

# Digitizing library Resources for New Modes of Information Use in Uganda

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**Abstract:** *People have become increasingly dependent on digital information and the Internet as a medium for gaining and exchanging information. However, despite promising developments, numerous challenges that are related to digital content and collection, interoperability, standards, knowledge organization systems, users and usability, legal, organizational and social issues, staff education; infrastructure; language barrier and technology remain. This paper concludes that digital libraries are a key technology especially for developing countries. They can assist human development by providing a non-commercial mechanism for distributing humanitarian information on topics such as health, agriculture, nutrition, hygiene, sanitation, water supply and many other areas ranging from disaster relief to medical education. The paper recommends that adapting quickly to new digital technology is vital for success.*

**Keywords:** Information, Digital information, Digital depositories, Digital libraries and Technology

## Introduction

Libraries are an essential component of a nation's information infrastructure. Historically, libraries have played various key roles in information-oriented societies as the major storehouses of human kind's recorded knowledge. However, the physical media that store the recorded knowledge are constantly undergoing metamorphosis due to continuous technological advancements and innovations. Currently, we live in the so-called "Digital Era" where by information is recorded, stored, retrieved and disseminated in the digital form unlike the past when information was accessed in analog formats. Nowadays information is capable of being stored on specially constructed electronic media and is retrieved whenever required in the most fundamental form, as arrays of zeros and ones (i.e. binary format). Thus, digitization of the library resource materials opens up new modes of use, enables a much wider potential audience and gives renewed means of viewing our cultural heritage with a higher degree of clarity and in a much more compact structure.

## Why Digital Libraries

The rise of an information economy has brought about an information age that is highly reliant on information and communication technologies (ICTs) (Ngulube, 2004:21). It is an age where the survival and development of human kind are ultimately defined by the use, production and consumption of information. The African Information Initiative adopted the digital agenda in 1996 in order to transform stagnating African economies (ECA, 1996:9). In 2001, the 34<sup>th</sup> session of the Commission for Africa reaffirmed that ICTs were key to the economic and social development of the African continent (Ngulube, 2004). Digital libraries are organizations that provide the resources, including specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time collections of digital works so that they are readily and economically available for use by a defined community or set of communities (Waters, 1998; Digital Libraries Federation, 2002). The component characteristics of digital libraries are the storage of information in digital form, direct usage of communication networks for accessing, obtaining information, and copying by either downloading or online/offline printing from a master file (Husler, 1996). According to Husler (1996), traditional libraries, which were known as repositories of knowledge, have hence become accessible in database form; the Internet and the Web are making knowledge universal and linked internationally. In summary then, a digital library maintains all, or a substantial part, of its collection in computer-possible form as an alternative, supplement, or complement to the conventional printed and microfilm materials that currently dominate library collections. Digital librarians, including those in Uganda, enable managing very large amounts of data, preserve unique collections, provide faster access to information, facilitate dealing with data from more than one location, and enhance distributed learning environments. Digital librarians also help to perform searches that are manually not feasible and offer to protect the content of the owner's information (Husler, 1996). Some of the forces responsible for

digital library development are the changing nature of the book, the patron, the library, standards, information retrieval and metadata.

### **The changing nature of the book**

The book has undergone a series of changes that have made its storage and use more efficient (Koehler, 2004). The changes include transitions in form - from stone slab to papyrus scroll to acid free paper codex to electronic bits. Tables of contents and indexing standards have been developed. More recently cataloguing and classifying standards to describe books in a larger context - the library and later the union catalog were developed. These forms of description and meta-description have allowed librarians to develop organized systems for our information container collections. Koehler (2004) posits that one factor that will affect user-centric models in the libraries of the future is the very nature of information containers. In this case, digital collections provide new additional opportunities for organization.

### **The changing nature of the patron**

Koehler (2001) emphasizes that the future vision of the digital library must include some speculation on potential changes in the kinds of services demands that the library patrons will make on the digital library of the future. The author thinks that it is possible to speculate on how those demands will shape those libraries. The library users do and will want a full array of library services delivered to some point of delivery now at least through some electronic means of delivery-Internet, telephone, and others. Physical objects may be transferred by courier, faxed/scanned and transmitted or accessed online; the popularity of e-books and e-journals will grow. The patrons also expect their libraries to provide different services or rather additional services than once they did before.

### **The changing nature of the library**

The library world has undergone much re-thinking in the last quarter century by embracing the idea of the "library without walls (Birdsall, 1994). The 1990s witnessed the explosion of the Internet and particularly the popularity of the World Wide Web. The Web proved to be both a conduit for and a significant source of an immense amount of information, leading some people to predict the displacement of traditional information institutions like libraries. The patrons' expectations for a distance service delivery across library services have increased. Patrons have come to expect a wide variety of automated push and or pull services from libraries and from a distance. The Internet has led to a redefinition of some but certainly not all library functions. Koehler (1999) however recognized that the Web itself lacks library characteristics. There has been much discussion of variant forms of libraries between "pure traditional" and "pure digital" or the "hybrid library". To understand any aspect of library futures, one must give some consideration to probable changes to the information containers themselves and the institutions in which those information containers may be housed Koehler (2004).

### **The standards wars**

The establishments of standards of the digital library futures will be dictated by the standardization decisions made now. Koehler (2004) observed that standards have never been more important. Technology, society and systems, are all intertwined and lead to unanticipated consequences. Similarly, changing library standardization and increased universalization of that standardization will lead to unanticipated consequences in the digital library community and in society in general. Consider for example, cataloging and classification and differences among different classification schemes. Many academic libraries in the United States have undergone retrospective conversion from DDC to LCC. Does this suggest that we are treading toward a single standard? The MARC environment has seen the development of a number of different national systems to support local linguistic and stylistic requirements. The MARC standards have evolved. For example USMARC and CANMARC merged as MARC21. Significant limits have already been placed on the content licenses, particularly libraries and their users on their ability to transfer access to or to make copies of the content. If libraries continue to acquire more contemporary and retrospective content in digital under license from second parties, the ability of libraries to continue to serve their users as they have traditionally done may be significantly circumscribed in the future.

### **Information retrieval and metadata**

One of the primary functions of a library is to develop its collection in keeping with the underlying philosophical purpose of the library. What may be appropriate or useful for one patron may not be appropriate or useful for another. Koehler (2004) suggests that expert intermediaries, ultimately human beings, but aided by expert systems provide and will continue to provide those services in the digital libraries of the future. Metadata systems have increased both in number and complexity. The purpose of metadata and metametadata, as with any cataloguing, classification, or indexing system is to provide description in addition to the original or native document. Typically we want improved description to allow for better storage and retrieval of the object and the information contained therein. These systems will span all classes of objects-text, images, audio, and video and multimedia. These will be coupled with expert level search and retrieval systems as well as the end user. Both expert and end user systems will probably have complex human-computer interfaces to facilitate the search and retrieval process.

### **Higher education needs**

The Internet is not a replacement for books, but it is imperative that libraries reposition themselves within their institutions in order to continue to ensure access to information, education, people, services and ICT. Libraries find themselves in a transitional phase, as they adapt to the needs of an innovative higher education sector. The implementation of the strategic vision is not solely the responsibility of libraries and computer centers. Institutions as a whole can and must implement it. Every opposition must be overcome - for example, the library versus the computer center, electric versus printed information, or centralized versus decentralized systems. A sound budget is needed to find some way out of the present fiscal crisis. Schumann emphasized that information provision is an essential factor in research and teaching - for both the natural and the social sciences. He advised that existing institutions and newly created virtual or project-related organizational units must work together in a joined-up way. In the face of reduced budgets, the new challenges must be met with technical innovations, staff training and development, changes to the working environment and by suitable labor and business models. Bundy explained what he thinks it means for libraries to go beyond their traditional role of merely providing information. In his opinion, the academic library is the driving force for change in the area of education. Unfortunately, library budgets continue to be reduced. Bundy calls for a change in the entire system of higher education in order to meet the demands of users. Libraries cannot manage this alone, but they must nevertheless participate in this transition even to the extent of contributing to the curriculum.

### **Technology push**

The focus of most development at present is tools to integrate content that is already being managed by the library. Cox and Yeats (2002) reviewed library-oriented portals solutions and products available in the United Kingdom: This can mean one or all of integrating multiple resources for the user into a comprehensible landscape; allowing cross-searching or searching of many databases with one interface; personalization; behind the scenes authentication; and the enhancement of simple bibliographic records with tables of contents, and dust cover images. Also implied are management tools to customize the gateway for user groups and to consolidate usage statistics. Many of the systems also have a capability to manage the digitization process and local digital collections. Other solutions exist to solve some of these problems and none offer as much control to the library, or such a complete professional solution.

### **Benefits of Digital Libraries**

Digital libraries are a key technology especially for developing countries. They can assist human development by providing a non-commercial mechanism for distributing humanitarian information on topics such as good governance, health, agriculture, nutrition, education, hygiene, sanitation and water supply. Many other areas, ranging from disaster relief to medical education, also benefit from new methods of information distribution. Perhaps even more important than disseminating information originating in the developed world is the need to foster the ability for people in developing countries to build information collections locally.

### **Human development**

Just as industrialization and globalization have increased the gulf between the haves and have-nots, information and communications technology is creating a chasm between the "knows" and "know-nots"

(Witten *et al.*, 2003). Witten *et al.*... (2003) further observed that in the developing world, digital libraries provide perhaps the first really compelling *raison d'être* for computing technology. Five important areas where digital libraries can promote human development include dissemination of human information, disaster relief, preservation and propagation of indigenous culture, locally produced collections of information and then, new opportunities to enter the global marketplace.

#### *Dissemination of humanitarian information*

Traditional publishing and distribution mechanisms have tragically failed the developing world (Witten *et al.* (2003). A wealth of essential humanitarian material is produced by various international organizations. Being produced by internationally-oriented, non-profit organizations, funded by all people on the planet, this information is, at least in principle, in the public domain: it could be made freely available in the form of networked digital libraries.

#### *Disaster relief*

Natural disasters, such as earthquakes or hurricanes, and man-made ones such as terrorist attacks or nuclear accidents, demand immediate and informed response in an environment where the local infrastructure may be unpredictable or severely damaged. The response to a crisis is characterized by the generation of large amounts of unstructured, multimedia data that must be acquired, processed, organized and disseminated sufficiently rapidly to be of use to crisis responders. Digital library technology allows organized collections of such information, graced with comprehensive searching and browsing capabilities, to be created very rapidly. Intelligence specific to the nature of a disaster, the geographical region and the logistic resources available for the relief effort can be gathered into a built-to-order digital library collection that combines targeted knowledge with general medical and sanitary information. A recent example is the Tsunami wave that killed thousands of people in Asia and left millions homeless.

#### *Preservation and propagation of Indigenous Culture*

Information about indigenous culture takes many guises: oral history in the form of narration and interviews; artifacts in the form of images and descriptions; songs in the form of audio recordings, music transcriptions, and lyrics; dances and ceremonies in the form of video, audio, written synopses and interpretations. Multimedia digital libraries allow such information to be integrated, recorded, browsed, and searched, within a uniform user interface. Because language is the vehicle of thought, communication and cultural identity, a crucial feature of digital libraries for culture preservation is the ability to work in local languages. This strengthens individual cultures, promotes diversity and reduces the dominance of only a few languages. Digital library applications in culture preservation have the advantage that the relevant information is readily available locally. But there are countless other scenarios that involve creating and distributing locally produced information collections. Teachers prepare educational material that addresses specific community problems, and adapt published material to employ local examples. Indigenous people have invaluable medicinal knowledge based on local plants or long-acquired knowledge of the cultivation and protection of local species. Such knowledge is vital: more than half of the world's most frequently prescribed drugs are derived from plants or synthetic copies of plant chemicals, and this trend is growing. Local groups assemble information collections that describe and reflect neighborhood conditions, providing new material for socio-cultural studies, fostering cultural exchange while retaining diversity, and increasing international understanding.

#### *New opportunities to enter the global marketplace*

The varied demands of digital library development, such as manual metadata extraction, collection organization, cataloging and information presentation, expand the range of tasks that the developing world can undertake, creating valuable new export markets. One of the most important developments of recent years is the establishment of open archives and institutional repositories. Preprints can be found there, as can electronic versions of dissertations, research data, teaching materials, and increasingly also articles that have gone through peer review processes. Rosenberg (2004) also sees the future market for scientific information and education in electronic information repositories. She noted that the repositories are connected with one another over global networks, and since they are based on public standards with digital libraries, the users will be offered more convenient and quicker access to the required information.

### **Challenges of Digital Libraries**

The long-term preservation of digital information is a very complex task confronting various challenges, many of which are still subject to profound research. Largely dependent on the primary purpose and the orientation of the project, is the selection of the material the repository shall be composed of. Hereby, the source of the data is determined at first. On the basis of this, a policy has to be declared, whether the material will be handled very selectively, forming a well-sorted collection, or rather gathered in an automatic fashion, resulting in a comprehensive archive. Installing proper storage facilities is a prerequisite for a well working repository. Thereby, a robust and capacious solution is required, but at the same time it needs to be flexible enough to adapt to advances in technology. Digital data is prone to decay. This is not only due to physical deterioration of the storage media used, but to a much greater extent caused by quick succession of ever superior systems replacing hardware as well as software. Because of this evolution, access to digital documents in the long run is at great danger. Strategies have to be developed to counteract this loss of information. Those involve converting data in regular cycles to a subsequent data format that is in use at that time. Another approach sets out to emulate on a future computer then obsolete system environments. However, great effort has still to be put into the research and implementation of such solutions. Ultimately, access has to be provided to the depository. Allowing a convenient and efficient usability of the collections constitute an ongoing task. Furthermore, economics and legal issues demand consideration. Much remains to be done to achieve the realization of such a venture. Yet, steps have to be taken immediately at a high priority taking into account what is at stake. One of the key problems found in the digital library of the present and one that will persist into the future is maintaining the match between the fluid content and its description in the library, digital or otherwise. There is already an emerging literature to point to the complexity and difficulty in maintaining that match, and many conclude, for example, that Web documents, among the most ephemeral of digital material, may be too elusive for serious long-term collecting (Koehler, 2002; Markwell and Brooks, 2002; Nelson and Allen, 2002; Rumsey, 2002). Shiri (2003) identified some of the challenges related to the implementation, development and evaluation of digital libraries to be:

#### *Digital content and collections*

This category refers to individual digital objects and collections of objects in repositories encompassing a variety of materials in different digital formats. Shiri (2003) observed that one major challenge with regard to metadata is the diversity of digital information formats. The author noted that there are challenges associated with digital content: for instance conversion of printed materials into digital format and creation of digital- only materials for the purpose of a particular digital library. Digital collections require well-structured metadata schemes to describe digital objects and content at various levels of granularity. Structural and descriptive metadata are two general classes of metadata of particular relevance. Shiri (2003) propounded that one major challenge with regard to metadata is the diversity of digital formats and the ways in which they should be described in different collections with different target audience and uses. In the electronic environment, institutions and individuals license access to content; they do not own the containers that surround that content. Libraries have already found that they are limited in the scope and range of patrons who may have access to their licensed collections. For example, some academic libraries cannot allow people who are not part of their university access to certain licensed electronic content. However, had that information been contained in purchased "paper" journals, under the doctrine of first sale, there would be no issue. Indeed, given copyright and contract provisions, most electronic material cannot be copied and transferred through interlibrary loan (Koehler 2004).

#### *Interoperability and Standards*

Interoperability is one of the most heavily discussed issues in digital library research. Shiri (2003) mentioned that the requirement for interoperability is derived from the fact that various digital libraries with different architectures, metadata formats and underlying technologies wish to intellectually interact. The challenge however, is that this can only be done through applying a range of common protocols and standards. Standards within the context of digital libraries encompass all protocols and conventional that has been set for the digital library architecture, collections, metadata formats, interoperability and so forth. For all digital libraries in the world to have common standards is a big challenge particularly for the information scientist.

### *Knowledge organization systems, users and user ability*

This category refers to a range of tools used for knowledge organization, classification and retrieval of knowledge in a general sense. Shiri (2003) acknowledged that one of the challenges is the way in which these interact with each other. Hilt (2002) mentioned that research is under way to investigate issues surrounding mappings and interoperability among various knowledge organization systems. In order to develop usable digital libraries, Shiri noted that researchers have addressed user behavior and user requirements in different contexts including academic environments, schools, government departments and business. One of the challenges is associated with the methodologies and data gathering techniques. He observed that researchers have tried to use a combination of tools and techniques to collect data for user evaluation.

### *Legal, organizational and social issues*

Rights management, intellectual property and copy right issues are all legal aspects of digital libraries. Shiri (2003) intimated that social issues in relation to digital libraries center on the ways in which people view digital libraries and their usefulness; and the extent to which they are integrated into people's lives and social activities. Every government must adopt common laws and procedures so as to eliminate misuse and theft of information. Filtering systems should be used so that genuine users are not inconvenienced. An information product is intellectual property (Thurow, 1997). The protection of intellectual property rights and privacy are the two areas the World Intellectual Property Organization (WIPO) seriously is concerned with. Its December 1996 Diplomatic Conference produced two treaties: the WIPO Copyright Treaty and WIPO Treaty on Performances and Phonograms. The first Copyright Treaty supplements the century-old Berne.

### *Staff education*

Education and training are fundamental to the improvement of the preservation of digital resources (Rosenberg, 2004: vi). Competency and expertise in managing digital resources were identified in a study for the Research Libraries Group as major requirements (Hedstrom & Montgomery, 1998). Kemoni & Wamukoya (2000:134 identified lack of information skills due to inadequate training as one of the impediments to the management of electronic records at Moi University in Kenya. Ngulube (2002a:31) also discovered that expertise in the field of digitization in Southern Africa was very limited. Ngulube (2004) again noted that information studies programs in Africa did not reveal many modules that specifically address preservation of information containers and digital preservation. A survey by Liu (2004) on the subject of digital libraries in the United States, Canada, Europe and Asia revealed that some course contents were not up to date in the field of library and information technology. Ngulube (2004) emphasized that educators should bear in mind that rapid changes in information management technologies and the preservation challenges presented by diverse media require constant upgrading of knowledge and skills so that educators produce graduates who would be comfortable with the demands of the digital age. The answer to this is in giving due emphasis to in-house training.

### *Infrastructure*

Digital libraries depend on Internet and intranet connections, yet there is no foolproof system to prevent virus damage. A more serious obstacle is that network access varies widely across the globe. Differences in technology between developed and developing countries persist. Whereas in 1998 more than a quarter of the US population were surfing the Internet, the figure for Latin America and the Caribbean was 0.8 per cent, for Sub-Saharan Africa 0.1 per cent, and for South Asia 0.04 per cent (UN, 1999). Schools and hospitals in developing countries are poorly connected. Even in relatively well-off South Africa, many hospitals and 75 per cent of schools have no telephone line. Universities are better equipped, but even there up to 1,000 people can depend on just one terminal. The Internet, as Arunachalam (1998) puts it, "is failing the developing world". While global satellite communication networks will eventually bring relief, this takes time and money. The core issue of IT development is the objective of providing universal access, in which libraries play a crucial role. Bringing Internet access to all is a daunting task. Physical distribution of information on recordable devices such as Compact disk read-only memory (CD-ROM), is a very practical format for areas with little Internet access.

### *Language barrier and technology*

Language is the embodiment of a culture and preservation of identity is important. There are about 6,000 languages spoken in the world, and of these nearly 90 per cent are dying out. It is estimated that just over half of the world's population speak one of just five languages: Chinese, English, Hindi, Russian and Spanish. Uganda alone has over 50 languages. In the past libraries came into being at the behest of kings and nobles, and enjoyed aristocratic patronage. With the change to a democratic political system, the responsibility fell on the government. The private sector and the corporate sector especially, were not involved. Any contact was related to their own concerns, not the development of libraries. Now the private sector, particularly in advanced countries manufacturing Internet related equipment, is in a position to extend both material and financial support. Being the major producers of computer technology they are able to set up such industries in developing countries. Developing countries could offer incentives such as tax breaks, investment subsidies and so on. This alone would help in reducing the cost of goods needed for constructing a digital library. Unless this is achieved digital libraries and universal knowledge will be restricted to the elite familiar with one of the major languages of the world. The challenge is to evolve a strategy so as to provide information in the language required by the reader. While installed network software is easily detected, it is difficult to determine whether it is operational. Incorrectly installed or configured software is endemic in developing countries, because computers there are often cast-offs whose software is inappropriate to their present environment, yet system support to rectify the problems is unavailable.

### **Sustainability for Digital Libraries**

Sustainability has become a buzzword in the field of new library projects and developments (Hamilton (2004). As McArthur *et al...* (2003) say, in the digital library context, sustainability is a broad term that refers to everything from technical issues about the digital preservation of materials, to the social questions surrounding the long-term accessibility of resources to the public at large. Traditional libraries may not regularly have to justify their existence but most, these days, need to fight to maintain their budgets. The sustainability question arises so frequently in the digital library world because digital initiatives tend to be introduced as special projects (Zorich, 2003). In many cases, insufficient thought has been given at the outset as to how they will turn into long-term developments. And at times of economic pressure, when even the core is questioned, anything else is vulnerable. The key to sustainability, therefore, is to reach a position where the digital library is no longer regarded as an add-on, but as part of this integral core (Zorich, 2003). The answer may include being essential, or an integral, uncuttable part of the organization. This is the status to which digital libraries must aspire (Hamilton 2004). Strategies for achieving sustainability of digital libraries include economic sustainability, finding champions, funding sources and self sustained growth.

### *Economic Sustainability*

Economic sustainability is a softer, more political area than preservation, and consequently solutions are less tangible and concrete. Smith (2003) sums the position up as "the hardest part of sustainability - how to pay for it all". Hamilton (2004) states that there are no easy answers, which is one reason why in the past so many digital library projects have blossomed briefly and then withered. Hamilton (2004) recommended that one view is that more money should be spent on sustaining services and less on initiating projects, but in most cases it is best to start from the premise that external funding obtained to establish a project will rarely be an appropriate source to provide ongoing, unlimited funding for its continuation.

### *Finding Champions*

It is rare that a digital library project is so intrinsically valuable that the host institution is forced to find funds for continuation. Hamilton (2004) suggests that one route towards backing the "withering" trend is to ensure strong branding, linking a successful product with the institution. The author advised that most projects require rallying support through conscious efforts to gain champions beyond the immediate circles and this is where strong, ideally charismatic, project leadership is important.

### *Funding Sources: the options*

Sustainability options are categorized into subscription fees, charges for online courses, sponsorship/endowments, and integration (Hamilton, 2004). He advised that combinations of any of the four might be appropriate. Charging for access will be an option if charges would apply for similar physical information. Charges may also be acceptable for added-value services where basic services are free. Hamilton again stressed that if charges are deemed appropriate there are two approaches: charge from the start or allow free access initially, then charge once the users have been "hooked". The author warned that the availability of so much free information on the Web does create a barrier to payment by individuals who have to be convinced of the value of the particular information you are providing. If the payment will come from institutions rather than individuals, it is important to consider the position of budget holders. For many, payment for a new service will mean something else will have to be stopped. When dealing with academic libraries, the situation is further complicated by the existence of a wide variety of budget control systems ranging from fully devolved to fully centralized, so it can be difficult to target your marketing. Sponsorship and in-kind support can take many forms and creativity may be required to overcome institutional antipathy to and restrictions on advertising. Campbell (2000) gives examples of varied sources of sponsorship for Australian subject gateways ranging from endorsement through free publicity to solid financial support. In-kind contributions are often overlooked. As Zorich (2003) points out, this can lead to problems if the contribution is withdrawn, and it also means that organizations "cannot effectively use this support as evidence when funders seek tangible proof of outside financial commitments to a project". Hamilton (2004) believes that integration is the ultimate goal for many digital library project leaders. But it is hard to integrate a project once its funding has run out. It is also hard to plan for such integration from the outset but this must be the main approach. The formal business plan required by many funders should not be regarded as one more bureaucratic hurdle but the passport to a successful, sustainable digital library.

### *Self-sustained growth*

Libraries in developing countries in particular rely primarily on governmental funding. The resource crisis has affected every field of activity. The problem is further confounded by the increasing cost of books and periodicals in developed countries and the falling value of the currencies of developing countries in the international market. Further periodic increases in freight charges add to the strain on the already low budget allocations. Also, many public and departmental libraries are understaffed. It is clear that relying on the government is not conducive to self-sustained growth. Under these circumstances it is better to explore ways to earn income so as to reduce dependence. This becomes all the more important in the context of globalization. It is therefore essential that adequate thought is given to finding financial resources for digital libraries and their upkeep.

## **Prospects of Digital Libraries**

### **The technological infrastructure**

Computers are not so hard to come by in developing countries as one might think. Their extraordinarily rapid rate of obsolescence, coupled with the developed world's voracious appetite for the latest and greatest, makes low-end machines essentially free: instead of clogging landfill sites many (although certainly not enough) find their way to developing countries. A 1998 World Bank survey of developing countries found three to 30 PCs per 1,000 people, depending on the poverty level (World Bank, 2000). With growth predicted at 20 per cent per year, it was estimated that by the year 2000 there were 50 million PCs in developing countries, serving a population of four billion!

### **Distributed collections**

Electronic collectibles have become more commonplace (Koehler, 2004). Vendors, consolidators, and publishers are providing more and more content either directly to end users or to end users through libraries in electronic format. More monograph and serial titles are being offered to institutional and individual subscribers in either electronic format only or in print and electronic format. If the catalog is in digital format, the target object may or may not also be in similar format. Digitized content can be and very frequently is transmitted directly to the end user on demand from the catalog (Koehler, 2004). When libraries and individuals purchase information objects they own the container but not the content. Content ownership resides with the copyright holder. Nevertheless, as owners of the container, we may transfer the

title to the container or lend it to others. We also have limited rights to copy the content. In the digital environment, where the concept of container is very different and content is licensed, the rules have changed.

### **User behavior**

Studies have shown that students would like smaller digital portable systems rather than carry too many printed books, although this may be in addition to the printed books. Lynch (2001) predicted that users would carry their digital library in their pocket. In that case, their pocket may actually become a digital wearable system for that purpose. Nokia's research center, for example, had the idea of "virtual pockets" for some time (Lehikoinen, 2000), but the notion has not yet affected libraries. Koehler (2004) observed that the youngest generation of end-users has already learned to search for information independently. They learn and research in groups, move in parallel in diverse virtual worlds and wait impatiently 24 hours a day, all over the world, for immediate unlimited access to relevant information (in full text). Koehler (2004) advised that in order to satisfy these demands, issue-oriented, extremely fast and highly effective, flexible search and retrieval systems are necessary. Librarians can make a contribution here by increasing the information skills of the library users, supporting the process of electronic learning, and by getting involved in creating electronic archives and improving their profile and access.

### **Conclusions and Recommendations**

Digital libraries are a key technology especially for developing countries. They can assist human development by providing a non-commercial mechanism for distributing humanitarian information on topics such as health, agriculture, nutrition, hygiene, sanitation and water supply, and other areas, ranging from disaster relief to medical education. The electronic revolution coupled with improvements in communication make it imperative to look beyond today and prepare for tomorrow. In order to promote continuous upgrading of digital libraries in Uganda, there is need for a national information policy to pave the way for the digital library era.

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