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Applications of digital libraries and electronic technologies in developing countries: practical experiences in Uganda

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Keywords

Libraries, Information technology, Developing countries, Uganda

Abstract

Analyses applications offered by different organisations in Uganda and gives a way forward for the use of digital libraries. A qualitative approach with a purposive sampling strategy was adopted. The study was limited to practical experiences on the services and applications that made the basis of analysis. The results indicated that the majority of organisations apply IT in bridging access across networks and sharing of information between different organisations. It was observed that the current ICT systems in Uganda do not enable it to reach the majority of the community. It is concluded that digital libraries and electronic technologies have contributed effectively to collaborative applications between institutions in Uganda. Recommends that services need to be integrated into the organisations' strategic objectives coupled with knowledge and skills.

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Introduction

A digital library is an automated or electronic library, where activities like accessing, retrieval, processing, automatic indexing and textual analysis, with the help of a computer, assist resource sharing and storing. Digital libraries have become a feature on the landscape in developed countries. However, of late, they have also become a feature in advancing communication, information, and knowledge in the developing world. A digital library can be understood as an information centre with no sense of physical location for an end user. The user can access from anywhere and information can be held anywhere. This is characterised by major computer systems and telecommunication systems in the storage and dissemination of information. A digital library offers facilities for accessing collections of automated libraries online.

To meet the needs of the user, the primary requirement of a digital library is that from the start it will be committed to organising, storing, and providing electronic information for periods longer than human lives. Users will need information that is reliable, and locatable so that whether personally or on the Internet, they can expect to find what they want.

Libraries cannot exist as a single entity and require technology to link their resources. The collections of these digital libraries are not limited to surrogate development but extend further to digital artifacts that cannot be represented or distributed in printed formats. Digital libraries are a shift in electronic content. This enables libraries to apply a growing range of information technologies to the management of collections of primary print information.

The emergence of the World Wide Web is perhaps the great symbol of this shift, with applications for scholarly communication, the new role of databases, shared cataloguing, and computer networking for collaboration and corroboration within the library community, online public access, abstracting and indexing schemes.

Based on information and knowledge today, it has become necessary for information workers to take the issue of automating libraries seriously for purposes of facilitating communication, information sharing, research and communication.

Techniques have been introduced in the field of libraries and, as a result, information workers are expected to serve computerised online services, selective dissemination of information and current awareness services to the users.

Digital libraries in Uganda do not exist beyond an experimental level. However, the existence of databases, library online catalogues, and electronic journals in different organisations in Uganda, including academic institutions, professional organisations, international organisations, non-governmental organisations, and government agencies, creates what is sometimes called a digital library.

In Uganda's context, digital libraries will be defined as those libraries that are greatly aided by networks, have or can access electronic databases, have an online public access catalogue and to some extent provide e-mail and Internet services to its users, and at least a certain percentage of their information resources are in electronic format.

In the modernisation of business activities in the world today, electronic technology is imparting and dramatically changing the fabric of our lives. To be a player in development, organisations have adopted the use of the Internet and in particular the adoption of digital libraries in exchange of information and resources, co-operative projects to avoid duplication of efforts and bridging access to information to distant and disadvantaged communities.

Methodology

Data used in this study were collected from academic bodies, NGOs, professional organisations, international organisations and government sectors that use computers in the management of their activities, taking into account the functions performed by each category of organisation. Multiple methods were employed to collect the data. Different organisations were visited and an interview was conducted on different services provided. A questionnaire was administered to identify a number of organisations. A documentary review was made from existing literature. The sampling strategy was based on purposive sampling from identified individuals in selected organisations who

would represent the views of the whole institution.

To address the research problem, the data were first analysed to come out with the services offered, to enable the study to deduce the practical applications based on these services. Descriptive analysis of related services in Uganda were observed and described together.

Tables were used to relate different services for easy co-ordination and analysis. The services offered in different organisations were tallied to obtain the statistics of the practical experiences of different organisations. Data were presented according to the services that facilitate the use of digital libraries.

Practical corroboration cases in professional organisations

In order to find out how the professional organisations have promoted digital libraries in facilitating information sharing, knowledge and communication, different organisations were requested to identify the services offered and indicate the collaborative applications. Table I summarises the results obtained from professional organisations interviewed.

Non-governmental organisations' practical applications

Non-governmental organisations are non-profit making organisations registered by government currently under the Ministry of Internal Affairs. These include international organisations, national organisations and community-based organisations. A number of NGOs were visited to find out how information technology is applied. Table II shows the observations made for each facility provided by NGOs.

Organisations supported by government in the use of digital libraries

Government supports ministries and other parastatals. These are organisations that get their funding from the national budget (see Table III).

International organisation corroborative applications

Uganda, being a developing country, has good collaboration with different countries in the world. There are several networks set up by international organisations to disseminate information and enable sharing of information and resources. A number of

Table I The practical applications on the use of information technologies by professional associations

Services	Descriptions	Practical experiences
Resource sharing	Exchange of information materials both locally and internationally between libraries through use of computers	The Uganda Medical Workers Association enables Sir Albert Cook Medical Library, Mulago Hospital to carry out resource sharing with other libraries through MEDLINE, with other bodies like Mbale paramedical, Jinja Nursing School and Butabika Hospital
Digitised circulation	Controls in terms of library operations with issues, returns, records, preservation inquiries and information available	Uganda Farmers Association has promoted the use of AGRIS at the National Agriculture Research Organisation for its members to get bibliographical research through international AGLINET system or a co-operative network for agriculture libraries
Information services	Organising forums in which resource centres, libraries and organisations exhibit the services they offer	Uganda Library Association has for the last two years organised an information bazaar for organisations to exhibit different information technologies to the public
Current awareness	To inform users about newly acquired information materials over a given period of time	Through the Uganda Institute of Professional Engineers, on request, you can display the contents of information materials and the user's request can be mailed to him or be given at a place to where it can be brought. An interested user may search by date. The institution usually sends messages to all the users at the same time through mail lists
Online public access catalogue	This provides availability of status and bibliographic details to the users. It is accessible to all members of the public and is an information retrieval system	National Agriculture Research Organisation mainly utilises the OPAC in accessing bibliographic data in agriculture
Ordering and acquiring information materials	Through the use of catalogues on CD-ROM and the Internet in ordering information materials indicated as available for sale	National Agriculture Organisation orders books from Egypt and other countries
Creation of databases	Collection of related materials, specifically those in computer form	National Agriculture Research Organisation publishes CD-ROMs on AGRIS that enables sharing of data
Electronic mail services	Associations usually send mail when communicating with their members	Uganda Teachers Association, Uganda Institute of Professional Engineers, Uganda Library Association when communicating with members (continued)

Table I

Services	Descriptions	Practical experiences
Publications	Publicising the activities and services of the associations. Publishing newsletters and bulletins. They bring access to distant and disadvantaged communities. It has enhanced sharing of resources between information producers and users	Uganda Library Association publishes its strategic plan and bulletin at a mirror Website hosted by the School of Library and Information Studies, University of Oklahoma: http://www.ou.edu/cas/slis/ula-index.htm UIPE has a monthly newsletter. Uganda Journalists Association produces an annual journal. This has enabled the publication of the newspaper on the Internet including: http://www.monitor.co.ug ; http://www.newvision.co.ug ; http://www.africanews.com/ Radio Simba and Radio One have also come online: http://www.simbafm.com ; http://www.radione.com
Storage of Information	Information is stored on computers' hard disks, CD-ROM, diskettes	Uganda Fishers and Fish Conservation Association, Uganda Library Association, Uganda Farmers Association, and National Association of Professional Engineers. Association of Uganda Tour Operators maintains a Website: http://www.vistuga.comuti/auto.htm
Information analysis and design	Assistance in professional consultancy and projects. These include computer bodies' solutions for professionals	Uganda Institute of Civil Engineers is engaged in consultancies using LUCAS, PROKEN, SUPER STRESS, STAAD systems to the public
Networking	This involves interconnecting different centres of the associations	UFFCA has got offices in more than ten districts and other bodies; it collaborates with organisations like Lake Victoria Fisheries Project. Uganda Library Association (ULA) links with local and international bodies like COMLA, IFLA and UNESCO. Uganda Fishers and Fish Conservation Association (UFFC) produces an annual report and links with International River Network. National Environmental Management Authority (NEMA) for activities and programmes and to provide advice where possible

Table II Electronic services offered by different NGOs

Services offered	Practical experiences	Applications
Selective dissemination of information	Through the use of e-mails, Websites, telephone, radio, fax. Uganda Human Rights Initiative selects information that is vital and selectively disseminates it and gives it to the population in terms of hardcopy or education for the benefit of people who can't use the Internet	This helps to bridge access to distant and disadvantaged communities Sharing of knowledge Aids education
Current awareness services	The Aids Support Organisation (TASO) uses the Video Library Centre and gathers people together for training. CARE International has used videos in rural areas to train people in tree planting, family planning, improved agriculture	This helps to bridge access to information to distant and disadvantaged communities
Advisory services	Aids in TASO have a direct line for counselling. FIDA offers legal aid online and DENVA carries out research from the member NGOs. Foundations for human rights assist people who do not have online services for purposes of counselling, legal aid and popular human education.	This helps to bridge access to information to distant and disadvantaged communities
Bibliographic control services	The online public access catalogue has helped world vision in bibliographic indexes on CD-ROMs. UNDP also has a Website OPAC at: http://www.ock.org/	Enables electronic resources across network Facilitates resource sharing between information institutions
Resource sharing	British Council shares data between the centres and other organisations. A client of UNDP can access information online from any IDRC home page: http://www/acadia.or.ug The Aids Support Organisation and the traditional health practitioner together have an automated system that allows them to share databases in providing information to AIDS patients. FIDA and UWESO exchange and share information by use of CD-ROMs. World Vision has offices across the country. It has digitised information and communication activities	Enables electronic resources across network This has avoided duplication of work Resource sharing This helps to bridge access to information to distant and disadvantaged communities
Online public access	Electronic mail, remote login and file transfer are provided by many NGOs. Uganda Human Rights Initiative (UHRI), International Women Education Centre, Plan International, Uganda Women's to Save Orphans, use e-mail for interaction with other colleagues. They transfer data for the benefit of other users and resource centres	Co-operative projects to avoid duplication of effort Advances in communication and efforts Aids electronic resources across networks

(continued)

Table II

Services offered	Practical experiences	Applications
Lending and borrowing	Through the Online Computer Library Centre (OCLC) that operates in Africa, users can search the world's largest databases. They can identify who has materials and request loans/documents via Inter-Library Loan on: http://www.oclc.org/oclc/menu/fts-new.htm	Information sharing Enhances knowledge sharing Aids in communication This has helped electronic resources across networks
Provision of online services	Use of Internet services, e-mail services for informing members of new developments. Tele Centres that are local focused with assistance of IDRC have links in Africa, which produces assistance to users in accessing and guiding them towards sources of information. These centres are in Nabweru, Nakaseke and have put in place a Website: http://www.acacia.or.ug	This has helped in the electronic sources across networks They have helped in training of the local people on the technology This has assisted distant communities in communication
Abstracting and Indexing	Amnesty International (Uganda chapter) is a human rights watchdog. It has documented a lot of its information bank on human rights, which it distributes free in order to promote awareness amongst the population.	It avoids duplication of efforts Information sharing is enhanced Assists in disadvantaged groups who cannot afford to access information
Database management	Uganda Consumer Society (UCS) has a database of all produce imported and exported, rates at both national and international level to be accessed by the public. Distant communities get information through other media like radios. Videotapes are loaded on the Internet. CD/ISIS, Access, card master as DBMS software has been utilised. Action Aid has an information databank for all their activities. UCS has made available to the public existing seals/trademarks	Duplication of work is reduced This limits infringements of trademarks through advancing knowledge Facilitates communication among the institutions Assists disadvantaged communities to be able to access information
Website use	Published newsletter (to share information with other organisations) is put online by information providers like British Council and American Center, making use of educational Websites to communicate and disseminate information to their users. These organisations have participated in the Information Bazaar organised by Uganda Library Association	This has helped electronic resources across networks Assisting the disadvantaged communities
Publications	ANPPCAN made up of professionals in the fields of medicine, law, social work and physiology for a better world for children applies modern technology in publishing <i>Child</i> magazine and access to information for international sources in child rights, e.g. using ILO publications. Women's Federation for Peace In The World promotes peace in the world and produces a magazine <i>Women and Peace</i> . They also organise seminars, and disseminate their reports online	Information sharing between institutions This helps in bridging access to information to distant and disadvantaged communities Sharing of knowledge Has enhanced research

Table III Services offered by organisations supported

Services	Case descriptions	Practical applications
Online catalogue	NARO has an online catalogue to access information on agriculture. This is available on the Web: http://www.naro.ug It also stores information on CD-ROMs on agriculture	Sharing information across networks Enhances communication Improves knowledge and research
Database management	Parliament Library has made a catalogue using CDS/ISIS and has put online about 2,000 records. NEMA has about 1,800 records on CD-ROM and a database online and has developed and maintained a Web page. Uganda Tourism Association has also developed and maintained a Website: http://www.vistuganda.com/uta/ Uganda Bureau of Statistics has digitised its library at: http://www.unbs.ug	Information use and sharing is improved Research enhanced
Ordering and subscription	Uganda Television and Radio Uganda get much of their information online and subscribe to Usenet News Agencies like China, BBC, CNN. It accesses information by searching as well as having offline CD-ROM for future use. They subscribe to the following: http://www.cnn.com ; http://www.bbc.com Uganda Post Ltd has subscribed to OVID Technology in London at: http://www.ovid.com , which offers recent telecommunication technology. Uganda Post Ltd is connected to various stations in the world including Kenya and Zambia Post Office	Sharing of information across networks Communication among the institutions
Online searching	Bank of Uganda has provided a database of finance, loans statistics etc. to be able to be accessed by people online. World Bank has provided information about finances, loans, poverty alleviation for people to access: http://www.worldbank.com Uganda Government has utilised this facility	Sharing of information across networks Controls and security of information initiatives are highlighted Avoid duplication of data and researches
Publications	Uganda Constitution with Website address: http://www.uganda.co.ug/chapter15.html . Uganda Welcome on: http://www.safarweb.com/uganda/welcome/htm The parliament also contains texts of publications online as long as a person is connected to the Internet. It has CD-ROMs which contain information for different subjects and topics. NEMA keeps a CD-ROM on environmental impact assessment	Facilitates electronic transfers Avoids duplication of information Sharing of information is enhanced
Bibliographic sources	Parliament has databases that show what exists in Uganda. It is able to share with other governmental parastatals	Sharing of information across networks

(continued)

Table III

Services	Case descriptions	Practical applications
Online communications	Communication centres have been put in place by UNESCO under the Ministry of Education in Nakaseke, and Kihhi. Ministry of Education has put in place the Management Information System Programme and has a Website: http://www.uconnect.org/	Sharing of information across networks Assistance in disadvantaged distance communities Enables effective communication to users Enables sharing of information
Information processing	The Ministry of Public Service has computerised its registry and personnel office to enable use of data. Ministry of Health has in place the health information system and computerises reports and health issues	
Resource sharing	PERD Library communicates with other libraries and is linked to NEMA, UNDP and FAO. It uses Alice for Windows a server mapped to all stations modules of enquiry, management, circulation and periodicals. NARO produces contents to resource centres	Sharing of information across networks Easy access and retrieval Aids sharing of information
Research	Research findings at NARO are electronically produced through e-mails, CD-ROM. Uganda National Council of Science and Technology publishes a monthly newsletter online on: http://www.uncst.go.ug	To avoid duplication Research results accessed Dissemination to disadvantaged
Information services	ARIS produces electronic agriculture containing over 130 journals on CD-ROM	To aid research Avoid duplication of research
E-commerce	Information products of Uganda. Export promotion board has been posted to: http://www.yahoo.com It has also established an information centre for important and export information	To enhance information sharing To enhance research

organisations were visited to find out how they have embraced the use of digital libraries and information technology in the execution of their services:

- *FAO* (Food and Agriculture Organisation) is an agency of the United Nations. It has used videos to record community histories and for online development initiatives in order to stimulate debate in the community. Recent development has led to the use of CD-ROM in capturing bibliographic sources. AGRINET and AGRIC are the services provided by FAO to improve document delivery between large agricultural libraries of the world. AGRIS (agricultural information systems) is FAO's bibliographic database system. FAO has developed a formula for world-wide information sharing that responds to local needs. SPAAR (special programme for African agriculture research). This is a joint world bank/FAO project and has established a database of African research. An agriculture research network is possible with the Websites put forward: <http://search.yahoo.com>; <http://www.fao.org/> FADSTAT-fsao is a statistical database, which is available, free, on the Internet. It provides statistics of 210 countries and 3,000 items in areas of agriculture, fisheries, forestry and nutrition, is multilingual and contains over 1 million time series of records. The FAO documentation catalogue is also available. It has information in the network on post-harvest operations and is also available on CD-ROM.
- *UNEP* (United Nations Environmental Programme). This has a primary role in facilitating the collection, exchange and dissemination of environmental data and information between countries, and regions. It has its offices at the National Environmental Management Authority (NEMA). It administers the INFOTERRA, GRID and ENRIN programmes. They have bibliographic information on network for 174 countries. The Global Network of Environment Data Centre has a database management, remote sensing, geographical information system to prepare, analyse and present environmental data and information assessment. It also has a global communication system which is UNEPNET, MERCURE. It has in place a Website at: <http://www.enep.org/unesp/eia>. This programme operates through co-operative partnership, which includes national governments, United Nations, regional and sub-regional organisations, multilevel organisations and NGOs. Website: <http://www.unep/eia>
- *East African Internet Association* established in 1995, seeks, by pooling resources and sharing of experience, to promote and expand co-operative electronic communication and internetworking in the East African region. Members from Uganda, Kenya and Tanzania register their membership online.
- *UNECA* (United Nations Economic Commission for Africa) is involved in improving telematic facilities for development in Africa. The primary purpose is increasing Internet connectivity, building training capacities, and securing the necessary reform for African participation. It also has information on CD-ROM and Internet.
- *World Bank* provides linkage support to 1,200 public schools to Internet and Uganda has benefited from this in world net. The school net has also connected more than four schools in and around Kampala for this project. It has facilitated activities in economic and finance matters. With the help of IMF, it has been able to control the grants and loans that are given to different countries, of which Uganda is included on: <http://www.worldbank.org> World Bank downloads information from this database and puts it online and prints it to be distributed to the distant communities that cannot access the Internet.
- *International Telecommunication Union (ITU)* programme for Africa in co-operation with UNESCO, IDRC, WHO have provided Telecome Health Centres and have facilitated Telemedicine at Mulago Hospital in Kampala.

- *International Newspapers* are accessed online in East Africa, e.g. *Nation* is available on: <http://www.nation.co.ke/>
- *IFLA* has bibliographic systems reports placed on the Internet. This sets standards to be used, including Electronic Library Programme, the Consortium and International Council of Museums at: <http://www.scran.ac.uil/iconst>
- *UNESCO* has provided information on the exchange programmes. It has facilitated common communication format (CCF), Dewey decimal classification online and machine readable catalogue (MARC) standards.

Academic institutions' collaborative applications

Academic institutions are responsible for teaching, education and research. These include universities, institutions of higher learning and other training institutions (see Table IV).

Analysis of the services provided by digital and electronic technology in Uganda

Information on a number of services offered by digital libraries and information technologies in academic organisations, professional organisations, international, non-governmental and government organisations, was obtained that gave a basis for the analysis of collaborative applications. Table V shows the services offered by different organisations.

Publications, resource sharing and online public access are the most frequent services offered by digital libraries in the majority of organisations.

Telenetting, e-commerce and union catalogues are the least frequent services offered by the use of digital libraries.

Analysis of practical applications offered by different organisations in Uganda

In order to find out the practical applications offered by different services in the organisations, data were coded according to the practical applications areas. Table VI

shows the number of services offered by the organisations that facilitate particular applications.

Observations

The majority of the associations apply information technologies in bridging information access to distant and disadvantaged communities. This has been facilitated through repackaging of information. Electronic resources across networks is a common feature in most organisations, which have assistance from donors and international assistance. The local organisations have effectively utilised the technologies in communication, using e-mails and associated technologies like fax, telephone and ordinary mail to distant communities.

It can be observed that the majority of non-governmental organisations have utilised information technologies in information sharing between institutions with whom they share related objectives. Bridging access to information to distant disadvantaged communities is associated with civil NGOs. Education and information retrieval are not the primary functions of application of digital libraries. The majority of NGOs associate themselves with digital libraries and information technologies for matters of effective delivery of their services. The majority of the services offered are based on the Internet.

Sharing of information among the institutions is mostly experienced among government organisations. Use of the Internet has effectively facilitated the use of digital information in government institutions in enhancement of resources across networks and communication among communities. Most of the government organisations that utilise information technologies have integrated projects into the government national plan and objectives.

The majority of international organisations have applied digital libraries in the transfer of information across networks. It also facilitates bringing access to information to distant and disadvantaged communities. Enhancement of communication between the communities was also characterised in the international organisations.

A research function is the most practical collaborative application of the majority of

Table IV Practical experiences of digital libraries in academic institutions

Services	Description	Practical examples
Designing and creating Websites	Various data for particular institutions can be accessed on the Website of their institutions locally and abroad at different times	Makerere University has a Website where it provides its information for the public at: http://www.muk.htm . It contains information on courses, information materials
Online searches	Online searches are subsidised and enrich students with information relevant to their education. It can be used to equip information on scholarships that can be downloaded for students	Makerere University, Uganda Management Institute, Uganda Polytechnic Kyambogo aids searching information for online ordering for purchase of textbooks, instructional materials. Students also access databases like ASKME.COM for their reference questions
Public access catalogue	Helps easy access to information and to retrieve information as fast as possible. This promotes resource sharing and avoids duplication of information	Uganda Management Institute, the Global Information Centre, University and Economic Policy Research Centre, Makerere University, Mulago Hospital and Joint Clinic Research at Rubaga share information on research about AIDS
Union catalogue	These merge materials for multiple academic institutions	Makerere University Library arranges links for international bibliographic databases for reference materials, e.g. askme.com for any reference query
Distance education	Vital Digital Library technology to advance correspondence with other institutions. Students interface with their personal computers and they are able to attend lectures conducted at Holland University, Faculty of Science and Technology. Cornell University in the USA is currently using this technology in linking two parties testing coffee between Kampala and the network	Makerere University, Mbarara University and Uganda Polytechnic, Kyambogo allows students to access various discussions, seminars, workshops at home in Uganda
Information access	Gives access to various databases, discussion groups, lectures and seminars and workshops	Students at African Virtual University, Makerere University Library and Uganda Polytechnic Kyambogo can have discussion groups with their colleagues across the world
Research	To aid lecturers and students to carry out their research	Makerere University and Uganda Polytechnic Kyambogo have subscribed to databases with the AVU to assist researchers: http://www.avupk.avu.org/sites/avupk ; http://www.avumuk.ac.ug Databases on CD-ROM are also in place

(continued)

Table IV

Services	Description	Practical examples
Digitalisation of materials	Academic institutions have produced a form for exchange of ideas, promoting institutional co-operation, research and development in all fields of library activity online, on CD-ROM and Internet	Makerere University, Uganda Institute of Management, Institute of Research and Economic Policy, Makerere University has digitised its materials
Collaborations with other universities	Collaborations to support projects like preservation of books and other textbooks by creating digital images of serials and other materials	Universities of Michigan, Cornell, The Uganda Management Institute (Global Information Centre), and Uganda Polytechnic Kyambogo have a collaborative effort. The Mellon Foundation, Cornell University has funded this project of co-operation
Online ordering	Automated information materials and computer based ordering to enable ordering of books and serials	Uganda Polytechnic Kyambogo and Uganda Management Institute have benefited from this
Internet searching	People are able to get access to information from different parts of the world, like online journals	Through AVU project, Makerere University can access online journals at: http://www.avu.org ; however, a password is required for each user
Database management	Abstracts and indexes are put on computer. CDS/ISIS has been utilised in the computerisation of reports, theses, journals and books	Sir Albert Cook Medical Library has made a CD-ROM on AIDs and other related databases. It produces MEDLINE, POPSLINE and has made a database AIMS (African Index Medicus)
Networks	There are networks that assist communication between the academic institutions	Health net assists communications between health academic institutions; earlier there was MUKLA that was catering for communication among Makerere University departments. Makerere University is planning to put in place the University Network to assist in the administration and management of the university
Telenetting	People are able to get access to information on local computers, through the network for sending their mail. Then the messages are sent later	Makerere University Main Library offers such facilities to students and staff where they open private e-mail addresses
Commercial online services	Online services offer dialog for use by searchers and researchers to advance knowledge	A number of students at Makerere University can be offered mediated searches at UNI (Global Information Centre)

Table V Services offered by different organisations in the application of digital libraries

Services	Number of organisations offering the service					Total
	Professional	NGOs	International	Government	Academic	
Resource sharing	4	4	4	1	3	16
Digitising information	2	1	1	1	1	6
Online public access catalogue	2	4	1	0	5	12
Information services	1	2	1	1	4	8
Ordering and acquisition of information	2	0	0	4	3	9
Database management	2	1	1	3	2	9
Publications	4	4	4	5	5	22
Storage of information	2	1	3	1	5	12
Information analysis and design	2	1	1	1	4	9
Networking	4	0	4	1	0	9
Selective dissemination of information	0	3	1	1	4	9
Advisory services	0	3	1	1	4	9
Bibliographic services	0	1	2	1	4	8
Lending and borrowing	0	1	2	1	3	7
Online services and searching	3	1	3	2	4	13
Abstracting and indexing	0	1	0	0	6	7
Website management	3	3	2	2	3	13
E-commerce	0	0	0	1	2	3
Union catalogue	1	0	0	0	1	2
Distance education	0	0	0	1	4	5
Telenetting	0	0	0	0	1	1

Table VI Practical applications of services offered by digital libraries

Applications	Services that facilitate the applications					Total
	Professional	NGOs	International	Government	Academic	
Development of electronic resources across networks	5	5	6	6	5	27
Co-operative projects to avoid duplication of efforts	2	2	3	4	2	13
Sharing of resources between information institutions and providers	8	4	4	4	6	26
Bridging access to information to distant and disadvantaged communities	8	6	2	6	2	23
Enhancement of research among users	2	3	3	3	8	19
Aiding access and retrieval of information	2	1	1	4	6	14
Enabling standardisation and control among institutions	1	2	1	4	3	11
Enhancing communications within communities	8	2	3	6	6	25
Facilitating education	5	1	1	2	6	15
Enhancing knowledge among communities	2	4	1	2	7	16

academic institutions. This has been achieved through sharing of information across the networks and availability of databases to enable access and online use of information online offered by many organisations. This is mostly to enhance knowledge among the communities in respective institutions.

Discussion

Generally, most of the organisations offer resource sharing. The sharing of information

is not limited to one category: academic institutions are basically using information technologies for research purposes through searching on the Internet. E-mail services were the most frequently used activities by most of the organisations. It can also be observed that the majority of the organisations engaged in use of digital libraries get their funding from donations and outside assistance. Most of the projects have been funded by international donors.

The application of digital and information technologies is limited in developing

countries, due to satellite time and Internet access, costs of connection, and bandwidth limit co-operative applications. The Uganda power supply is unreliable in most of the parts of the country, and non-existent in rural communities.

High telephone bills have been experienced by the majority of organisations; network breakdown and full control over the ISP being the hosts of Websites has limited the effective utilisation of digital libraries in Uganda. The existence of social and interaction differences between the national and international scene has contributed to slow resource sharing of information using information technologies.

Some observations indicated that institutions are facing high monthly subscription fees to the ISP. Market uncertainty was observed to be a failure of most organisations engaged in e-commerce. Databases on CD-ROM were observed to be at a minimum due to the technology involved in their production.

The current ICTs system in Uganda does not enable it to reach the majority of the community in Uganda, as more than 80 per cent of the population lives in rural areas where there are few telephone services to facilitate the use of digital libraries. However, this is being enhanced through the repackaging of information to be transmitted on television, radio and print media to disadvantaged groups.

Conclusion

It is evident that digital libraries and the use of electronic technology have contributed effectively in collaborative applications between institutions. Digital libraries have generally contributed to the development of electronic resources across networks. Sharing of resources between information users and providers has made a basis for effective utilisation of digital library services for the enhancement of communication and bringing access of information to distant and disadvantaged communities.

In order effectively to benefit from the use of digital libraries and information technologies, the services need to be integrated into the services provided by different organisations. However, in Uganda there is need to address issues like:

- literacy and attitudes to different communities for the adoption of ICT into their activities;
- integrating ICT into the education system; and
- enacting policy for use and the regulatory environment for effective delivery of ICT services in Uganda.

Organisations need to put in place ICT master plans and ICT policies to enable effective delivery of services. The marketing of services and information available to enable awareness of the corroborators is paramount in the use of digital libraries. Knowledge and skills for the use of electronic technology are the key to adaptation of digital libraries in Uganda.

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