes an institution's research outputs in digital formats*⁷. The objectives of an institutional repository are:

- To provide *open access* to institutional materials, i.e. research reports, articles, technical reports, annual reports, seminar papers, etc
- To offer the opportunity for long term *storage* and *preservation of digital assets*
- To aid the *management* of often easily forgotten (*grey*) *literature* such research reports, technical reports, etc

Institutional repositories involve different stakeholders, each bringing different contributions to the repository, and librarians are among the key stakeholders in institutional repository projects. Librarians bring skills and standards required to manage digital information resources and work towards continued preservation of and access to digital resources.

While most university libraries in the SCANUL-ECS region have created online bibliographic databases of their special collections, either as part of the library catalogue or as a separate database, providing access to full-text versions of the collections, especially grey literature materials such as research reports, conference papers, etc, in digital format, via electronics networks, is not common outside South Africa. Development of institutional repositories (open access repositories) in the SCANUL-ECS region has not yet taken off. In the study by Rosenberg, which excluded libraries from South Africa, only two libraries - Makerere University and the University of Namibia had set up institutional repositories (Rosenberg 2005:10). The University of Zimbabwe, with funding from the International Network for the Availability of Scientific Publications (INASP), is also in the process of establishing an IR containing articles and research papers and the project is expected to be completed by the end of 2006. Even in South Africa, there are very few examples of IRs, and among them are the following:

⁷ Adapted from: Barton, Mary R. & Waters, Margaret M. 2004. *Creating an Institutional Repository: LEADIRS Workbook* - <http://www.dspace.org/implement/leadirs.pdf>

- *Rhodes eResearch Repository* (<http://eprints.ru.ac.za/>) - which holds the academic and research output of the Rhodes University community. The repository is administered by Rhodes University Library.
- *University of Cape Town Computer Science Research Document Archive* (<http://pubs.cs.uct.ac.za/>) - which archives and makes accessible documents that are products and by-products of research by the Department of Computer Science of the University of Cape Town

2.5.1 Electronic theses and dissertations (ETDs)

Related to institutional repositories, especially in university libraries, is the provision of access to full-text copies of Electronic Theses and Dissertations (ETD). Without ICTs it has been impossible to access full-text copies of theses and dissertations from a remote location. While in developed countries, theses and dissertations have been made available on microfiche and microfilm, in sub-Saharan Africa, the only way to have access to these resources has been by paying a visit to the libraries where the collections are housed. As a result, theses and dissertations in Africa have largely been closed collections accessed mainly by students and researchers residing in the host country. ICTs have changed this arrangement. Some universities libraries in the SCANUL-ECS region, especially in South Africa, are implementing projects aimed at providing access to full-text copies of ETDs and these include the libraries of the following universities:

- University of the Witwatersrand (<http://146.141.35.251/ETD-db/>)
- University of the Western Cape (<http://ww3.uwc.ac.za/index.asp>)
- University of Pretoria (<http://upetd.up.ac.za/ETD-db/>)
- Rhodes University (<http://www.ru.ac.za/library/theses/collection.html>)
- University of Johannesburg (<http://0-etd.uj.ac.za.raulib.rau.ac.za/>)

Also worth noting is that libraries from the following universities in SCANUL-ECS region have participated in the development of a Database of African Theses and Dissertations (DATAD) (<http://www.aau.org/datad/>), hosted by the Association of African Universities (AAU), by contributing bibliographic records of their theses and dissertations to the database:

- Addis Ababa University, Ethiopia
- Eduardo Mondlane University, Mozambique
- Kenyatta University, Kenya
- Makerere University, Uganda
- University of Dar es Salaam, Tanzania
- University of Zimbabwe

DATAD, which is currently providing only bibliographic records, is expected to finally provide access to full-text ETDs, and this will increase the number of libraries providing access to ETDs in the SCANUL-ECS region.

2.6 Digital Libraries

Using ICTs librarians are creating digital libraries, that is libraries *where some or all of the holdings are available in electronic form, and the services of the library are also made available electronically - frequently over the Internet so that users can access them remotely* (Rosenberg 2005:2). Digital libraries are made up of digital collections including document surrogates like bibliographic records and indexes in addition to full-text documents, videos, images some of which cannot be represented or distributed in printed formats. These digital works include both *internal* and *external* resources.

In an academic environment, a digital library can provide students with access to educational materials, i.e. solved and unsolved problem sets, courseware modules (drills, simulations, models, virtual lab benches, and class presentation materials; while in a national library environment, digital libraries opens up the information resources for access by library users located across the country. In most countries, national libraries are located in the capital cities and therefore, access to their resources is restricted mainly to those that can afford to travel to the capital city. Digital library resources of national libraries can be accessed even from remote places.

There are several examples of digital library projects or initiatives being implemented by university and national libraries around the globe and these libraries can be accessed over the Internet. These projects usually involve digitization of existing information resources and making them available to defined groups of users for searching, retrieval, and processing via communication networks. One example is the Alexandria Digital Library (ADL) - developed by the University of California, Santa Barbara Libraries. ADL distributed digital library with collections of georeferenced materials containing more than 15,000 holdings, such as maps, images, and datasets that are available online for public download over the Internet, at <http://www.alexandria.ucsb.edu>.

In the SCANUL-ECS region and in sub-Saharan Africa in general, there are not that many digital library initiatives being undertaken. However, one of the initiatives being implemented in the SCANUL-ECS region is the Andrew W. Mellon Foundation sponsored DISA Project, the National Digital Imaging Project of South Africa, at the University of KwaZulu-Natal. Through the DISA Project, journals of many organizations involved in the apartheid struggle are being converted to a digital format for research access via the Internet, and these can be accessed at <http://disa.nu.ac.za/disaind.htm>.

2.7 Capacity Building - Using ICTs

According to Williamson and Rajabifard (2003), *the term capacity has many different meanings and interpretations depending on who uses it and in what context it is used. It is generally accepted that capacity building as a concept is closely related to education, training and human resource development (HRD). This conventional concept has changed over recent years towards a broader and more holistic view, covering both institutional and country specific initiatives.* In the context of this paper, libraries need capacity building as it relates to human resource development and to the institution, to enable the staff to use and manage ICTs and the library to plan and implement sustainable ICT projects.

ICTs offer libraries an opportunity to develop and deliver online capacity building programmes targeting their staff to enable them to use or implement innovative use of ICTs in the libraries. Online based capacity building programmes make it possible for librarians and information management professionals who are unable to leave their work places to attend classroom-based courses to develop and upgrade their skills in information management. There are several examples of online based capacity building programmes or initiatives available to librarians and information management specialists. These include the following:

- *Information Management Resource Kit (IMARK)*, an e-learning initiative developed by the Food and Agriculture Organization of the United Nations (FAO) and its partners. IMARK is being developed as a series of modules on CD-ROM and on the Internet (<http://www.imarkgroup.org>) offered free of charge, and introduces the latest concepts, approaches and tools for information management. Among the modules already available on IMARK that is of great interest to librarians in the sub-region are *Management of Electronic Documents* and *Digitization and Digital Libraries*.
- *VEsats: a Southern Africa Training System*, a web-based learning system for librarians and documentalists offering training on both the Environment and on various aspects of information management using the World Wide Web and related network skills. *VEsats* was developed in 2000 by staff of the University of Namibia Library for the IUCN - The World Conservation Union - Regional Office for Southern Africa, based in Harare, Zimbabwe and the system can be accessed at: <http://www.iucnrosa.org.zw/work/vesats/index.htm>.

3. THE CHALLENGES IN THE SUB-REGION

Information and communication technologies do not discriminate. They do not have a say as to where and how they are used. Therefore, any institution in the world can introduce and use ICTs and take advantage of the opportunities provided by these technologies. Unfortunately, in the case of libraries in developing countries, the situation is not that simple. There are several factors that are making it difficult for them to take full advantage of ICTs, and these are mainly related to the following:

- Financing and sustainability of ICT infrastructure
- ICT technical infrastructure
- Using and managing ICT facilities
- Preservation of digital-based information resources
- Management of intellectual property rights
- Institutional policy and strategy

3.1 Financing and Sustainability of ICT Infrastructure

The greatest challenge facing libraries in sub-Saharan Africa today is how to provide increased, effective, efficient and sustainable information services and access to a wide variety of information and knowledge resources on the face of reduced funding. Since the early 1990s, there has been a steady government reduction in funding for different sectors of national economies in developing countries, and *libraries in sub-Saharan Africa which largely depend on grants from national governments for most of their recurrent and capital budgets have been hit hard* (Mutula 2004). Admittedly reduced funding for libraries is a global phenomenon and there are various reports, articles and documents commenting on this situation in different countries (Coffman 2003, Financing Frontline Services 2005, & International Publishers Association 2004). However, it can be said that libraries in sub-Saharan Africa, have been hugely affected by this trend, and the most visible outcome of reduced funding for libraries is that most of them no longer purchase books or pay for journal subscriptions from their own budgets.

The use of ICTs in libraries has not made the situation any better. Introduction and use of ICT facilities in libraries depends on adequate funding for hardware, software purchase and licence fees, and maintenance contracts, upgrading of hardware and software systems, telecommunications, and subscriptions costs to e-resources. Unfortunately, most libraries do not have budgets for ICTs. The lack of funds for ICT infrastructure is a major reason why in the sub-region:

- The first computers and library automated systems installed in most libraries were donations from external organizations.
- There is heavy reliance on or quest for donor/external funding when implementing library ICT projects. For example, Rosenberg (2005:11, 14) indicates that only 10 libraries out of 62 reported purchasing 100% of ICT facilities and only two libraries purchased 100% of their e-resources from institutional as opposed to external funds, while 45 (73%) indicated that external support for the purchase of hardware and e-resources was crucial.
- Some libraries that started automating their functions in the late 1980s and early 1990s are yet to complete the process, or have failed or are yet to migrate to modern or updated library systems to replace the old systems.

- Access to reliable and sustainable Internet facilities is still not wide spread in the libraries because most libraries cannot afford to pay for adequate bandwidth, i.e. the maximum data carrying capacity of a network connection, i.e. the Internet.
- Development of digital libraries and information repositories is yet to take off on a large scale.

As a way of sustaining the provision of ICT-based library and information services, especially Internet-based services, some libraries, as seen in the case of the Kenya National Library Service, are charging Internet access fees and this arrangement is slowly being adopted by many libraries, i.e. the study by Rosenberg (2005:11) showed that 29 (47%) libraries charged fees for Internet access, whilst 24 (39%) offered the services free of charge. The funds raised in most cases go towards the payment for Internet connectivity and stationery, i.e. toner for the printers and paper.

Unfortunately, income generation is not the core business of libraries and there seem to be no other means for them to generate funds for the payment of subscriptions to online e-resources, maintenance costs for automated library systems and hardware upgrades other than depending on income from the parent institutions. As indicated by Rosenberg (2005:17) the main hope for sustainability lies in libraries increasing their share of the institutional budget, and one way of achieving this, according to Raseroka (1999:10) is for each faculty in the university to allocate a percentage of its budgets for library development based on the courses offered, research undertakings and expected academic support.

Librarians should also realise and accept the fact that there are several competing services for government and donor funding and libraries are not on the priority list. Therefore, there is a need to advocate for libraries and the value of libraries, and this should not be taken for granted by librarians. The value of libraries should be communicated to all stakeholders, as often as possible (Economic Commission for Africa 1993), and to paraphrase the words of Arthur Midwinter, it is no longer sufficient for librarians to make a professional case for resources for their libraries, but to make a case which highlights libraries' contribution to the Executive's wider social and economic strategy (Financing Frontline Services 2005). Unfortunately, there seem to be no coordinated efforts to lobby for libraries in the region. Most national and regional library and information professionals associations are not doing much in terms of lobbying for libraries.

3.2 ICT technical infrastructure

Basically, there are three major challenges related to the ICT infrastructure in libraries and these are the:

- i. Constant change in the ICT industry
- ii. Lack of technical ICT background among library administrators
- iii. Lack of adequate ICT facilities in libraries.

3.2.1 Constant change in the ICT industry

As seen above, ICTs encompass a wide range of rapidly evolving technologies. New technologies are being introduced and improvements are being made to existing technologies almost on a daily basis, and therefore, the main challenge for libraries is how to catch up with these developments. As indicated by Esterhuysen:

“The most damaging consequence of the volatile nature of ICT, however, is that users, having invested time and money and having struggled to establish connectivity and make good use of it, are caught up in an internal game of “catch up.”

How does an organization that recently learned to use a new computer react when its efforts to address basic problems elicit a response along the lines of, “Why don’t you upgrade to Windows 2000 and buy a faster modem” (Esterhuysen 2002:17).

3.2.2 Lack of ICT technical background among library administrators

Due to the volatile nature of the ICT industry, librarians need to be more involved in monitoring technological change and be more proactive in adopting appropriate information technologies to improve library and information services. However, this is difficult for most library administrators because they do not have an ICT background, which is necessary if they are to have a clear understanding of the developments taking place in the ICT industry.

3.2.3 Lack of adequate ICT facilities

Another challenge associated with the ICT technical infrastructure in most libraries is the lack of adequate ICT facilities. Lack of funding means that most libraries are not able to acquire adequate ICT facilities to enable them provide to efficient and effective ICT-based information resources and library services to their clients. Most libraries cannot get adequate bandwidth to enable them to provide fast access to online based information services. In some libraries Internet connection is so slow that sometimes it is impossible to download and print documents from the Internet. Owusu (2002) paints a good picture of how frustrating this can be to a library user or library staff when he writes about Internet facilities existing at the Kwame Nkrumah University of Science and Technology (KNUST) in 2002 in Ghana. He writes that:

Of most importance and concern to the users of the IT facilities and services in the University Library is the slow rate of transmission of materials. For a greater part of the day, the transmission rate is very slow to an extent that most users become frustrated and some even leave; in some cases staff of the section close down the section. Most times at the University Library Internet Café, it takes between 15 to 30 minutes to move from the domain name address; and sometimes it takes 15 minutes to open or send a letter/message... (Owusu 2002: 93)

The above situation may have changed at KNUST but the main point is that this is a common feature in most university and national libraries in Africa.

Lack of adequate bandwidth and reliable Internet connectivity is also making it difficult for some libraries to develop and provide access to web-based information services. This is supported by Augustine Mwamba⁸, a librarian at the University of Zambia, who indicated that Internet connectivity at the University of Zambia has been quite erratic and unreliable and if something was done to stabilize Internet connectivity, the library could develop services on the library page.

In addition to inadequate bandwidth, some libraries even though they have computers, these are not networked making it impossible to provide access to networked information resources. In most libraries there are not enough computers for use by library users to access the OPAC or other online library services and resources. For example 85% of the university libraries, in the study by Rosenberg (2005), provided less than one computer for every 100 fulltime equivalent (FTE) students and 36% provided less than one computer for every 500 FTE students. In the same study, 14 (23%) libraries provided no data regarding availability of computers for public use.

3.3 Using and Managing of ICT facilities

Management of ICTs in organizations involves two levels: the strategic level which includes reviewing and putting in place the most appropriate ways to exploit existing ICTs, and sourcing and using new ICTs that are needed in the organization; and the operation level which involves providing high quality, reliable ICT services to the organization through capacity building (training), development (delivery of ICT projects), implementation, application and by monitoring usage and effectiveness of systems. Both levels of ICT management require people with appropriate ICT skills, and these are largely absent in most libraries.

Generally, there is a low level of technical knowledge of ICTs among most library administrators and this makes it difficult for them to manage the facilities at the strategic level.

⁸ E-mail communication with the author on 9th February 2006.

At the operational level, depending on the size or level of sophistication of the available ICT infrastructure, a library may require database administrators, systems analysts, network administrators, software engineers, website designers, “digital librarians” and many others. These skills are never taught in library and information studies schools, and it is also difficult for libraries to recruit individuals with specialized ICT skills and remunerate them appropriately. Highly-qualified ICT individuals can earn more money working in the private sector or parastatal companies than in libraries. It is also difficult to get staff with skills in the management and provision of electronic-based library and information resources and services. In the study by Rosenberg (2005:14), 39 libraries (63%) indicated the lack of or retention of trained library staff as one of the main challenges they faced in providing e-resources and e-services.

While most libraries are training their staff to be able to troubleshoot library automated systems and other applications being used in the library, overall most libraries in the SCANUL-ECS region will never be able to equip their staff with all the required ICT skills to manage the ICT technical infrastructure. Therefore, there is an urgent need to find a suitable solution or arrangement that will ensure that the library ICT infrastructure is properly maintained and libraries are able to provide library and information services to their clients. Among the available solutions include libraries working in partnership with ICT departments/centres of their parent institutions, and libraries using remote hosted library systems.

In universities, libraries have an opportunity to collaborate with the university ICT departments regarding the management and maintenance of the library ICT infrastructure. In general and compared to libraries, university ICT departments have relatively adequate ICT skills, ICT maintenance budgets, and are able to support the university ICT technical infrastructure.

As seen above, the use of a remote hosted library automated systems frees the library resources earmarked for system maintenance and enables the library to concentrate on the provision of library and information services. Unfortunately, this option is not viable in most libraries in sub-Saharan Africa due to poor and sometimes unreliable Internet connectivity and inadequate bandwidth.

3.4 Preservation of digital information resources

Preservation of digital-based information resources is a major concern and challenge to librarians. Although institutions such as universities are widely adopting the use of ICT and thus generating information in digital formats, most archiving and preservation methods and activities for information resources currently in use are primarily focussed on paper-based resources. As Chisenga and Rorissa (2001) observed, the print-based library and archives environment, as opposed to the digital information environment, has evolved over centuries. Preservation methods and formats for print-based documents have also been developed and tested. In addition,

training courses in library and information studies/management also incorporate modules on how to handle, store or preserve paper-based information resources.

While most national libraries and some university libraries in the sub-region have the mandate, under the legal deposit laws, to collect and preserve all publications produced within the country, most existing legal deposit laws only cover print-based materials. Yet there are so many documents being generated and distributed primarily in digital formats which are not being collected or deposited at the libraries. The situation in many countries is still not clear as to who is responsible for the long-term preservation of digital information resources and librarians appear not to be making a case for the preservation of these resources.

3.5 Copyright and intellectual property rights management

Development of digital libraries and information repositories is being hampered by the absence of appropriate legal instruments and guidelines to facilitate the management of information and a digital environment. While there are several copyright laws and regulations governing the copying and photocopying of print-based information resources, digitization and provision of access to digital collections accessed via electronic networks, especially the Internet, is presenting bigger challenges to librarians. Digital-based information resources can be accessed from anywhere via electronic networks, copied several times, manipulated (i.e. edited, modified, repackaged, etc) or deleted, and most librarians do not know how to deal with this situation.

Libraries and their parent organisations need to put in place copyright and intellectual property rights policies to guide librarians and information end-users accessing and using digital information resources. These policies should be in conformity with national and international laws and conventions governing intellectual property rights. Where national copyright and intellectual property rights laws do not exist or do not adequately cover works in digital formats, it is still advisable to formulate appropriate policies and guidelines outlining how to handle copyright issues in a digital library/information environment.

3.6 Policies and Strategies

Countries in Africa have now recognized the developmental opportunities and challenges brought about by ICTs, and the need to put in place integrated national information and communication policies and strategies to harness, seize and obtain maximum benefits from ICTs. As a result, the situation has changed from what it was in the 1990s when very few countries had national ICT policies. In February 2005, 28 countries had national ICT policies, 15 countries were in the process of developing their policies, and 10 countries (among them the following countries from the sub-region: Congo, Eritrea, Madagascar and Somalia) were yet to develop or initiate the

process of developing their ICT policies (United Nations Economic Commission for Africa 2004). A national ICT policy provides a national framework that facilitates the development, adoption and use of ICTs in a country, from which libraries can also benefit.

Organizations also need to develop their own local ICT strategies that define how they are going to use ICTs. It is no longer acceptable to computerize for the sake of computerization. Organizations are now required to develop an ICT strategy that:

- Incorporates the goals of the organizations and how these will be met using ICTs
- Provides a supporting framework for the development of ICT in the organization
- Outlines how the full potential of ICT is to be exploited to support all aspects of the organization's core business (functions).

An ICT strategic plan also enables the organization to identify its requirements and the type of ICTs that will work best to attain them.

Most libraries in the sub-region introduced ICTs without any formal strategy - an official, written plan containing objectives and guidelines for acquisition or usage of ICT by the library. In some cases ICTs were adopted because funding was available from the donors and therefore, it could be said that for most libraries making use of the available donor funds to purchase and install ICTs was more of priority than trying to justify why ICTs should be acquired, how they are to be used and sustained. An ICT strategy would have helped most libraries to align the introduction and use of ICTs to their goals and mission and to the goals and mission of the parent organizations.

4. CONCLUSION

The use of ICTs in libraries in the provision of access to information resources and services is resulting in the disappearance of the concept of a library as has been known for centuries - a physical building located in a specific geographic location. ICT has transformed the nature of library services over a period of time. Library "collections" consist not only of physical information resources such as books, periodicals, videos, films, and many more, stored in physical library buildings. They now include digital resources created locally and those accessed on remote computers that are managed by other libraries or information service providers. Further, unlike in a print-based library system, access to digital information resources is not restricted to specified hours and days of the week at one physical library building. Information resources and services are available for 24 hours, 7 days a week, throughout the year from any computer connected to the Internet from any place around the world.

Although overall there is a widespread adoption of ICTs by libraries in the SCANUL-ECS region, innovative use of the facilities is not widespread. Application of ICTs is very limited, and as indicated by Rosenberg (2005:19) *there is tendency to automate what was previously done manually, and there are few signs of services or applications that were not present in the pre-digitization/automation era*. A large number of libraries in sub-region are missing on the opportunities presented by modern information and communication technologies, mainly due to several factors among them lack of funds for the purchase and maintenance of ICT facilities and the absence of appropriate ICT technical skills in libraries. Most libraries are entirely depending on donor support for almost all aspects of their ICT infrastructure, ranging from the purchase of the ICT facilities to payment for subscriptions to e-resources and maintenance of the facilities. This is not a suitable arrangement.

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