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Integration of ICTs in Library and Information Science Education in sub-Saharan Africa

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ABSTRACT

The education and training of LIS professionals has to be such that it empowers them to unleash their potential as they endeavour to offer relevant and efficient services within the current levels of technological sophistication. Sub-Saharan LIS schools have embarked on this task by incorporating ICT modules in their curricular. Curriculum development has shown considerable strides in infusing ICT competencies as most LIS schools have developed relevant ICT modules and/or merged relevant ICT knowledge in traditional modules. However, most LIS schools teach these modules theoretically because they have inadequate quantities and quality of computers and poor Internet access. The problems are to be found in the overall ICT policy and infrastructures both at national and institutional levels as well as the lack of sustained funding, appropriate equipment, expertise and management in sub-Saharan HEIs and hence LIS schools. However, the significance or magnitude of these issues and challenges vary between countries and institutions due to diverse socio-political and economic environments. While noting some of the successes, the paper recommends that that LIS schools in Africa must continually strive to offer competitive ICT-laden education and training to their students.

1. Introduction

Information and Communication Technologies (ICTs) have become ubiquitous with current and future social and organisational development. The role of these technologies in national development is undeniably significant. As the positive effects of ICTs have

continually been noted in developed countries, it has become critically important for developing countries of Africa to embrace these technologies. The United Nations Development Programme (2001: section 2.1.1) refers to ICTs as a "powerful enabler of development" because of the significant impact on the economic, scientific, academic, social, political, cultural and other aspects of life. In higher education and human capacity building, there are significant patterns of change because ICTs are impetus for change in traditional concepts of teaching and learning, as well as prime motivation behind the change in scholarly and professional activities. Library and Information Science (LIS) academic departments have witnessed not only this increasing globalisation of higher education but also that of the LIS work place including the consequent extension of competition beyond traditional, institutional, national and regional boundaries. This environment has made it important for LIS Education and Training to strive to improve their quality of programmes, on the one hand to be able to participate in educational networks and develop innovative strategies in planning and administration of LIS education (Curry, 2000), and on the other hand, to produce graduates whose workplace spans the whole world. Thus it is a foregone conclusion that ICTs are significant in the achievement of LIS educational goals/objectives and the fulfilment of the primary tasks of LIS schools. Hence, with this conclusion came the realisation that there was need for greater infusion of ICT knowledge and skills into LIS course content, as well as thorough diffusion of ICT competencies into the LIS students.

Sutton (2001) observes that the changes brought into the LIS profession by ICTs can be divided into two major categories, namely, the natural evolutionary changes, on the one hand, and transformatory changes, on the other. As *natural evolution*, the library and information science profession has harnessed ICTs to perform old tasks better through the automation of housekeeping tasks such as reference work, bibliographic services, cataloguing, serials, circulation and acquisition, which are performed more efficiently in an ICT environment. *Transformatory* changes, on the other hand, include the emergence of new functions arising out of an expanded, demand-driven information society, wider and/or interdisciplinary jurisdiction and closer focus on user needs (Sutton, 2001). These transformative trends represent systematic changes that substantially alter the boundaries of the profession. For example, Fourie and Bothma (2006) observe the increased use of the World Wide Web in private, social, business lives of many people and hence note that it is a vital component of the enabling structure for school, university, career and other use for information and communication. This one platform exhibits the fact that those involved in information services need to be sufficiently prepared to handle both the users of information and the attendant technologies. Thus knowledge of networking, communication and retrieval technologies has become core to the profession. And as distinctions continue to blur between telephones, television and computers (Curry, 2000), information professionals, and/or LIS graduates have to be able to navigate information networks competently so as to provide relevant services and materials for their users. Consequently, LIS curricula need to consolidate ICT concepts, knowledge, skills and proficiency into core competencies, and LIS schools need to provide adequate content and practice that will enable LIS graduates to adapt and use ICTs effectively.

But in Africa, while recognizing and endeavouring to fulfil its role in enabling Africa to be visible in the information age, LIS education also needs to balance enthusiasm for futuristic goals with realism about the base and pace of change that sub-Saharan Africa institutions can expect to achieve given the financial and infrastructural inadequacies and uncertainties i.e. the dilemma of the digital divide. It is an understatement to state that LIS education in sub-Saharan Africa faces challenging curricula issues. Achieving a balance between traditional and modern LIS content, and between theoretical vs. practical training of ICT-based competencies, have to be resolved amid inadequate ICT resources, a largely non-literate population using a multiplicity of languages (Zulu, cited in Addo, 2001), and an information environment that is challenged by disparities among its people in terms of economics, culture, geographical dispersion, politics and other physical challenges. In addition, LIS schools have to content with emerging disciplines such as Knowledge Management, which while positively offering Africa new benefits such as the management of indigenous knowledge (Jain, 2006), also pose the challenge of 'stealing the show.'

2. Literature Review

There is a lot of literature on the use of ICTs in Africa, which reports on the rapid growth of ICT use, especially in urban areas. The development of web content from Africa is expanding with the increasing organisation-based web sites. Jensen (2002) provides an updated overview of ICT developments on the continent but observes that prohibitive cost and sparse and unreliable telecommunication networks form the major hindrance for many people in Africa. This, in spite the general worldwide decrease in hardware prices and development of open source software. ICTs in African higher education has been discussed by Ajayi (2000), Ajayi, Isalawu & Raji (1999), AAU (2000a, 2000b), AVU (2002), Daly (2000) and Janczewski (1992). Various angles of ICTs and LIS education in Africa are covered by Chisenga (1999), INASP (2002), Minishi-Majanja & Ocholla (2003), Ocholla (2000, 2001, 2003), Odini (1999), Raseroka (1998), Shiholo (1997) and Thapisa (1999).

Suffice it that an extensive review of literature related to this entire topic can be found in the article by Minishi-Majanja (2003), among others. More specifically, discussion of the LIS curricula, as they strive to consolidate the new concepts of knowledge, skills and proficiency of a changing LIS workplace, into core competencies, have been discussed by Dowlin and Loertscher (1999), Fourie & Bothma (2006), Hoskins (2005), Lim (1998), Mangan (2000), Manmart (2001), Marcum (1997), Stoker (2000) and Thapisa (1999). Issues of the transformation of LIS education have been discussed by Burnett (2001), Curry (2000), Dowlin & Loertscher (1999), Lim (1998), Mahmood (1997), Mangan (2000), Manmart (2001), Marcum (1997), Ocholla (2003), Smith (2002), Stoker (2000), Sulistyo-Basuki (1999) and Tenopir (2000). Other issues deliberated upon by the same authors include that of the human resource capacity in terms of teaching staff because ultimately the success of ICT-based education depends upon the teacher's ability to keep pace with the developments because they (teachers) are responsible for quality control, improvement of learning and the aggregate effectiveness of the learning process.

Academic staff, in their academic delivery face various challenges such as c*hanging educational theories (*Barron, 2002; Olcott & Wright, 1995; Rudasill, 2002; Shoffner, Jones and Harmon, 2000), *knowledge of Hypertext Mark Up Language* (Rudasill, 2002), expert use of *distance education methods* (Barron, 2002; Egan, Sabastian & Welch, 1991; Rockwell, Schauer & Fritz, 2000; Threlkeld & Brzoska, 1994; Willis, 1993; Wilkes & Burnham, 1991). Students on the other hand, are challenged by *physical access to ICTs* (Smith, 2002, LEEP, 2002), e*pistemological access to ICTs* (Broekman, 1992; Herther, 1999), n*ew learning skills* (Tallman & Benson, as cited in Smith, 2002; LEEP, 2002), *the new learning environments* (Barron, 2002; Burnett, 2001; Curry, 2000; Herther, 1999; Kazmer, 2000; Smith, 2002).

It is hard to establish consensus about the ICT subject or modules. The naming of subjects/modules often depicts the "confusion" and largely seems to be dictated by the ICT industry, rather than the LIS sector. As a result, most LIS schools, worldwide, formulate titles based on what they either understand or come across in their geo-academic environment. However, it is good to note that there is better agreement regarding the basic competencies that a LIS graduate needs. Some of the notable ones include an understanding of basic computer-information science convergence; understanding connectivity; knowing the Internet; installing, configuring and using a browser; evaluating networks, software and hardware; etc (Fourie & Bothma 2006). Current LIS graduates should also be capable of efficiently handling a myriad of ICT-based processes such as creating charts, importing graphics, establishing FAQs, conducting chat reference sessions, participate in collaborative reference work, creating databases, etc.

3. ICT Offerings in LIS Curricula

Sub-Saharan Africa LIS schools offer a wide variety of ICT modules within their curricula. However, the curricular are not harmonised – neither across the region nor even within individual countries. Thus within one country, such as South Africa, it is not unusual to find great diversity of offerings among the LIS schools. Each school attempts to offer what they believe to be key competencies for their graduates. But also underlying this diversity is the national and institutional ICT capacities (Ngulube, 2006). At national levels, some countries have made greater strides than others. For instance, the South African government recognises that ICT human resource capacity building is the key to the accomplishment of the ideals of the information age. To ensure that the country is well positioned for this society, not only is the infrastructure continually under scrutiny, but higher education is expected to increase enrolments in the ICT fields of study (Ministry of Education, 2001). Another example is Uganda's liberalised telecommunications policy of 1996, which paved the way for private sector investment into, and hence greater and faster ICT penetration (Ikoja-Odongo, 2006). The significance of governmental intervention is exhibited in the growth of the ICT infrastructure, which then provides a platform for institutions and LIS departments to increase their ICT diffusion. But this is not true of all African countries. Poor economies, political instability, large populations, bad leadership/governance and a myriad of other

problems have not made it possible for many African countries to adequately address the subject of ICT infrastructure and education.

At institutional levels, each university or college is able to muster technological diffusion depending on its history, management (vision, policies, etc.), financial well-being (i.e. funding sources or innovativeness, etc.) and a host of characteristics. In South Africa, the "historically black universities are much more badly resourced" while the "historically advantaged are well resourced and appear to do be doing better" in terms of ICT education and training (Ngulube, 2006:4). In many African universities, the government is the main source of funding, with the result that many universities are poorly funded (Rosenburg, 2000). Moreover, long-term planning in such universities is often problematic since government funds are appropriated annually, without express assurance. A host of private universities have recently emerged in some countries such as Uganda (Ikoja-Odongo, 2006), whose main source of funding is the students' fees. While the fees are generally higher than those paid within the government-funded universities, they (fees) cannot be so high that the prospective students fail to afford. Since one of the main aims of these universities is business, they tend not to invest heavily in expensive programmes, infrastructure or equipment. Thus the success of LIS schools in such universities depends on the viability of LIS programmes – often defined in terms of a greater number of students requiring minimum investment. This definitely compromises the level of ICT education to be provided. Apart from financial dynamics, institutional human capacity plays a big role in the ICT modules offered. With the general ICT human resources scarcity (due to brain drain and better financial rewards elsewhere), LIS schools often lack academics that can champion and dynamically develop ICT programmes, subjects or even modules.

According to Minishi-Majanja and Ocholla (2004), the modules that generally top the list are of fundamental relevance to LIS practice. These include Operating Systems, Applications software, Hardware & Software selection, LANs and Intranets, Internet Facilities and Internet Tools. However, as mentioned before, what is taught in the above modules does not always translate into comparable knowledge and competencies. There is no uniform approach to what is taught, let alone how it is taught (Ngulube, 2006). Additionally, even though sub-Saharan Africa LIS schools collectively offer what seems to be an adequately wide variety of ICT modules, research on ICT curricula reveals a preponderance of difficulties in the absence of African benchmarks and models (Ngulube, 2006). Only few LIS schools offer what may be deemed as the full range of ICT competencies. In some of the individual institutions, the range of modules offered cannot even be deemed to be enough. For instance, Manda (2006:5) observes that the integration of ICT into paraprofessional training in Tanzania is limited in both modules and course content. He further observes that "as an independent subject, ICT is offered only as an optional course" in the MA Information studies curriculum at the University of Dar-es- Salaam (Manda, 2006:5). However, and to emphasize the disparities among universities even within one country, Manda further observes that the BA-LIS programme at Tumaini University in Tanzania offers more ICT modules and content than the University of Dar-es-Salaam's MA programme, the basic deciding factor being resources (ICT and human).

3.1 Core vs. Elective competencies

Most ICT modules are offered as core and/or required within the LIS programmes. In many cases, ICT content is said to be "integrated" in other modules that are core/required. Table 1 (*reproduced from Minishi-Majanja & Ocholla, 2004:194*) shows the percentage of LIS schools, under each category, offering each module.

Table 1 Reflective of the relative importance of ICT Modules N=29

Module	% **Core**	% **Elective**	% **Integrated**	% **Not Offered**
Online Database Searching	55	0	35	10
Internet Facilities	55	3	28	14
Mgt of Library Automation	55	0	35	10
Gen. Applications Software	52	7	28	14
Library Software	52	0	38	10
Information Systems	48	10	28	14
Electronic Publishing	48	10	24	17
Internet Tools	48	0	24	28
Hard/Soft-ware Selection	45	10	35	10
Internet Hardware/Software	45	7	35	14
Hypertext	45	0	17	38
Operating Systems	41	7	35	17
Local Area Networks	41	0	41	17
Multi-/Hyper-Media	38	3	38	21
Intranets	38	0	38	24
Automatic Indexing/Abstracting	35	7	38	21
Electronic Current Awareness	35	0	41	31
Programming	31	14	13	41
Electronic Document Delivery	31	0	38	31
Intelligent Gateways	31	0	24	45
Telecommunications	31	7	28	35
Data Communication	31	7	31	41
Computer Architecture	24	3	28	45
Text Digitization	24	3	21	52
Human-Computer Interaction	24	0	35	41
Artificial Intelligence	17	14	14	55
Distributed Systems	17	3	10	69
Broadcast Technologies	3	7	24	66
Software Engineering	3	10	17	69

3.2 Practical versus Theoretical Learning

A balance between theory and practice can be considered the best approach because it enables the curriculum to respond to the need for extensive knowledge in information systems and technology, while at the same time addressing market needs for practical skills (Rosenberg, 2000). LIS schools need to ensure that there is a hands-on practice when teaching ICT modules and/or to increase the amount of this practical component. Similarly, experiential learning that highly integrates the use of ICTs should be

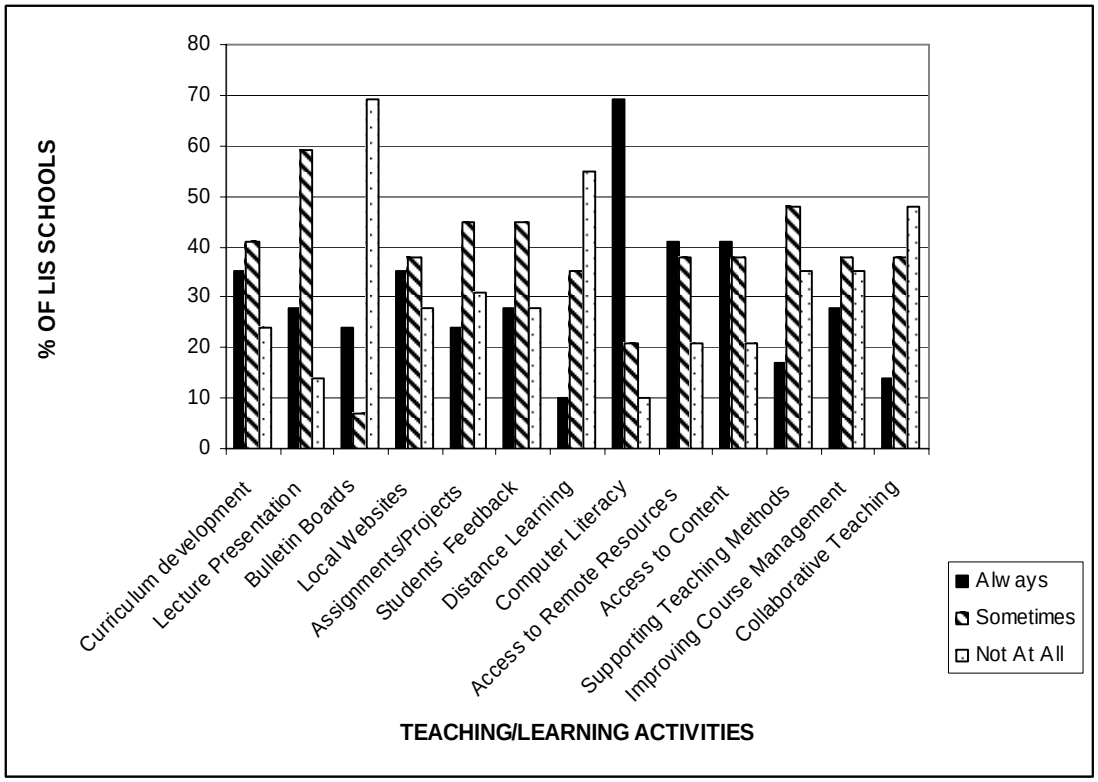
emphasised. Such learning is highly dependant on students having sufficient success to computers and the Internet. Unfortunately, this is not often the case. Many universities centralise their ICT facilities in order to ease the burden of management and maintenance. But a centralized system (i.e. computer laboratories open to all students) means heightened competition in accessing the facilities, especially since the number of PCs is unlikely to be adequate for the entire population of students. Most LIS schools face the problem of facilities' shortage hence inadequate access by students (Chifwepa, 2006; Ikoja-Odongo, 2006; Manda, 2006; Moahi, 2006) The best arrangement for LIS training would be decentralized or departmental LIS laboratories, so as to ensure that LIS students have equal and relevant access to computers. Owing to the inadequacy of facilities in many of the African LIS schools, students are taught largely theoretically.

While appreciating that the major reason for this problem is the inadequacy of facilities, it is easy to see that such education and training compromises the standard/level of competency among the graduates. To overcome the challenge, some LIS schools arrange/organize practical attachment for students to work in particularly ICT-rich environments that can reinforce the theoretical knowledge. To yield best results, such attachments should always be well timed.

3.3 Use of technology in the teaching/learning activities

The use of electronic resources in teaching and learning positively impacts the delivery of LIS modules. Some of the new approaches, methods, techniques and instructional resources/tools of teaching/learning, when innovatively used, not only make it easier for students to learn, but also insidiously acquaints students with the ICT tools. Not surprisingly, some students obtain computer literacy for the first time at university and hence, many LIS schools have this as one of the mandatory modules during the first year of undergraduate study. Other activities are shown in Figure II (*reproduced from Minishi-Majanja & Ocholla, 2004:196*) depicting the average percentage use of ICTs for the individual teaching/learning activities.

Figure II: ICT use in Teaching/Learning activities ***(N=29)***



An important development in educational methods is the use of online teaching/learning. This form, often considered under 'flexible teaching/learning' methods which seek to provide educational programs in ways that meet the changing needs of learners. Programs are designed to cater for a more diverse range of learners, learning styles, needs and interests than are normally catered for through conventional study programs. Flexible teaching/learning, in the context of higher education, is concerned with the provision of a learning environment for students that incorporates a variety of access opportunities such as online (electronic) education, distance education and computer-assisted education. Besides, offering computer and/or web-based courses is a way of enriching content through direct integration of information resources into LIS programmes, because information relevant to LIS education is increasingly available on the Internet or in electronic formats. Online teaching/learning should not merely replicate traditional classroom events through the Internet, but also provide for different ways of learning and the construction of a potentially richer learning environment using fresh approaches to learning, catering for different learning styles, as well as allowing for greater diversification in learning and greater access to learning. Computer-assisted teaching/learning is already happening in many of the African LIS schools, but mainly just occasionally. Only a few (34%) of the sub-Saharan Africa LIS schools practice online teaching and learning (Minishi-Majanja, 2004:212). An example is the University of Botswana, which has introduced e-learning by encouraging lecturers to use the WebCT platform in delivering courses and the Department of LIS has been in the forefront in embracing the innovation (Moahi, 2006).

It is important that LIS schools continue to increase the use of ICTs in teaching and learning, with the aim of achieving greater effectiveness, especially since the field of LIS is essentially ICT-oriented. It would be useful for African LIS schools to strive towards more online and distance education in order to provide flexibility for students as well as reach work-bound and other students. Additionally, the use of the online environment is itself a learning process for students as well as for academic staff, and will serve to sharpen their skills of communication, collaboration and web activities in general.

4 Major challenges and opportunities

All LIS schools recognize the importance of infusing more ICTs in their curricular. But their wishes and efforts are constantly thwarted by a number of key challenges. These include:

4.1 Challenges

a) Inadequate technological infrastructure to support the integration of ICTs in the curricula (Manda, 2006). This refers to issues as poor or lack of national ICT policy, low internet connectivity, inadequate supply of electricity, inadequate number of PCs, etc. There is need for policies that deregulate satellite communication and other telecommunication links, regulate ISPs, regulate government and cross-border data flows, etc. ICT policies can help address stringent tax regimes that still treat computers, communication equipment and other peripherals as luxury items, thus imposing heavy import duties on them and subsequently rendering these items very expensive.

Internet access is now widely available, but the efficiency is poor as many LIS schools experience downtime, several times a week. The telecommunication services are the root cause of these downtimes in terms of, either, low bandwidth, technical faults and other network configuration problems. As Jensen (2005) puts it, there are also “many external systemic factors such as electricity, transport networks, import duties” etc, which impact on internet service delivery on the African continent. In some institutions, access is limited, not only by the number of Internet service points, but also by the time that access is available or permitted, leave alone the difficulty of bandwidth. Yet for research purposes, access to the Internet is no longer a luxury or privilege for only a few people because in academic circles, access to the Internet and hence to the world’s stores of knowledge is a necessity. LIS departments still need to lobby to gain greater access to Internet resources for academic staff and/or research. Thus there is urgent need for improved ICT policies and infrastructure in institutions and countries.

b) Funding/sustainability of the technology is the major non-technical constraint in LIS schools (Minishi-Majanja, 2004). Most universities decry the issue of under-funding in most of its functions. Besides, the unprecedented, phenomenal and multifaceted growth and development of the ICTs themselves pose another challenge. This rapid pace and transient nature of technological development requires sustained funding. While the centralization of ICT services, hence funding, has been found to be the most affordable

system for institution-wide development and use of ICTs, it only works well where there exists a policy that has explicitly incorporated the goals and needs of all sectors, including those of the LIS school. In institutions where the political economy is slanted, coupled with the absence of such a policy, a LIS school may suffer from neglect and hence be unable to develop and use ICTs.

c) Job market vs curriculum change. There is a gap between the competencies that LIS education provides and those required by the job market today (Ikoja-Odongo, 2006). It is a challenge for current LIS curricula to meet the expectations of stakeholders (Beukes-Amiss, 2006). Even though some consultation is usually taken by LIS schools when they re-curriculate, it is often difficult for employers to clearly visualize how their needs can be translated into the curriculum and vise versa. Producing job-specific graduates is a "tall order" considering the diversity of employers. LIS schools, in trying to provide for everybody, often end up providing for none.

d) Expertise. Among the constraints cited by respondents in the study were the issues of (a) re-skilling lecturing staff so as to improve their ICT competency, (b) lack of systems manager/support staff and/or ICT experts, and (c) low levels of students' epistemological access (Minishi-Majanja, 2004:227). Manda (2006) observes the lack of ICT knowledge and skills among staff. Ikoja-Odongo (2006) decries the problem of brain drain i.e. that staff sent overseas for training either do not return to their posts or are taken up by other organizations that are able to offer them higher remuneration. This suggests that in so far as re-skilling academic staff is concerned, opportunities are available but there is still no guarantee that the problem will be solved because of the prevalence of skills shortage at macro/national levels.

There is still a serious need for technical support staff with high level expertise in the maintenance aspects of ICTs. Because of poor maintenance and insufficient skills to diagnose system problems and swap parts, there are many out-of-commission machines which could easily be re-activated and used. The problem of technical expertise is two faceted. In the first place, there are not enough people qualifying or attaining ICT specialist skills at the speed at which the technologies are adopted. Secondly, the problem of brain-drain whereby the few experts opt for better paying jobs overseas.

Ikoja-Odongo (2006) observes that many students join the university without any computer skills and hence much time is taken trying to make them computer literate. However, it seems that the problem of students' ICT skills may be short-lived because on the one hand, computer literacy has now been introduced at many school and colleges, while on the other hand, the 'N' and 'Y' generations are becoming of age.

4.2 Opportunities.

a) Expanded job market. The market demand for LIS graduates who have strong ICT skills and broad perspective on information management has expanded. Both the public and private sector have recognised the importance of effective management of their knowledge and information resources. However, many of the organizations in these

sectors do not necessarily want the traditional LIS perspective. Rather, they need a versatile professional who is able to actively participate in detecting cues for relevant information, gaining/providing access to relevant information sources, searching and synthesizing data, repackaging information, and adding any other value that enhances the effectiveness of the organisation. All these need extensive ICT knowledge and skills that LIS education can effectively integrated in their curricula.

African LIS schools should continually review their curricula and innovatevely infuse a stronger ICT component. Apart from the established procedures of curriculum review, heads of LIS schools need to network and keep in contact with colleagues in other LIS schools through correspondence, email or conference attendance so as to pick up new ideas. Additionally, LIS schools should explore methods of collaborating with their counterparts (such as other LIS schools, academic staff or non-LIS departments), who have expertise and resources to offer modules/competencies that they may be unable to offer. Where academic staff expertise is the problem, but ICT facilities are available, this can be achieved through distance education and/or online education.

b) It is encouraging to note that some international companies, such as Bull, Compaq, IBM, NCR, Oracle and Microsoft operate offices in Africa with reliable local representation in most countries. The presence of these companies and/or their representatives indicates their appreciation of the market for their products, and it would be in their best interest to maximize their exploitation of the market rather than concentrate only on the corporate Africa. In any case, PC equipment is often clone equipment imported from Asia, but Compaq, Dell, IBM and ICL also have significant shares of the market and Dell South Africa is now selling via the Web (Jensen, 2005). There is also the growing availability of high-speed wireless Internet access, which is often seen as Africa's information revolution. As Van der Merwe (2003) observes, "Africa needs this system because it makes the continent more accessible to international business people and business… But more than that, the wireless technology lends itself to the rapid, low-cost roll-out of a new wave of connectivity into rural areas not currently served by telecoms"

Jensen (2006) observes that countries can strategically improve infrastructure policies that can minimize bandwidth problems, for instance, by obtaining "access to national and international backbones at cost, rather than at the high tariffs charged at monopoly prices by the incumbent operators." Nevertheless, LIS schools in sub-Saharan Africa should continually urge their parent institutions to draw realistic budgets and provide sustained funding for the ICT projects. Individual institutions and departments must try to find ways of obtaining the necessary funds, be it through income generation activities or liaisons with the private sector. Additionally, some cost-cutting measures can also be employed, such as those suggested by James (2001), i.e. the use of open source software or cheaper versions of software e.g. NewDeal, Office2000, etc. which can also operate on older hardware; procurement of refurbished computers distributed by such organisations as New Deal, Freecom, Computer Aid International, and World Computer Exchange; redesigning of hardware so as to lower the cost of Internet access, for instance using hardware that does not have hard drive or disc drive but has Internet software; merging

Internet technology to use television connection with modifications; and using community wireless LANs e.g. Air Port (http://www.freebase.sourceforge.net) and Residential Gateway.

5. Conclusion and recommendations

It can be concluded that sub-Saharan Africa is in the mainstream of ICT exploitation and consumption, even if somewhat lagging behind. As Moahi (2006) observes, the LIS environment in much of subSaharan Africa is still basically traditional, but becoming more and more ICT-driven following trends in the rest of the world. The education and training of LIS professionals, their needs and their potential, empowers them to unleash the potential and the sophistication of technology. Sub-Saharan LIS schools have embarked on this task by incorporating ICT modules in their curricular. Curriculum development, which is largely under departmental jurisdiction, has been attended to and most LIS schools have developed relevant ICT modules. However, complete diffusion of ICTs into the LIS schools has not been achieved because the schools are beset by issues and problems that are largely above their total control. The problems are to be found in the overall ICT infrastructures both at national and institutional levels, as well as individual LIS School's equipage of appropriate hardware, software and expertise. An important undercurrent in these problems is the lack of adequate funding for ICT implementation in sub-Saharan LIS schools. However, the significance or magnitude of these issues and challenges vary between countries and institutions, presumably due to socio-political and economic environments. Thus the diversity of the continent is mirrored in the nature, type and diffusion of ICTs in LIS schools within the region.

But the 'bottom line' is that LIS schools in Africa must harness the opportunities offered by ICTs in teaching and learning, for instance, in the development of appropriate market-driven curricula, acquiring of relevant, up-to-date educational technologies and resources, and the use/application of state-of-the-art educational methods and techniques such as mounting on-line courses and enhancing computer assisted learning. It is important that the Head of a LIS school possess the vision, knowledge, commitment and exploratory flexibility to adapt to new changes/challenges and spearhead or apply the theory of Individual Innovativeness by allowing early adopters to provide guidance.

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Appendix 1: Examples of ICT modules offered in different LIS schools.

Course Level	Zimbabwe (NUST)	***Zambia***	***Uganda (Makerere)***	***Namibia (UNAM)***	***Botswana***
Certificate	• Information Technology (Basics of Information Technology; Hardware Concepts; Software Concepts; Historical Development of Computers; Applications of Computers; and, CD ROM Technology.	• Basics in information technology	• Information Technology	•	• Introduction to IT (Core) • Computing & Information Skills (GEC) • Intro to Internet and Web Design (Optional) • Information Resource Management (Optional)
National Diploma	o Data Communication and Networks in Libraries • Database Analysis and Design	• Introduction to information technology (Role of IT in IRM; Different types of computer systems; Computer basics; Data communications and networking; Using of computers in resource management; Database management: including MS Access and ISIS	• Information Technology • Management of Electronic Records • Database Management Systems • Management of Electronic Records • Computerized Records Management Systems	• Information and Communication Technology • Basics of Desktop Publishing • Information Storage and Retrieval Software: WINISIS • Computerized Records Management Systems and Management of electronic Records	• IT Tools and Applications (Core) • Digital Libraries (Core) • Introduction to databases and Information Retrieval (Core) • Introduction to the Internet and Web Design (Optional) • Information Management and Systems Development (Optional) • Computing and Information Skills Fundamentals I (GEC) • Computing and Information Skills Fundamentals II (GEC)
Higher National Diploma	• Record Systems Analysis and Design (Systems Theory and Systems Thinking; Records of Information Management Systems; Feasibility	•	•	•	•

Course Level	Zimbabwe (NUST)	***Zambia***	***Uganda (Makerere)***	***Namibia (UNAM)***	***Botswana***
	Studies; Analysis Records Systems; Records Systems Design; Records System Implementation; and, Records Systems Evaluation.				
Bachelor degree (Library and Information Science/Studies)	Year 1 • Introduction to Information Technology 1 (Use of hardware, software and communications; Internet information; electronic communication; word processing & document design; data modelling with spreadsheets; database design and maintenance for information storage, retrieval and presentation. • Automation of Library Processes (selection of computer hardware and software for instructional purposes; use of automated systems for management activities such as circulation, acquisition, cataloguing, etc.; computer networks. • Information Retrieval Systems. • Application of Information Technology Tools in Libraries and Archives . • CDS/ISIS (Computerised Documentation Systems/Information Systems for Information Services)	*(proposed)* • Information Systems and Technology • Web Design and architecture • Database Management Systems • Open Source Software for Libraries • Mark-up and Metadata • Legal Issues for Information Professionals (including aspects of copyright)	• Information Technology I • Information Technology II • Desktop publishing • Media technology management • Management of electronic records • Publication design and production • Database management Systems • Website development and Internet Technology • Media technology practice • Electronic publishing • Digital library services	• Computer Literacy • Web Page Design (Adhering to Web 2.0 Technologies in the design of web sites, creation of Wikis, Blogs, Podcasting etc.) • Desktop Publishing • Systems Analysis, Design and Evaluation • Analysis and evaluation of Internet Search Engines • Indexing and Database Management	• IT Tools and Applications (Core) • Digital Libraries (Core) • Introduction to databases and Information Retrieval (Core) • Computer Communications and Network Fundamentals (Core) • Online Information retrieval (Core) • Advanced IT Applications (Core) • Organising Internet Resources (Core) • Database Management Systems Design(Core) • Global Information Systems (Core) • Introduction to the Internet and Web Design • Information Management Systems Development

Course Level	Zimbabwe (NUST)	***Zambia***	***Uganda (Makerere)***	***Namibia (UNAM)***	***Botswana***
	Year 2 • Online Information Retrieval • Database Applications in Archives, Libraries and Publishing • Archival and Information Systems Management • Design and Realisation of Internet Information in Libraries and Archives				
Bachelor of Science Honours Degree in Records and Archives Management	Year 1 – Same as the BSc. (Hons) in LIS Year 2 • Design and Realisation of Internet Information in Libraries and Archives • Management of Electronic Records I Year 4 • Reprographics • Management of Electronic Records II	•	•	•	•
Master of Science in Library and Information Science	• Advanced Information Technology Applications (Core) • Management Information Systems (Elective) • Specialised Information Systems in Agriculture, Health and Environmental Issues (Elective) • Advanced Records Management	•	• Computers and Communication Technology • Information Storage and retrieval systems • Programming	•	• Computers and Data Communications (Core) • Information Storage and Retrieval (Core) • Business information systems (Optional) • Database systems (Optional) • Web Design and Multimedia (Optional) • Information networks and networking (Optional) • Cataloguing Electronic Resources (Optional)

Sources: Hikwa, 2006 (Zimabwe); Chifwepa, 2006 (Zambia); Ikoja-Odongo, 2006 (Uganda); Moahi, 2006 (Botswana).