OTHER ARTICLE

Paradigms shifts in information environment: prospects and challenges African libraries

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Abstract

Purpose – The purpose is to trace the revolution in information and communication technology (ICT) and changes in this wake such as globalization, digital divide, information society, Millennium Development Goals (MDGs) and e-government and how these changes impact on the provision of library and information services.

Design/methodology/approach – The paper is largely based on review of literature both online and print.

Findings – The paper concludes that the paradigm shifts occurring in the information environment have affected the concept of library; the perception of ownership versus access of library resources; the nature of information resources and services; and the role of the information professional among others.

Research limitations/implications – The paper advocates for a proactive strategy on the part of information professionals in order to re-engineer and adapt the library to the volatile global information environment in order to remain relevant in the wake of new paradigm occurrences.

Practical implications – Effective access and use of information will inevitably have great influence on the realisation of positive effects that the new paradigms occurrences engender in the global environment. It is desirable at this point in time to research into how information access and use can be brought to bear on the attainment of MDGs, bridge digital divide, enhance attainment of information society, promote e-government, etc.

Originality/value – Despite, the rapid changes within the global information environment that has been occasioned by ICT, there is lack of critical mass of information science literature that addresses issues such MDGs, globalisation, information society and digital divide from the perspective of the information professional.

Keywords Globalization, Government, Digital libraries, Information society, Information profession, Africa

Paper type View point

Introduction

This paper attempts to put the paradigm shift for information technology in perspective for African libraries and African library professionals, who are active if often somewhat resource-poor participants in the international discourse.

Libraries have attempted to employ some resemblance of technology to transact business since the 1930s-1950s. As far back as the 1930s punched card equipment was implemented for use in library circulation and acquisitions. Later in 1945, Vannevar Bush envisioned an automated system that would store information, including books, personal records and articles. Bush's (1945) memex was described as a mechanical library that would allow a user to view stored information from several different access

points and look at several items simultaneously. His ideas would later be used as the basis hypertext operations.

Development in information and communication technology (ICT) is not the only aspect that has impacted library automation. World imperatives such as globalisation, the digital divide, the information society, Millennium Development Goals (MDGs), e-government and public sector reforms are other developments that increasingly indicate the directions that libraries should move.

Paradigm shifts for libraries
Role of information professionals
The role of librarians has been changing in parallel with changes in technology. Librarians were long responsible for the welfare of books carefully policing their use, instead of emphasizing access and user services. These curation and policing roles evolved into information management, where librarians engage in creating tools and procedures to enhance access. As information facilitators in today's information age, librarians are called upon to help people use resources, and to reach out to various users such as faculty. They are also seen as information consultants involved in behind the scenes activities such as helping software designers to develop systems that fit users' information seeking behaviour.

Stueart (2006) points out that changes in the information environment have also made librarians into negotiators responsible for identifying needs, into facilitators responsible for providing effective search strategies, into educators familiar with information in many formats, and into information intermediaries responsible for current awareness services. Librarians working largely in IT environments have seen their titles change to cybrarian or webrarian to reflect their increasing role of information management in cyberspace.

Access, quality and selectivity
The library has also experienced a shift from ownership to access and to a focus on the quality of what can be accessed. There is increasing demand for librarians to catalog and classify internet resources. Similarly, there is the issue of the quality of access in terms of bandwidth given the digital divide gap that exists between and within countries and communities, especially within Africa. OPACs are now being used as gateways to information owned within the libraries and outside the libraries. The library catalog is no longer just an inventory list or a finding aid for what the library owns. It has become a portal to everything that the library can access.

Publishing
The publishers have also transformed to become suppliers of information directly to the users. Some journal publishers have terminated their print versions and now concentrate on web-accessible versions. These publishers and database vendors are targeting libraries as a significant market. Because, these resources can be accessed conveniently from any location with a web connection, subscriptions to them have become increasingly popular in research and academic libraries.

Paradigm shifts in global information environment

Digital divide phenomenon

The Digital Divide Network (2004) defines digital divide as the gap between those who can effectively use new information and communication tools, such as the internet, and those who cannot. Chen and Wellman (2003), on the other hand, define digital divide as the multi-dimensional inequalities in internet access and use, ranging from the global level, to nation states, to communities, and to individuals. Warschauer (2002) pointed out that bridging the digital divide is about much more than providing internet and computer connections, because access to ICT is embedded in a complex array of factors encompassing content, language, literacy, education, community and institutional structures. The Digital Opportunity Task Force (DOT Force, 2002) identified priority actions that must be taken by individual countries in order to bridge the digital divide. These priority areas include: fostering policy, regulatory and network readiness; improving connectivity, increasing access and lowering costs; building human capacity; and encouraging participation in global e-commerce.

Information society

The International Federation of Library Associations (IFLA) in its submission to the World Summit on Information Society (WSIS) identified universal and free access, learning the skills required for effective searching and retrieval of information, using traditional media and new technologies, and information and records management as a necessary condition for good governance. On the other hand, WSIS placed a higher priority on consumer protection, privacy and security, relevant content, user training, and ethics in the information society. WSIS moreover underlined intellectual property rights, freedom of expression and internet access tariffs.

The African Information Society Initiative (AISI) envisages that by the year 2010, a sustainable information society in Africa could be realized, where among other things:

- information and decision support systems will be used to support decision making in all the major sectors of the economy in line with each country's national development priorities;
- every man and woman, school child, village, government office and business should be able to access information and knowledge resources through computers and telecommunications; and
- access would be available via international, regional and national information highways.

E-government and freedom of information

Heeks (2002) defines e-government as the use of ICTs to improve the activities of public sector organisations. Because, government services are expected to reach every citizen, e-government supporting infrastructure tends to be expansive. Libraries can exploit such infrastructure to offer information services to a large number of people. For example, Durban Metropolitan Municipal Council in South Africa, made attempts to initiate the Community Information Link (CIL) project in 2000 by using an existing public library network reaching 40 public libraries, to provide web-based community and council information via a client/server network with touch screens and a browser.

Though, the project is said to have failed, it demonstrates just how libraries can evolve to take advantage of new technologies (Anonymous, 2002).

Similarly, in Australia, the Victorian Government through e-government initiative aims at complementing the delivery of online government services with strategies to encourage use of these services, particularly for people who find it difficult to access the internet due to their level of income, physical ability or geographic location. The government has through this initiative established the Virtual Library that provides online access to library resources 24 hours a day, seven days a week (e-government Resource Centre, 2002).

Freedom of information (FOI) supports accountability, transparency and anti-corruption measures and is an important component of modern democracies. FOI gives citizens a mechanism for holding their governments accountable by requesting information about official activities and provides assurance that personal information is only used for legitimate purposes (Wamukoya and Mutula, 2005). FOI legislation ensures that information is not manipulated and misused for corrupt purposes by governments or bureaucrats. Information professionals should educate public about the import and implications of FOI for enhanced access to information by all in society.

MDGs
The UN through the MDGs aims to half global poverty levels by the year 2015. Among issues to be addressed include:

- eradicating extreme poverty and hunger, achieving universal primary education;
- promoting gender equality and empowering women; reducing child mortality;
- improving maternal health; combating HIV/AIDs, malaria and other diseases;
- ensuring environmental sustainability; and
- developing a global partnership for development by 2015 (Department of Public Information, United Nations, 2005).

Although ICT is not a specific goal or target within the MDGs framework, it is a cross cutting catalyst for achieving all the goals. The UN General Assembly Resolution 56/183) of 21 December 2001 recognises: the need to harness the potential of knowledge and technology for promoting MDGs (International Telecommunication Union, 2005).

Public sector reforms and records management
The increasing use of ICT, especially the internet, in governments around the world has given impetus to the generation of e-records, which are seen as strategic assets vital to the functions of the state. Like traditional paper records, e-records support the day-to-day operations of government services and interactions with citizens, private and public sector partners. By and large, in developed regions such as North America and Europe (Open Text Corporation, 2003) where government services have increasingly moved online, e-records are becoming the basis for confirming pension and other entitlements; registering births and deaths; verifying citizenship, certifying voting rights; enabling collection of taxes, supporting financial management; and supporting litigation (IRMT, 2004). The information professional role of records managers has changed to include e-records management.

E-learning

The world over, institutions of higher learning especially universities are increasingly implementing various forms of online mode of instruction to enhance classroom teaching and at the same time improve the quality of research. ICTs in general, and e-learning technologies in particular, provide the opportunity to enhance participatory teaching and learning from anywhere any time; facilitate joint group work; provide the opportunity for reduced costs; encourage self-directed learning and enable students to maintain electronic portfolios of their work. When an electronic portfolio is posted on the web, it can allow viewing and sharing in the works of other people (Livingston, 2004). The drive towards e-learning requires libraries to transform to serve the increasing online populace. Systems developers and librarians should provide systems that support e-learning initiatives including content.

Open source software

Open source (OS) has entered the mainstream software market and its impact is becoming apparent especially in the software industry and in society as a whole. Open software is a useful tool to allow developing countries to leapfrog into the information age. The major benefits of open software and open standards include:

- reduced costs and less dependency on imported technology and skills;
- affordable software for individuals, enterprise and government;
- universal access through mass software rollout without costly licensing implications;
- access to government data without barrier of proprietary software and data formats; and
- ability to customise software to local languages and cultures and participation in global network of software development.

OS software gives librarians, especially African Librarians, the opportunity to venture into application development in partnership with counterparts and other professionals around the world.

Local content

Local content refers to locally owned and adapted knowledge of a community. Local content is reflected in many ways such as: material culture traditional medical practice, architectural design, music, art, or handcraft. During the year 2002, African-produced content accounted for 0.4 per cent of global web content. Out of this 0.4 per cent, South Africa generated 0.38 per cent with the rest of Africa generating 0.02 per cent (Adagbasa, 2002). Local content is emerging as an important component in bridging the digital divide within and between countries. Consequently, development agencies have mounted efforts to mainstream local content into their programmes. Local content has been given prominence by G8 DOT FORCE, UNESCO and the world bank (Graham, 1997; DOT Force, 2001; Sopova, 2003). It is therefore important for African librarians to join the rest of the world in building a super network of global information society by making its knowledge available far and wide through the world wide web.

Through internet telephone, it is possible for libraries to engage with their customers and suppliers. Voice over IP (VOIP) uses efficient and cheaper internet protocol to route voice traffic over company network. The VOIP is made possible because of convergence of data networks and telephone services. Pressure is mounting on governments especially in Africa that have not done so to relax restrictions on VOIP to make business cheaper and easier. Liberalisation of VOIP sector in Africa would provide libraries with a more cheaper means to engage with its clients especially with regard to provision reference services, interaction with suppliers and teleconferencing.

Challenges of new technological development for libraries

The revolutions in technology and global imperatives have impacted on the library profession in a number of ways. For example, there are now several information providers, such as ISP's and the media. Similarly, once an internet resource is cataloged, it becomes a virtual part of the library's collection, and it can be accessed only through the OPAC. This implies that users must be provided with adequate infrastructure to access the information required. Moreover, the new technologies being used in library exert pressure on the library to:

- provide hardware and software support in the library, as well as for remote users;
- provide search ability to retrieve internet resources, such as full-text databases, e-journals, and images so that users can access these resources at home and in the office; and
- create a user-friendly OPAC display for internet resources.

Some challenges of library automation of the early stages still persist. For example, an integral aspect of the automation process was the need to convert the manual files, including parts of the library catalogue. Unfortunately the absence of standard record formats meant that much of this work had to be done again in later years (Boyd, 1971). Recently a number of standards are available, though still undergoing various revisions such as Dublin Core, Warwick Framework, Text Encoding Initiative (TEI). Similarly, the cost and complexity of data conversion was a major impediment to early library systems development. Many libraries manually re-keyed catalogue records into formats designed in-house (Peake and Dobrovits, 1970). Recently due to financial constraints to purchase catalogue records, African libraries still take inordinate amount of time to key in bibliographic data.

Marshall (2005) points out that, though most library systems have greatly evolved to provide enhanced functionalities especially with respect to providing print materials, there is less sophistication for features to manage electronic content. Often librarians are required to buy add-ons for back-end management functions and front-end delivery systems for their electronic collections. The increasing acquisition of electronic content in libraries has therefore not kept pace with systems development. The emerging tools for e-content management should be integrated in existing systems rather than being stand-alones which create added costs of installation, reconfiguration, support and integration.

While, the acceptance of digital libraries is increasing, a number of challenges of economic, social legal, organizational and technical nature will need to be addressed.

Digitisation is an expensive and, labour-intensive process. Firstly, there are huge volumes of materials to digitise. For example, within the European Union, it is estimated that there were more than 2.5 billion in 2001 in libraries. Similarly, the long-term costs of digital preservation are unknown, though studies and experts indicate that these are likely to be significant. Moreover, legal questions that revolve around copyright will have to be addressed, since to digitise is to make a copy. This may be problematic under current copyright law.

Though, the internet remains undisputed as a broad source of information, there are a number of issues that need to be addressed. For instance, anybody can publish on the Net without restrictions and their work being peer reviewed. Similarly, the information on the net is growing at phenomenal rate without adequate tools for bibliographic control, searching, filtering and retrieval. Most information on the internet lacks dates or a clear indication of the rights owner. The search engines are inadequate tools as they do not review the documents, directories and gateways only cover, limited materials. Some materials are hidden behind firewalls and remain inaccessible. Developing countries continue to remain on the periphery in matters of internet governance and this has skewed decision making in matters of internet policy in favour of developed countries especially in Europe and North America (WSIS, 2003).

As digital libraries become part of the traditional library infrastructure, it will be vital to deal with a number of issues. A major risk to digital objects is technological obsolescence of the devices to read them. Likewise, a major worry is the funding for the regular refreshing. Digital preservation will be an ongoing operation, requiring a regular future expense.

Ardern (2006) notes that records managers are bound to find it difficult to explain the need for record keeping systems in an environment that is more and more electronic. He notes that, recent studies have indicated that we have produced more information in the last 30 years than in the past 5,000. Since, 1983, over 23,000,000 personal computers have been created. Experts have projected that over the next 20 years, with all the potential new ways to create, receive and transmit information, we will receive 50 times as much as we have had in the past. The question is how much of it will be of value, who will decide what is of value, in both the short- and long-term? More importantly, if it is of archival value, how will we ensure that it is still accessible and retrievable as new versions of software and hardware are introduced into the marketplace? Who will ensure that electronic records are preserved and the systems designs build in the long-term requirements?

Though ICT is finding its way into elite installations such as libraries, universities, government offices, and corporate organizations in sub-Saharan Africa, there is largely gross under-utilization of such technologies (Adam and Wood, 1999). Such under-utilization has been reported at the University of Zambia, University of Nairobi, Copper Belt University in Zambia and the University of Botswana (Chifwepa, 2003; Yeboah, 1999; Adeyemi, 2002; Subair and Kgankenna, 2002). The under-utilization of the ICTs is attributed partly to inimical policies such as unnecessary restrictions on access to the technologies. Moreover, whereas computer technology has declined in price in developed countries, taxation policies in sub-Saharan Africa make the computer affordable only to a few people. The delivery of new services on a highly cross-subsidized, uniform price basis reduces or eliminates the prospect of competitive entry and discourages the incumbent from further investment and service improvement in

non-profitable or less profitable areas of the market (Australian Information Economy Advisory Council, 1999).

In developed countries telecommunications utilities are increasingly upgrading to fiber-based broadband DSL, but most countries of sub-Saharan Africa are reluctant to reinvest current revenues in order to raise the necessary capital investment for re-cabling, despite hopes for potential future gains from faster service (International Telecommunications Union, 2005). In addition various legislative framework do not favour complete liberalization of telecommunication services. Only a couple of telecom operators in sub-Saharan Africa at the moment have, for example, liberalized VOIP.

Interventions to challenges of paradigm shifts
Faced with challenges that have been occasioned by revolution in technology, libraries should strive to become developers and suppliers of automation systems, since libraries were pioneers in the use of technology. Library and information professionals should strive to build critical mass of IT capacity to venture into library automation systems. There is need for libraries to explore once again the consortium arrangement of 1980s as an avenue of quick library automation.

In Africa, though efforts in automation have been made, there is still a long way to go because of various constraints mainly of financial, skills, etc. A consortium approach may assist libraries to share costs of hardware, software and personnel. Requisite technology now exists that can allow several libraries to bundle together their bibliographic data and share ILS applications. The increasing availability of e-resources makes this imperative. This model of library automation may enhance standardisation of systems, data formats, etc. However, issues of management, and inter-organisational priorities remain.

Library schools should review their library automation courses to include core software and hardware components such as applications development, programming, network administration, web design, and content development. The libraries of twenty first century should not be completely reliant on IT department for systems support. Though libraries need to cooperate with IT departments in a number of areas, they should not be wholly dependent upon them. On the other hand, it is thought that if library systems were part of enterprise wide information management systems, they would attract attention in terms of resources and opportunities to develop their own IT skills. However, current practices of enterprise resource planning tend to give the responsibility of IT management to information systems department. Such a set up is already complex and would not give much attention to the needs of library information management. The situation would remain anonymous as during the mainframe era. Moreover, enterprise systems can be very complex and library procedures are demanding in terms of processor time and other resources.

There is increasing availability of open source that may encourage library staff to get involved in their own application development. The openness of the source code and collaborative nature of OS software development allows local talent to cooperate within the globally distributed teams of specialists and modify and adapt software for local needs. If properly adopted, the OS software can stimulate the growth of an indigenous software industry. However, Marshall (2005) points out that commercial systems will continue to dominate the library automation landscape as compared to open source library automation systems, going by trends in public, academic, school,

and special libraries. For example, in the US where open source is increasingly being used in public library environment, the number of users remains minimal. However, open source technology is in considerable use especially in link resolvers, institutional repositories, personalized library portals, and infrastructure such as the Apache web server and the Linux operating system. Georgia PINES is one of the open source projects in the US that aim to create an open source ILS to replace the commercial system that supports Georgia's more than 200 public libraries. The successful execution of this project may be a major boost in confidence for OS systems.

Garvin (1984) observes that there is need for interface designs that enhance increased functionality and varying level of system complexity to cater for users with diverse abilities, skills, requirements and preferences. Koffi Anan in the build up to WSIS in Geneva challenged Silicon Valley to create the computers and communications systems that would enable villages to leapfrog several generations of technology and enter the information age directly (WSIS, 2003).

The scale of the economic challenge for digitisation requires cooperation at institutional, country and regional level. More public private partnerships are needed to digitise and exploit the resources in our cultural organisations. In addition, close collaboration with publishers and other rights' holders is necessary to find new models for bringing copyrighted material online. Investments in digitisation must be accompanied by organisational changes within the institutions concerned. New types of skills are necessary to deal with the technological tools, together with the extensive expertise that already exists within the institutions. For libraries, this means tackling training and re-skilling as well as recruiting staff with the new skill-sets.

There is need to improve the tools for the digitisation and indexing of texts, particularly for non-english language and for old materials and fonts. Progress with the technological tools can contribute to reducing costs and to increasing efficiency of digitisation. Moreover, as the use of different technologies spread the breadth and width of libraries the world over, there will be increased need to address issues of cyber ethics to deal with misuse of information on the web. Furthermore, libraries need to device means of management both printed as well as electronic resources.

Attempts should be made to apply voice translation software tools to enable indigenous communities to protect unique cultural knowledge and materials which have been preserved through digitization. The SADC eReadiness Task Force (2002) noted that for e-readiness to materialize in the region, a paradigm shift was needed in the community where communities' culture must grow in such a way that they are open to accommodate the concept of e-world and use of the tools necessary to function in such world. Other efforts should aim at giving special consideration to rural and remote areas, under-privileged urban areas, institutions of learning, health, and women's organizations, in gaining access to information.

Future trends and directions for library and information management

As the internet continues to grow, it is envisaged that the next generation internet will be fast, always on, ubiquitous, seamlessly integrated, intelligent and trusted in terms of security (Nelson, 2001). From the perspective of libraries, Ardern (2006) notes that there is an increasing need for information management because information must be placed in a specific context to make it valuable to the user. Libraries are likely to continue to experience significant changes propelled by continuing revolution in technology,

convergence of systems and increasing sophistication of the users. The digital library will likely continue to attract a lot of interest as budgetary constraints continue to bite. With attention focusing on digital libraries, the issues that will have to be addressed include the transition from mediated to un-mediated user access, the vulnerability of digital materials to loss and destruction due to technological obsolescence, IP rights management in a digital environment, and web-based information literacy education.

The capacities of storage devices will continue to get larger and larger thus helping to address the problem of cost of archiving and storing materials. However, a paperless society predicted several decades ago, will unlikely be realized anytime soon. This is because rote learning is dependent on print, which is still the king of scholarship in some areas. Moreover, libraries are unlikely to transition completely from print to electronic – instead print and electronic media will coexist and complement each other. Moreover, given that many African countries are still not legislating admissibility of e-records for governance and for use in a court of law and the fact that users still print electronically received document rather than reading and archiving it, the print media will be with us for a long time to come. Likewise, despite the technology impact in librarians, we are likely to see some libraries deciding whether to go digital based on such factors as the of print versus electronic resources, the ease of access, user preferences, infrastructure costs, and options available for providing resources to users.

Librarians will have to decide on issues relating to valuing and costing for information so that they balance the needs of the publishers for profit and need to enhance access to information as a basic human right. Moreover, issues of copyright will have to be balanced with fair use and free access to information. Perhaps, within Africa the use of multi-site license will be agreed upon to compensate publishers for their losses that may be occasioned by development in IT. Similarly, with the proliferation of electronic resources and the increased complexity of the internet, there will be need to address issues of information or digital literacy. With globalization and emerging issues that cut across boarders being given increased attention, there will be increased consumption of information by governments. Librarians will need to position themselves to take the opportunity to service these needs, otherwise other information providers will opportunistically take over. The future is likely to experience growth in information industries because of this growing demand for and recognition of the value of information by governments within Africa. Libraries will experience expanded access to world markets of goods and services including information.

The library of the future is likely to adopt marketing approach and advocacy in order to address some of the challenges that have been brought by revolution of IT. Marketing will help African librarians to identify the needs and wants of consumers by providing a service or product that fulfills those needs and wants profitably (Woodruffe, 1995). The purpose of adopting marketing techniques is that it will help to analyse customer behaviour in terms of products and services, rethink about business model and reengineer aspects of business process model that has not worked well in the past. (Porter, 1980). Libraries will need to strengthen their existing advocacy programmes as one way of enhancing visibility of their presence to government and society at large. This will help in positioning them to become one of the principal players in national development. Similarly, continuing research and staff development

will increasingly become critical in addressing issues and problems that have been occasioned by revolutions in technology.

Conclusion

This paper has demonstrated that the revolution in IT in the last decade has brought forth new paradigm occurrences that demand the library and information professional to transform in order to respond effectively to the new information environment. The MDGs, Digital divide, information society, e-government, e-records management, e-learning and open source are some of the new challenges that the information professional is increasingly being required to strategically address. The library and information professional has also to deal with the competition that are being occasioned by new information providers such as internet service providers, the media, publishers, etc.

For the library and information professionals to meet these challenges, they will need new skills (i.e. marketing, information and digital literacy, advocacy, change management, etc) adequate funding, innovative use of technologies (developed through, for example, the use of open source software), partnerships with colleagues especially in the developed world and more. The time for the library and information professional to re-invent in order to remain relevant in the increasingly fluid and dynamic information environment is now, lest they get overrun by emerging and enthusiastic new information providers.

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Further reading

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